UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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ASSISTANT ADMINISTRATOR
FOR ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Amos Hochstein
Special Envoy and Coordinator for International Energy Affairs
Bureau of Energy Resources
U.S. Department of State
Washington, DC 20520

Ms. Judith G. Garber
Acting Assistant Secretary
Oceans and International Environmental and Scientific Affairs
U.S. Department of State
Washington, DC 20520

Dear Mr. Hochstein and Ms. Garber:

In accordance with our authorities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, EPA has reviewed the Department of State's (Department) Final Supplemental Environmental Impact Statement (SEIS) for a Presidential Permit application by TransCanada Keystone Pipeline, LP (Keystone) to construct and operate the Keystone XL Project (Project). We are providing these comments now, rather than when the Final SEIS was published, because of the possibility that a decision of the Nebraska courts would have led to changes to the Final SEIS.

EPA recognizes that the Department has made a considerable effort to evaluate the potential environmental impacts associated with the proposed Project and reasonable alternatives, and to consider measures to mitigate potential harmful effects. The Final SEIS is comprehensive and provides responses to our April 2013 comments on the Draft SEIS. We would like to especially point out the usefulness of the new compilation of all of the proposed mitigation measures (Appendix Z).

The Department has also strengthened the analysis of oil spill prevention preparedness, response and mitigation and has committed to requiring numerous mitigation measures regarding leak prevention and detection, as well as spill cleanup measures. While risks of oil spills and adverse impacts remain, and spills of diluted bitumen can have different impacts than spills of conventional oil, the Department has included provisions to reduce those risks, including working with the state of Nebraska to develop an alternative route that avoids much of the Sand Hills region, and incorporating mitigation measures recommended by both the Pipeline Safety and Hazardous Materials Administration and the independent engineering analysis. We note as particularly important the commitment by Keystone to be responsible for clean-up and

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restoration of groundwater as well as surface water in the event of a release or discharge of crude oil. These efforts will decrease the risk of spills and leaks, and provide for necessary remediation should spills occur. Nonetheless, the Final SEIS acknowledged that the proposed pipeline does present a risk of spills, which remains a concern for citizens and businesses relying on groundwater resources crossed by the route.

The analysis of climate change issues has also improved from the Draft SEIS. The Final SEIS makes clear that oil sands crude has significantly higher lifecycle greenhouse gas emissions than other crudes. The Final SEIS states that lifecycle greenhouse gas emissions from development and use of oil sands crude is about 17% greater than emissions from average crude oil refined in the United States on a wells-to-wheels basis.[1]

The Final SEIS also finds that the incremental greenhouse gas emissions from the extraction, transport, refining and use of the 830,000 barrels per day of oils sands crude that could be transported by the proposed Project at full capacity would result in an additional 1.3 to 27.4 million metric tons of carbon dioxide equivalents ($MMTCO_2$-e) per year compared to the reference crudes.[2] To put that in perspective, 27.4 $MMTCO_2$-e per year is equivalent to the annual greenhouse gas emissions from 5.7 million passenger vehicles or 7.8 coal fired power plants.[3] Over the 50-year lifetime of the pipeline, this could translate into releasing as much as 1.37 billion more tons of greenhouse gases into the atmosphere.[4]

Until ongoing efforts to reduce greenhouse gas emissions associated with the production of oil sands are more successful and widespread, the Final SEIS makes clear that, compared to reference crudes, development of oil sands crude represents a significant increase in greenhouse gas emissions.

The Final SEIS also provided a more robust market analysis, and examined how market dynamics may influence the levels of greenhouse gas emissions associated with the proposed Project. Based on that market analysis, the Final SEIS concluded, in January of 2014, that if the Project were not approved, oil sands crude would be likely to reach the market some other way, most likely by rail. The Final SEIS acknowledged that the alternative of shipment by rail is more expensive than shipment by pipeline, and would therefore increase the costs of getting oil sands crude to market.[5] However, the Final SEIS concluded that given global oil prices projected at that time this difference in shipment costs would not affect development of oil sands, which would remain profitable even with the higher transportation costs of shipment by rail. Therefore, the Final SEIS concluded that although development of oil sands would lead to significant additional releases of greenhouse gasses, a decision not to grant the requested permit would likely not change that outcome, i.e., those significant greenhouse gas emissions would likely happen regardless of the decision on the proposed Project. This conclusion was based in large part on projections of the global price of oil.

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[1] Final SEIS Executive Summary, p. ES-15.
[2] Final SEIS Executive Summary, p. ES-15.
[3] Final SEIS p. 4.14-46.
[4] Final SEIS p. 4.14-41.
[5] Final SEIS p. 1.4-90.

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Given the recent variability in oil prices, it is important to revisit these conclusions. While the overall effect of the Project on oil sands production will be driven by long-term movements in the price of oil and not short term volatility, recent large declines in oil prices (oil was trading at below $50 per barrel last week) highlight the variability of oil prices. The Final SEIS concluded that at sustained oil prices of $65 to $75 per barrel, the higher transportation costs of shipment by rail "could have a substantial impact on oil sands production levels – possibly in excess of the capacity of the proposed project."[6] In other words, the Final SEIS found that at sustained oil prices within this range, construction of the pipeline is projected to change the economics of oil sands development and result in increased oil sands production, and the accompanying greenhouse gas emissions, over what would otherwise occur. Given recent large declines in oil prices and the uncertainty of oil price projections, the additional low price scenario included in the Final SEIS should be given additional weight during decision making, due to the potential implications of lower oil prices on project impacts, especially greenhouse gas emissions.

Finally, we note that the Final SEIS includes additional information on how the Department screened pipeline route alternatives, and determined what routes to analyze in detail in the SEIS. Through this process, the Department determined that the Keystone Corridor alternatives, which would parallel the entire existing Keystone pipeline route in the United States, are not reasonable alternatives for the purposes of NEPA. The additional information provided in the Final SEIS is useful, but we note that eliminating alternatives from a detailed analysis based on an abbreviated estimate of environmental impacts is not the preferred approach under NEPA's requirement to take a "hard look" at alternatives, which would provide a more detailed and comprehensive discussion of the issues associated with these route alternatives.

Please feel free to contact me or have your staff contact Susan Bromm, Director, Office of Federal Activities, at (202) 564-5400 if you have any questions or would like to discuss our comments.

Sincerely,

Cynthia Giles

Cynthia Giles

[6] Final SEIS Executive Summary, p. ES-12.

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THE STANDING SENATE COMMITTEE ON ENERGY, THE ENVIRONMENT AND NATURAL RESOURCES

EVIDENCE

OTTAWA, Thursday, June 6, 2013

The Standing Senate Committee on Energy, the Environment and Natural Resources met this day at 8 a.m. to study the current state of the safety elements of the bulk transport of hydrocarbon products in Canada.

Senator Richard Neufeld (*Chair*) in the chair.

[*English*]

The Chair: Welcome to this meeting of the Standing Senate Committee on Energy, the Environment and Natural Resources. My name is Richard Neufeld, a senator from British Columbia and chair of this committee. I would like to welcome honourable senators, any members of the public with us in the room and viewers all across the country who are watching on television.

I would now ask senators around the table to introduce themselves, beginning with my deputy chair, Grant Mitchell, from Alberta.

Senator MacDonald: Senator MacDonald, Nova Scotia.

[*Translation*]

Senator Ringuette: Pierrette Ringuette, from New Brunswick.

Senator Massicotte: Paul Massicotte, from Montreal.

[*English*]

Senator Seidman: Judith Seidman, from Montreal, Quebec.

Senator Unger: Betty Unger, Alberta.

Senator Wallace: John Wallace, New Brunswick.

Senator Patterson: Dennis Patterson, Nunavut.

The Chair: Thank you. I would also like to introduce our staff: the clerk, Lynn Gordon, on my left, and our two Library of Parliament analysts, Sam Banks and Marc LeBlanc.

On November 28, 2012, our committee was authorized by the Senate to initiate a study on the safe transportation of hydrocarbons in Canada. The study will examine and compare domestic and international regulatory regimes, standards and best practices relating to the safe transportation of hydrocarbons by transmission pipelines, marine tanker vessels and railcars.

Our committee has held 14 meetings on this study to date. We have also travelled to Calgary; Sarnia; Hamilton; St. John, New Brunswick; Halifax; and Point Tupper, Nova Scotia.

Today, I am pleased to welcome, in the first segment of our meeting, Evan Vokes. Mr. Vokes, we have set aside about 20 minutes for your presentation, so that gives time for the senators to ask questions. Thank you for being here. I appreciate you spending your time, when you probably have a very busy schedule of your own, to come here and speak to us about your experiences.

Evan Vokes, as an individual: Thank you very much. I appreciate the opportunity to testify today on the safety of pipeline construction and operation in Canada.

I am trained as both a tradesman and a professional engineer, with a Master of Science in materials engineering. I worked at TransCanada for five years as an engineering specialist before I was dismissed without cause in 2012. I was one of the few core TransCanada employees directly involved in the technical acceptance of work on pipeline projects with values from thousands of dollars to billions of dollars, but all pipelines share the same technical challenges and quality requirements.

I found that TransCanada had a culture of non-compliance, deeply entrenched business practices that ignored legally required regulations and codes. What I have documented is a mix of politics and commercial interests that has resulted in the false public claims of exceptional industry practice.

As described in their book *We Are Here*, TransCanada details the so-called rightsizing of the corporation, which resulted in layoffs for engineering, audit and inspection staff as the outcome of a new business plan. This new business plan never reflected the regulations but was enshrined in the practice of engineering and supply chain operations as how business should be conducted, with the company desiring to take no accountability.

I had indirectly worked for TransCanada before I became an employee in 2007, and so I experienced a change in perception, from the accepted public image to the reality of what the TransCanada business model was. At this time, the quality problems were known to management, with several quality failures in the United States and Canada.

My experiences reporting internally as an employee were marked by exposure to situations that were not in compliance with regulation. On the first project, with up to a 100 per cent repair rate, I identified a serious code violation and I was forced to retract that code violation. The second situation I

identified is a commercial requirement for customer data confidentiality that was not being observed. It is that one there.

Intimidation and coercion were the TransCanada management tools I experienced in my first months at TransCanada, as the written communications were very different from the oral instructions. The first compliance changes I tried to make were for technical compliance as part of a quality improvement investigation in 2007. In 2008 I was being reassigned into non-destructive examination. I had identified serious welding problems to my managers. The proof of unsupported welding procedures was included in an official internal audit to improve quality at TransCanada. Lack of control of the inspection process was also identified as a central requirement. As an outcome of the internal report, I put forward a design basis memorandum to start the control of inspection, which management did not implement. That would be Exhibit D.

The second compliance phase of my efforts was changing behaviour from the top down through engineering standards. As I took on more responsibility for the non-destructive examination role, with the attendant increase in accountability, my mentor showed me a court order against TransCanada business practice for violating the regulations. That is the Westpath.

I started working at changing the engineering documentation by consensus, which resulted in a small victory but not full compliance. A significant functional problem was that projects still could not directly hire non-destructive examination, since the company lawyers had designated the task as supply chain management accountability. Initially no vendors were in place for compliance, but with peers at the functional level of supply chain management we implemented a new database with no official permission.

Incidents related to business strategies were getting more serious, with major engineering scandals within the Keystone and Bison projects that resulted in substandard materials being used in the Keystone project and a brand new pipeline that blew up in the United States.

The third compliance phase was to approach project managers to achieve voluntary compliance. The overall response from the project managers was silence as they carried on standard business practices instead of correcting their actions. Several classic examples of projects refusing to comply occurred in 2009, and these are Exhibits H and I.

When the National Energy Board finally stepped in on welding and pressure testing violations, they limited the scope to 12 non-compliant welding procedures and 7 non-compliant pieces of pipe on the Cutbank project. We found that there were actually 100 welding procedures that were signed off by a senior subject matter expert when they did not meet code. Welding is the core competency of a pipeline company, so these events created a crisis within engineering as senior management did not step in to stop the practices that were exposed.

After the failure of compelling the projects towards voluntary compliance, the fourth compliance step was approaching middle management. A direct confrontation with management by a project manager I influenced and direct action by myself finally seemed to be starting to put this to an end. That is Exhibit L.

I was astounded when the chief executive officer sent a letter outlining his disappointment with the Bison and Keystone projects, when I saw many projects struggle after circumventing quality control measures. Even our state-of-the-art industry pipeline system that won awards at the International Pipeline Conference was having serious quality control problems. The more I looked into the business practice, the more the regulation violations were exposed as the root cause and the worse the pressure was to stop my investigations.

The fifth compliance stage was to reply to the CEO to stop these practices, but what I got instead was serious pressure to step into unsound practice. In particular, a witch hunt for a pressure vessel inspection that did not meet the code and the quality manager of Keystone pipeline circumventing regulation were both extreme experiences. Those are Exhibits N and O.

Currently, there are some issues related to commercial risk decisions that will be coming forward out of the United States related to serious breaches of construction quality that reflect poorly on our export industry.

The sixth compliance stage was the internal audit. I was forced out of the building before I could finish submitting all the documentation. Rather, the TransCanada staff who broke the law were retained and contributed to the audit when I could not defend my points. I had fought a protracted battle with TransCanada management and lost, with the regulation and code violations appearing in the internal audit.

As the seventh compliance step, I contacted the regulator about a formal complaint. I was requested to get the written, formal complaint in as the message had gone right to the top and that my allegations were being taken seriously. This is Exhibit P. This complaint submission resulted in a short discussion on how the National Energy Board got what they wanted after consultation with TransCanada about the internal audit, even though the complaint outlined how the internal audit contained code and regulation violations.

This inaction for such a serious matter resulted in the eighth compliance step — taking my message to the media. Indeed, I believe the only reason for the enforcement letter on the National Energy Board website was as a result of media queries investigating my complaints.

The letter to Dan King at TransCanada was not reflective of the severity or the scope of what was in the complaint. No court orders were issued nor corrective action suggested on most of the important points in the complaint. Who is accountable? In a recent CBC pump stations story, the National Energy Board stated that they were not accountable.

In essence, my complaint suffered the same response that the National Energy Board provided to the Cutbank project, which document you have, where serious problems were incorrectly scoped and responded to via emails as opposed to publicly transparent investigative paths that were expressed to this committee previously. The National Energy Board Act outlines the expectations of the court orders and enforcement for offences as outlined under section 128.

The TransCanada testimony that my complaints were administrative is false, as the complaints were both substantive and the documentation proves TransCanada took significant public safety risks. This is evidence that the National Energy Board's voluntary compliance model has moved compliance backwards in the last 10 years.

Indeed, the complaint had little effect on the quality plan of the National Energy Board itself, as senior management of the National Energy Board has appeared in front of this committee telling stories of compliance. The reality from both my formal complaints and looking at various submissions on the National Energy Board website shows serious violations occur repeatedly and no follow-up action is taken.

The Enbridge Southern Lights pipeline, the Enbridge Line 14b and currently KXL in Texas are demonstrations of the breach of social responsibility the public can expect in the future. These pipelines are examples of the lack of enforcement during construction, resulting in brand new pipelines that need integrity work either before or shortly after being placed in service.

Professionals practising engineering is not mandated under the National Energy Board Act or regulations, but it is professional engineers who have the knowledge, the duty of care and the will to drive forward technology and safe pipelines. Most engineered infrastructure such as pipelines remain in service long after the designers and those who have constructed them have retired. The risk to the public and other stakeholders is managed through

the industry standard, the code, which is formally accepted by the regulator as a legal instrument.

I believe that the goal-oriented onshore pipeline regulations with their yes or no answers are the best possible safety measure for the public if the laws are enforced and a professional subject matter expert is accountable.

In conclusion, TransCanada PipeLines has a culture of non-compliance and deeply entrenched business practices that ignore the legally required regulation and codes. What I have documented from the pipeline industry is that the mix of politics and commercial interests has resulted in false public claims of exceptional industry practice when the reality is that industry struggles to comply with code and regulation, rather operating as a risk-based industry with no enforcement or accountability.

I call upon the committee to ensure inclusion of engineering accountability into the act. I call upon the National Energy Board to enforce the laws of Canada, and I will submit to the committee the CD of evidence.

The Chair: Thank you, Mr. Vokes, for that presentation. I appreciate it. We will begin with questioning. I will go to my deputy chair, Senator Mitchell.

Senator Mitchell: Thank you, Mr. Vokes. I would like to get more specific. I would like to go through a couple of your points and see if you can give me a specific example. You mentioned the first situation and the second situation. The first situation, I think you said early in your presentation, was serious code violations.

Mr. Vokes: Yes.

Senator Mitchell: Could you give me an example of a code violation?

Mr. Vokes: A regulation violation will do. The Kevin Widenmaier email — I believe it is Part G — is a classic one, where we talked about how we went and had fittings that never met code. Actually, not only did they not meet the code, they never met two regulations: the Onshore Pipeline Regulations paragraph 14 and the Onshore Pipeline Regulations paragraph 15. They never actually met the code of construction. There are 1,200 fittings on the Keystone pump station, some of which do not meet the strength requirement of the engineering design.

Senator Mitchell: You said 1,200 on the Keystone?

Mr. Vokes: Yes, 1,200 fittings.

Senator Mitchell: How do you know they do not meet that?

Mr. Vokes: When they were doing hydro testing in the United States, the coding cracked off one of the elbows and it is very obvious. Another classic example of that is when I was at Fort McMurray at the beginning of my career at TransCanada. Some days we were having repair rates of up to 100 per cent when I was learning the business. I went and started tracking the automatic ultrasonic testing, and I could see it was actually one welder in particular that was causing the problem. We looked at the problem. We pulled back the cover and the welder was actually welding on one side of the bevel. That was very serious because there are thousands of welds in the ground and it is hard to go back and dig them all up. Of course, the natural thing to do is to make sure a person retracts that sort of statement.

Senator Mitchell: When you talked also in your presentation about substandard materials, would that also be referencing these — -

Mr. Vokes: The fittings from Keystone, yes. That was not the first time. We had big problems with lack of inspection with DL Flange. That should have been the wake-up message with TransCanada. Then we went on to having exactly the same problems on one of the alternative integrity validation pipelines, with fittings from Ezeflow Inc. That also had exactly the same metallurgical problems that we would subsequently see with the Canadoil fittings.

Senator Lang: I would like to ask a general question, and it has to do with your having your engineering degree. Obviously there are other engineers involved in the company and in other companies with respect to having the duties that you had. Is there a concern by your organization, on behalf of those who have engineering degrees, that this type of practice is going on within the pipeline industry? I am asking this question because I noticed in one of the emails on June 27, 2011, that you state: “I would not stake my PEng on this regardless of how few welds there are.” In other words, you were talking about your professional integrity and credentials.

Are there other concerns by other engineers? Do they have to sign off on these particular projects?

Mr. Vokes: That is very correct. Even though I cannot prove it, I was told some things very directly about how things would happen if I carried on the way I would.

Senator Lang: You did not answer my question. My question had to do with other engineers in the business that you are in. Do they share the same concern you have? Their professional credibility is in question if this is true, because they have to sign off, similar to you.

Mr. Vokes: If you look at the email from Chris Penniston in your package, you will see I went and addressed a responsible engineer that his approach to welding procedures was technically wrong and he wrote back and told us that we would do it anyway. My young peer Chris Penniston told him that we were not doing it that way, that he could do it himself.

Yes, other people are concerned. There are a lot of people. I had large support within TransCanada. I did not have support at the management level; I certainly had support at the functional level. The CD will show there are quite a few people who supported me.

Senator Lang: This has to do with your testimony in April before the three-member panel of the U.S. State Department regarding the application for the Keystone XL project. You stated that TransCanada had used the wrong standard for station welding for years in the U.S. and the company had a poor safety culture.

First, could you tell me what has taken place since — that is, has anyone verified your testimony to that panel, from what you said? Second, what steps on the U.S. side are they taking with respect to seeing whether that is true or not?

Mr. Vokes: I have not heard back from PHMSA lately, but the last time I talked to my contact in the United States, the initial complaint to PHMSA was with a lawyer in the United States trying to figure out what they will do to have TransCanada do a remediation effort for welds that are accepted with too long flaw lengths.

Senator MacDonald: Thank you, Mr. Vokes. I want to give you credit for coming forward. It is not easy to be a whistle-blower. Everyone wants to marginalize you and cast out your motivations.

You mentioned that over the past five years you have been steeped in the culture of what is the minimum we must do to meet the regulation and code. I would suggest that when it comes to private industry, when we are dealing with safety regulations, private companies are always motivated by profit —

Mr. Vokes: I would concur.

Senator MacDonald: — and finding return to their investors. I think there is always the danger that companies will try to meet the minimum requirements. That is why we have to make sure the minimum requirements are substantial enough to make a difference.

I want to speak to you directly about the pipeline system. As you know, there is a big discussion going on about reversing the east to west pipeline and bringing bitumen west to east. It is important for this country to get bitumen to market. I also think it is important to do it safely. With the present pipeline that is there, which they are looking at right now, what is the relative age of that pipeline in terms of different sections? Do you think that pipeline can be safely converted to carry bitumen to the East Coast of Canada?

Mr. Vokes: The first thing is I do not actually know the relative age of the pipeline. I do know the relative types of construction techniques used for that pipeline. In-line inspection without close oversight can be a risk. We saw that on Enbridge's Norman Wells pipeline. They had run in-line inspection on that line for many years before the massive slow leak was discovered. The important thing is that nowhere in the code of regulation does it talk about what you have to set to the recording threshold at for the in-line inspection. In the east to west pipeline, every one of those welds was probably going to be a shielded metal arc weld that has a little piece of the weld sticking through it called the internal reinforcement. That sticks into the pipe. Any defects can hide underneath that reinforcement and are difficult to detect with in-line inspection, as Enbridge demonstrated on the Norman Wells pipeline. It can be done safely if you pay close attention to the detail. The question is this: They are in control of it; they really want to get their line into service. “Trust me” is not much of a strategy for making sure that the in-line inspection is actually valid.

Senator MacDonald: One more question. Do you think the argument is there that if we want to take bitumen to market across the country — a big country, a long run — the safest approach would be to build a brand new pipeline specifically for bitumen?

Mr. Vokes: I believe that is absolutely the safest way to do it. Regarding conversion of Line 1 for TransCanada, that pipeline has known hard spots on it and we cannot find it with in-line inspection. You will notice that the majority of the ruptures recorded on the National Transportation Safety Board's website have to do with Line 1 and Line 2 of TransCanada. Those are about the last pipelines on earth that I think should be converted to carry bitumen. I do not have a problem with what is in the pipeline. I have a problem if it comes outside the pipeline.

Senator Unger: Thank you, Mr. Vokes, for your presentation.

I just have some general questions.

At the beginning of your presentation, you make the statement that while you are not faultless, you have led a sustained attempt. Why would you make that comment?

Mr. Vokes: As I learned about what we were doing, I made mistakes along the way. It is unfortunate because under the engineering act, — the code of ethics — an engineer is required to know the codes and regulations they work under. I was never properly introduced to the codes and regulations. Part of what I did at the beginning was to follow the lead of others, and, in the past, I have actually given advice based on the way we did business, rather than on what the code actually said.

In the end, I was not faultless. I told you about the very first project, when I retracted my statements on the welding quality. Even though I was an engineer in training at that point in time, I should never have retracted those statements because what I saw was real. They were really not following the welding procedure. We knew they were not following the welding procedure because they had the 100 per cent repair rate. Those sorts of situations are areas where, due to pressure, I stopped and did not follow through.

Senator Unger: You are a member of APEGA. Does the organization agree with you? Where do you stand in regard to your relationship with your engineering association?

Mr. Vokes: I was talking to a board member recently who said that, based on what I have done, they have changed their approach.

My complaint to APEGA was suspended because they needed it to be a clearer approach. It has taken me almost a year. I almost have it ready for resubmission. This is very difficult — you have to understand — because I am actually naming people who have done some very nasty things, and it is nothing to be taken lightly. Unfortunately, APEGA has spent a long time, for lack of a better description, looking at people building sheds in backyards, when the reality is that there are some very serious engineering travesties going on in industry. A classic example is what happened at Deer Creek Energy in Fort McMurray. Somebody should have stepped in and properly dealt with that problem. To have a company operating outside of its permitted procedures and blowing a hole that large in the ground and then to have my professional organization not step up to the plate on something that severe is a little hard to watch.

Senator Unger: You are basically taking on your professional organization.

Mr. Vokes: I do not know if it is that. It is just that they have never actually dealt with anything quite this large before, and that is what the problem is. There certainly have been challenges with the professional organization. It is not that anybody there thinks what I am doing is wrong. It is just that it is difficult to deal with.

Senator Unger: We have been told that the pipelines have a safety record of 99.9 per cent. You paint a very bleak picture of the pipeline industry in Canada and probably, by extension, into the United States.

How do you rationalize these two very diverse points of view?

Mr. Vokes: It is amazing. It is like a large act of providence. I have been on several projects that were very nearly disastrous. Under the category of things that are very nearly disasters, I am surprised that there actually are not more accidents. At the end of my career at TransCanada, with the self-inspected welders, when I was told what they were doing, the exact same practices that we were doing in 2011, we were doing in the 1970s, and it resulted in a pipeline rupture in 1992. The problem is that, with pipelines, it waits a long time. Many times with the pipelines, it has to be disturbed before anything will happen. There has to be ground movement or something like that. There are thousands of cracks in the system; it is just which ones will become the problem. It is low probability and high consequence.

Senator Unger: You used the term “very nearly disastrous.” How would you know that?

Mr. Vokes: If you had an 80 per cent through-wall crack in a very large pressure vessel and you only found it because the inspector went out and had a look, that is very nearly disastrous for a plant that does not have a fire suppression system.

Senator Massicotte: Thank you, Mr. Vokes, for being with us. I also compliment you for coming and speaking out on your concerns.

Senator Unger was basically on the same track. We hear you. I have to admit it is very detailed, probably beyond our scope to follow your reasoning, but we know you are sincere. Yet, we look at the history of incidents and accidents for TransCanada, and there is nothing alarming there.

How can we respond to you? How about NEB? Have they done something about your comments? They are probably better positioned to analyze, in detail, your argument. What is happening there?

Mr. Vokes: I believe the NEB can answer for themselves what they have done. I really cannot say what they have done because I have not seen much that they have done. I can respond to what you were saying about the near accidents.

There was a rupture at Beardmore, Ontario, in January 2011. Since all of you live in Ontario, it is good to know that you just about ran out of gas. The reason we ran out of gas is that, years previously, we had taken money out of the integrity budget. My peers in integrity could not get money back into the budget until we had a rupture at Englehart, Ontario, that burned the siding off of a house. We started putting money back into the integrity program. Then we had the rupture at Beardmore, Ontario, and did not have anything in place to put the lines back into service, and you were running out of gas. We were importing gas from the United States at that point in time. People have no idea how close they come. It does not have to be reported.

Senator Massicotte: How do you explain your superiors' behaviour? No one purposely makes mistakes. No one purposely becomes irresponsible. You allege that, since the merger of TransCanada, the culture of safety is not there. How do you explain that? Are they just a bunch of incompetents?

Mr. Vokes: In the emails that you possess in front of you right now, I probably would not call what Mr. Lazor did incompetent. I would probably find another definition. What he was doing, in that particular condition, was certainly not following anything to do with the code and —

Senator Massicotte: That is one individual. You are talking about corporate culture and about a dominant problem at TransCanada. How come no one is responding to your comments?

Mr. Vokes: I cannot comment on what TransCanada's actions are. I know there was one executive who did seem to take what I said seriously, but other than that, there are many other executives who behaved differently, in particular, when I brought up section 54. Even though I was right, the personal attacks were uncalled for.

How did they respond? I do not know, personally, how people respond. I just wanted to have code compliance because, at the end of the day, I was the accountable person. They were not the accountable people.

Senator Massicotte: When you look at TransCanada and compare them to the other pipeline companies, from what we see, the history of incidents or consequences compares quite well. Is that to suggest that this lack of corporate security or safety within the culture of TransCanada is the same everywhere else?

Mr. Vokes: A very classic example is the Enbridge Southern Lights Pipeline. That pipeline suffered material problems during the manufacture, and then it suffered construction quality problems during construction.

They built a twin to this line, called 14B, in Wisconsin, and it had construction problems.

Senator Massicotte: You are saying that this is an endemic problem, not only at TransCanada. The whole industry is not following code and being unprofessional. All of them.

Mr. Vokes: They are taking risks.

Senator Massicotte: All of them?

Mr. Vokes: They are taking risks because they know that the probability is low. When the probability is low, you keep hoping that you can extend it farther.

Senator Massicotte: To summarize, do you think all pipeline companies are being reckless with safety and are all the same?

Mr. Vokes: On the National Energy Board site, with its unresolved issues and summarizing offences by the various energy pipeline companies, I think it is very clear.

Senator Wallace: Thank you, Mr. Vokes.

When I listened to what you have had to say, you obviously have great passion and I have no doubt whatsoever your motivation in bringing this forward is for the good of all. When I do listen to you, and some of my colleagues have touched upon this, you seem to have very serious concerns with the competency of TransCanada, other pipeline companies, the National Energy Board, the engineering professional association, and I am wondering in that list if you have similar concerns about provincial regulatory bodies that are also involved in these matters. Do you have concerns about their competency as well?

Mr. Vokes: I will not address that at this meeting because I never dealt that much with provincial regulation.

Senator Wallace: To put it mildly, that is a very broad, sweeping indictment from top to bottom of all regulatory and industry participants in pipeline transportation. However, that is your opinion.

Whether it is engineers, lawyers, accountants, there are varying opinions on just about everything out there. Did you encounter any other professional engineers who would have opinions contrary to yours on these issues you have raised? We understand you believe very strongly in what you have to say, but have contrary opinions been put forward by other qualified professional engineers?

Mr. Vokes: The TransCanada internal audit contained contrary opinions.

Senator Wallace: I am asking whether independent engineering firms have voiced opinion on what your conclusions have been.

Mr. Vokes: Part of the reason for going down this path was some of the comments that came back from external engineering companies where they knew that some of what we are doing was not right and they were the ones who pointed it out; for example, section 17, not inspecting all the wells. One of the points came from an engineer from Cimarron Engineering who said what we were doing in our specifications did not meet the regulations.

Senator Wallace: I understand the NEB found some of the allegations you made were verified by TransCanada's internal audit process. I understand

that.

Mr. Vokes: That is correct, some of them were.

Senator Wallace: I have listened to the serious allegations you make, but are we to accept that at face value? I am asking if any other contrary opinions have been expressed by other professional engineering associations. I am not going to get into weighing who is right and who is wrong, but have you encountered that as you have brought forward these issues? Have other professional engineers voiced opinions that would differ from your own on these very serious matters?

Mr. Vokes: Yes, certainly; the responsible engineer I worked with at TransCanada was very adamant about voicing a different opinion.

Senator Wallace: Was he on employee of TransCanada?

Mr. Vokes: Yes, he was an employee of TransCanada.

Senator Wallace: What about engineering firms that would not be employees of TransCanada but would be independent engineering firms? Have any of those voiced opinions contrary to your own on these matters?

Mr. Vokes: I have never contacted any of them.

Senator Wallace: Has no other engineering firm voiced an opinion that you have heard?

Mr. Vokes: I have never engaged in a conversation on that.

Senator Wallace: Did you hear of any comment they might have made?

Mr. Vokes: I talked to Group 10 Engineering before they did their assessment of the ERCB and I showed them the GC113 TransCanada audit. We went through that and I showed him where that audit did not meet the regulations, but we did not have a discussion on whether it was legitimate or not. I know that is not exactly what you asked. That is a conversation I did undertake though.

Senator Wallace: The internal audit process that TransCanada conducted in July of 2012 did confirm some of the allegations that you made. Did TransCanada have a regular internal audit process dealing with these matters of safety? Would it be done annually, periodically or was the July 2012 internal audit by TransCanada an anomaly?

Mr. Vokes: That is interesting because the last time I actually heard where they did an in-depth investigation within TransCanada was in 2007 where they brought a man by the name of Stan Gaillard to look at quality improvement after a series of failures. I and several of my peers contributed to that audit and identified that there were some areas of serious shortcomings. That is the last real technical audit we had.

We had external audits, such as the GC113 audit performed by PricewaterhouseCoopers. When you go through the GC113 audit, it is short of technical substance certainly in the areas that I would have expected. For instance, it never directly addressed section 53, which says you shall audit, and we had no real audit program in place at all in TransCanada, and it never addressed section 54 on independence of inspection.

There were many shortcomings, yet we have this audit report. Everyone says we have been audited, but when you read the audit report, where is the conformity to the code? The reality was different from the audit.

Senator Ringuette: Mr. Vokes, I commend your courage. You must feel like David against Goliath. I have to admit, I am very disturbed by your testimony this morning. I am very familiar with the code of ethics within the engineering profession and it is commendable.

My big concern right now is the National Energy Board. Canadians put their trust in the National Energy Board being the body that will make certain that the system is optimal and secure. I am assuming that your complaint has been sent to the National Energy Board.

Are we in a bubble in which, for the sake of the oil industry, our eyes are closed, our ears are closed and we — I say “we” as a country — just want to push ahead and never mind the future result?

Could you explain the relationship of your complaint with the National Energy Board's response and the industry? We need to be concerned if the system to protect Canadians is not right.

Mr. Vokes: The most important thing the National Energy Board did is put the inclusion of whistle-blower protection in the regulations recently. That is a very important thing.

The second thing that is missing is this: What is the point of putting in a complaint if there is no change? That is the really important point. The regulations are brilliant as far as I am concerned. The lineup between the onshore pipeline regulations and the code is incredible if you understand it. I operated in a condition where we were following the corporate practice and that is what we did. In the emails that you have, you have people talking about the corporate practice, and the corporate practice was not what was in the code.

The question is even if it is low risk, should I embrace my corporate practice when the regulations say not to do that? That is clearly an ethical breach. They say it is low risk. I do not care if it is low risk. The point is that it is not in the code; it is not in the regulation. How much of a danger is it? A lot of it does not pose much of a danger at all, but a couple of things were pointed out in the National Energy Board complaints that were very high risk. I mentioned the self-inspected company welders. What they were doing was high risk, especially from the stories I got back from them. On that subject, there is definitely cause for public concern there.

There is the TransCanada pig launchers’ story. We could not see the welds for the scraper bars when our contractor was hiring his own inspection, and no one said a word about that for 10 years. I might have a problem standing by a TransCanada pig launcher nowadays, but I think that there are many people who intend to do the process correctly, and that is the only thing that saves us. Regardless of my poor experiences with some individuals, there are still a lot of people who would like to do it right.

The Chair: Senator Ringuette, I still have others. The question lasted quite long, as did the answer.

Senator Seidman: Most of my questions have been asked already. I must say that I am sitting here with enormous respect for you and for the courage that it has taken to come forward.

I am thinking about all the testimony that we have had here from pipeline companies saying that safety is their number one priority. They have described to us many aspects of this — their plans, their responses, their oversight, their quality control and all these things. I suppose there are many

adjectives to describe my feelings about your testimony here, such as confused, disappointed and worried about Canadians' safety as we look at building an increasingly larger infrastructure across the country.

Being futuristic, and thinking about what we can do — this is not a good story; there is no question about that — however, we do have the NEB and we do have a regulatory framework, and they do have oversight capabilities. What I would like to know from you is, based on your experiences, what would you recommend in terms of further regulatory steps that the NEB can take to ensure some kind of better oversight?

Mr. Vokes: The first and most important thing is the key to making sure that the regulations and codes are carried out, which is inspectors. The United States is good with the concept of the OQ qualified operators. I do like that concept, where people are formally trained and accountable and allowed to stop the work regardless of how much of a schedule disaster it is.

If I have a safety violation where a person may become hurt, the National Energy Board regulations allow me to stop the work. If I have code violations, everyone says, “Don't worry. Get it done. Deal with it later.” That is the wrong attitude. We see a lot of that.

If you go back through the cases on the National Energy Board website and how they are dealt with, and if you ask questions like did they follow the regulation, did they follow the code, the answer is overwhelmingly no. That is why they have problems. Did they get it done? Yes. Can they keep it in service? Yes.

The projects are broken down into three parts: cost, schedule and quality. If you do not take care of the quality you will get either cost or schedule. That is pretty much the way it is. I have seen some well-done projects and project managers who go through the effort to ensure they follow the regulations as best they can, and I have seen others who are trying to do the minimum code and underachieve.

The second thing is the concept of engineering. That concept is important because in the front of every code is a forward that says following the code might not necessarily be the best thing to do because you can still make mistakes. We have a lot of people who make decisions based on commercial points that are not necessarily in the best interests of the long-term viability of the pipeline. For instance, all of our in-service welding was qualified on low-strength materials, but the pipeline materials are high-strength low alloys. Welding on high-strength alloys is more risky than welding on carbon steel. For years we have all these in-service welding procedures that were qualified on this group over here and we are using them over there. It is legal under the code, but it makes no engineering sense at all, if it was a risk. You can fix it with money; you can fix it with time; but you have to have the desire to go forward and actually implement some of these things.

One of the things I was doing at TransCanada that was good for pipeline safety — and, in the end I was getting good project managers who were allowing me to use it — is using automated ultrasonic testing on pipelines where we normally would use radiography. Radiography has poor detection of the most serious pipeline defect cracks, whereas automated ultrasonic testing allows us to find all the cracks. Even though it did not seem economical at the beginning, we moved over to this technology and we did well. We did not do well financially, but we did well on actually improving the quality and the safety of the pipeline.

Senator Patterson: Many of my questions have been answered. I would like to thank you for your evidence.

Could you outline your educational background leading to your qualifications as a professional engineer, please?

Mr. Vokes: Sure. I was terrible at high school. I am serious; 63 in math, 33. I loved working with metal, so I worked in machine shops and pulled lots of wrenches. I am a very practical sort of guy. I was a very good welder when I was young but did not want to do welding for a living, so I became a machinist. I was part way through my machining career and I decided to take up the trades of millwright and journeyman. Unfortunately, a shoulder injury precluded me from carrying on. Back in the days when I could hardly pick up a cup of coffee, they challenged me and said they wanted to buy some technology but I would have to be an engineer. So I signed up for engineering school and in one year I did all my high school upgrading and went to engineering school. I did a research project while I was there on the same pipeline. I was coming out of Red Deer one day while I was going to school and I saw a big hammerhead in the sky. It was a pipeline that blew up out by Nordegg, Ram River. I did the research work on that on the stress and cracking because I knew a lot about machining. We did a novel paper at that point in time. He then made me an offer I should have refused, and I did a master's degree with him. I did a lot. I worked in a lot of labs. I do not have children so I have been passionate about my work.

Senator Patterson: Thank you very much for your candour. I would not want to talk about my high school math marks in public.

To elaborate further, you were a welder and a machinist. Did you get a journeyman licence?

Mr. Vokes: Yes. I am a journeyman machinist. I did not get my journeyman as a millwright. Because I did welding in a machine shop, we were not allowed to have defects in our welds.

Senator Patterson: Which province was that in?

Mr. Vokes: That was in Alberta. I am interprovincial: I am a red seal.

Senator Patterson: Which school of engineering did you go to?

Mr. Vokes: I did both my degrees at the University of Alberta.

Senator Patterson: I am a U of A graduate as well.

Senator McCoy: Thank you for the integrity of your spirit and your courage going forward.

As a point of clarification, I thought I heard you say Cimarron Engineering. You made a comment earlier about them. They are a third-party, independent engineering firm?

Mr. Vokes: That is correct.

Senator McCoy: Could you repeat what you said about them?

Mr. Vokes: There was an error in our specifications, and a young engineer at Cimarron Engineering had enough fortitude to stand up and tell the project manager there was an error. We looked at the specification and indeed we had an error. I did the research on it, and we had an error.

Senator McCoy: What I am hearing, then, is there are third-party, independent engineers who share your opinion.

Mr. Vokes: There certainly are. There was actually another one. There was the problem with the engineering specification in the United States, which actually was caught by a non-destructive examination contractor, because he read the specification and said there is a problem with it. He brought it

back to us, and indeed we had that same problem for three years and used that same specification for those three years.

The Chair: We have run out of time. There were some second-round questions that we will have to bypass. I just want to take the opportunity to ask a couple of questions, if I could, Mr. Vokes.

You spoke earlier about fittings and valves that were substandard, I believe — I am saying this in my words, not yours — that were used in the U.S.

Mr. Vokes: That is correct.

The Chair: Would you please explain to me, is the U.S. also very lax in how they do pipelines? We kind of get that drift — at least I do — from your presentation, that Canada is. What you are saying is that the U.S. is just as bad. Have any engineering firms or associations in the U.S., similar to Senator Wallace's question, stood up and said, “Yes, we agree with you, Mr. Vokes; it is terrible in the U.S. also”? Can you verify that? Can you tell me whether that happened or not?

Mr. Vokes: Surprisingly, if you say it is terrible you do not work in the industry anymore. I think they have made that fairly clear. Certainly fighting back does not work very well.

I will tell you how terrible it was. We hired UniversalPegasus to oversee inspection of the Bison Pipeline. I was not involved in this but just saw the outcome of it. They fired UniversalPegasus partway through building a pipeline from the inspection tasks. Currently, in the United States, TransCanada is building the KXL and everyone has heard about the 57 special conditions. However, what we have is a brand new pipeline that has dents and is being cut out. Dents are hard to put in a pipeline. You have to leave something in the ditch. The code is clear about not leaving things in the ditch. The 57 special conditions require that you run a quality control program so you would take the rocks out of the ditch, yet we have dents in a brand new pipeline.

The Chair: I am asking you if an engineering association in the U.S. has agreed with your submission that the U.S. is not doing it properly, nor is Canada. Is there an association? I understand about dents in pipelines. I have been around the oil and gas industry for a good part of my life.

Mr. Vokes: Absolutely. PHMSA has a record of Kenneth Lee's public presentation about how not to build a pipeline. He has a serious collection of pictures and events, including one of TransCanada's pictures, in his presentation about things that should not be done to build a pipeline.

The Chair: There is an engineering association in the U.S. that backs up what you are saying?

Mr. Vokes: There certainly is a regulatory association.

The Chair: Regulatory, but not an engineering association?

Mr. Vokes: Engineering has very little.

Senator Massicotte: I would like to qualify your question.

The Chair: Yes, quickly.

Senator Massicotte: How about the pigs? They do this a couple of times a year. Would they not come up with the same conclusion?

Mr. Vokes: As I was saying earlier when asked about the east-to-west pipeline, the pigs are amazingly accurate sometimes. The owner company actually gets to determine what the recording threshold is. Understanding that you cannot see under the weld reinforcement very well, at every girth weld there is weld reinforcement that comes through. We do not have perfect probability of detection. We are very good at detecting external corrosion on the outside of the pipeline. That is the highlight of what the in-line inspection is good at. I am not the expert on in-line inspection, but I do know some of the things it does. It can find some long-seam defects. It is good at finding external corrosion. It is not very good at finding defects in girth welds. Those need to be found when you construct a pipe.

Senator Massicotte: In your opening statement you said that the person operating that determines the degree of measurement they want. Are you suggesting that they purposely put those criteria reasonably high so they do not detect serious deficiencies?

Mr. Vokes: I would suggest that people should ask how the same pipeline is pigged multiple times without finding the defect that later leads to a long-term leak that was occurring all along.

The Chair: Thank you, Mr. Vokes, for taking time out of your busy schedule. We appreciate your testimony.

Welcome to the second half of our meeting of the Standing Senate Committee on Energy, the Environment and Natural Resources. We are continuing our study on the safe transportation of hydrocarbons in Canada. I am pleased to welcome, from Wave Point Consulting Limited, Darryl Anderson, Managing Director.

Mr. Anderson, welcome. Thank you for taking time out of your busy schedule to come and present your remarks. I look forward to them. We will have a brief period for you to make remarks and then we will go to questions.

Darryl Anderson, Managing Director, Wave Point Consulting Limited: To the chair and members of the Standing Senate Committee on Energy, the Environment and Natural Resources, I consider it a privilege and a pleasure to be here to discuss with you the maritime transportation of hydrocarbons. I speak to you this morning as an individual who came of age, academically and professionally, during perhaps the last great influential period where Canadian parliamentarians examined some of the issues that are before us today. I am referring to what is known as the Brander-Smith report. I think most people in the room have read it.

I had the privilege of graduating from university in 1989, and I truly say that I am a child of my times. I have also been fortunate enough to have watched the changes in energy development, technology and transportation that have occurred since that point.

In the slides and the presentation I have given you, I have tried to just highlight some of the many international regulations that are currently in place to govern tankers. This material draws on the insights of my colleagues, K. Joseph Spears, a maritime lawyer, and a former mentor of mine from Australian Maritime College and a tanker captain, Dr. Devinder Grewal. Some of you may have read some of the information that my colleagues and I have published.

In completing my opening remarks, I wish to stress that I will be responding to your questions based on my personal experience of living on Canada's West Coast for the last 49 years, and including a variety of occupations along the way. I did spend some years in Alberta Energy, working on international trade and energy issues, so I know something of the complexity of the task ahead of you. Perhaps most important regarding answering your questions, I will do so as an individual who is blessed with the opportunity to study maritime transportation policy issues from a Canadian and

international perspective.

Suffice it to say that the ideas in the presentation may help establish Canada as an undisputed leader in the safe transportation of hydrocarbons. Thus, I have already revealed my bias by telling you that I believe we can be leaders in the world in terms of ocean governance and safe and sustainable shipping, and this must be the cornerstone of a robust Canadian energy and environmental strategy.

I would also like to preface our dialogue by saying that Canada's changing energy trade prospects present a great opportunity and tremendous responsibility.

Before coming here this morning, I had an opportunity to review many of the speakers' remarks. I must say how we respond to environmental issues in the transport of hydrocarbons will take a combination of applying the best practices from both the domestic and the international realms, and I dare say it will require a collaborative approach, which I believe is a Canadian trait when it comes to problem solving.

I look forward to receiving your questions. I would just like to guide you through some basic structure of the presentation, and then we can immediately go into question and answer.

You have seen my introduction. We provided a framework. “We” is my colleague Joe Spears and I, and we have been working on maritime policy issues for many years. I am a graduate of Australian Maritime College, so I have gotten to know Dr. Devinder Grewal quite well over the years. Missing from a good portion of the debate and literature is the question of whether there is a framework for analyzing these complex problems. We hear no shortage of advocacy groups wanting A, B, C, D — and the list probably goes longer than the alphabet that I am familiar with — but we wanted to step back and ask, “Is there a framework?”

I must confess that in our framework we talk about prevention, response, mitigation and restoration. However, most of the work I do is in the first three stages; I am not an expert on oil spills in the environment and restoring that. We recognize that it is an important issue. The work we have presented today is really focused on the front three stages.

In that, we must also recognize that we have heard the expression “world-class standards” and other frames to describe a target people are aiming for, but I think it is important to note there is not one universal approach. When you review the literature — and I compiled on the plane yesterday around a hundred different research sources that are legitimate on this topic, minimum — what we find is that there is very little written in cross-jurisdictional comparisons.

However, I have included some papers at the back that I think are some of the outstanding pieces of work. Marlene Calderón Veiga from Portugal is probably the world's leading researcher. I will tell you the reason she became such an expert. She is from Portugal, and you might remember that, a few years ago, there were a couple of incidents off Portugal where they had oil spills. She was doing her master's degree in maritime transportation. I think it is funny how someone in Portugal was also a child of her times in doing an oil spill — and I look back on the West Coast, and we often find that our professional interests are rooted in that personal experience.

There are some characteristics that emerge from both her research and our research, and I would like to summarize them here for you today.

When it comes to oil spill preparedness and response, there have to be cascading and complementary layers of federal and state policy regulation and operational response. There is no one country in the world that tries to do it all. Second, the way they play out in the kind of resources you need — and we can get into it in more detail — but when I talk about a complementary approach, those regimes that are more robust have those cascading and clearly defined roles. You also need active roles and networks of expertise, and that includes both at the federal level and scientific information.

The key thing to remember is that we need regular reviews to recognize and update capability. While all of us have read the Brander-Smith report, do I dare ask whether anyone in the room had read the Brander-Smith report five years before this time, when we were talking about energy exports, or was I one of the few nerdy kids in high school who actually read it at the time? It is good work because it inspires, but that is a bit of a gap between readings. I have to share my copy now because they are hard to find; it is getting more popular.

It is also clear that for the more robust regimes, prevention is better than responding. Everyone agrees. However, when you do need to respond, it has to be quick, practised, measured and effective.

Finally, do not underestimate the need for a robust and well-informed regulatory system. It is crucial for enforcement.

You will notice that I used the term “robust.” Quite often people ask me what standard is better. We could go to the American standard — and I immediately joined our pipeline date here. We are talking about minimum standards. The European approach is for prescribed outcomes. I think we have to bring clarity to what we want in Canada. However, regardless of that, you need a well-informed regulatory system.

Finally, I would like to make brief comments on the use of tanker exclusion zones. When we look at regulatory regimes around the world, the use of large areas to exclude tankers over large areas is generally not found. There are provisions for specific areas to exclude tankers and enhance their environmental practice.

Those are some high-level summary data. The rest of the presentation is essentially information to say, “Darryl and company, how did you get there?” I turn it over to you and your colleagues for questions.

Senator Mitchell: I hope this is within your area of expertise; from listening to you, it probably is. Given the West Coast, which is certainly in the spotlight right now for marine transportation, is a huge expanse, if you had a spill in some isolated area along the coast, how would you ever anticipate centres close enough to get there quickly enough?

Mr. Anderson: That is the real challenge. I think on slide 14 I talk about how much tanker traffic there is and what it might mean. That is the real challenge in the West Coast. I have a background in transportation logistics. When we did the literature search, I thought I could find a logistic model on how to deploy resources, and there is not one. I will tell you how countries address it. There is no question that if you go on the south coast — and I live in Victoria and I can watch the ships — we are well covered there. Twenty minutes outside of Victoria, you are in the middle of nowhere. I know, because there is no cellphone coverage.

When I started my career I had the pleasure of working with the Fisheries and Oceans Small Craft Harbours, so I have been to almost every small-craft harbour on the coast. However, there used to be a coastal tug-and-barge and logging industry, and the whole works. I remember one year, when the forest industry collapsed, and they did not bring those tugs and barges. That was the winter we talked about regular garbage in remote communities: The winter of my discontent.

It is clear one of the things we identified is that you will need different resources on the north coast.

One thing that is fundamental to understand is that we have had tankers in Canadian waters for a long time. The tankers from Valdez, Alaska, regularly travelled through Canadian waters. What is fundamentally different about the proposals for oil tankers in LNG is that we are now shifting that activity away from what is essentially our territorial scene — our exclusive economic zone — and shifting it into our coastal waters, our internal seas.

One of the things that few people do not recognize is that the Oceans Act has an obligation for the precautionary principle. We can argue whether you can, and how far you should, extend that precautionary principle right through to our exclusive economic zone. My colleague and I have looked at that with some legal scholars. In our exclusive economic zone is the thin edge of the wedge of how aggressively you can apply the principle. Where our ports are located — Kitimat, Prince Rupert, Vancouver — is the heart of internal seas. We have not really come up with how to address that precautionary principle. There has been no real systematic study of the resources you need. You clearly need aircraft, and you clearly need the other kind of resources for quick response.

The silent recommendation from the Brander-Smith inquiry is whether there is enough shipping traffic on the north coast of British Columbia to warrant an emergency tug assistance standby that is dedicated. If we go to Washington State, there is one in Neah Bay, Washington State, that is now funded by industry but started by government. In Australia — the Great Barrier Reef — they have a cascading system and put a higher level of protection on the Great Barrier Reef, and they have standby emergency tug assistance, not only for tankers but also for all vessels. There are standby emergency tugs in European countries as well. We could go on with quite a list of resources, but, if we read the newspaper a couple of days ago, the Canadian Coast Guard was in such a state that their existing inventory was 25 years out of date. I think they read this report. They have not done a great job of keeping up. I really suggest that they are not ahead of the curve at this point. I am not saying they are behind, but it does require some level of effort to get there. I am the kind of guy who worries that you could actually physically build a pipeline in a shorter time than it would take our institutions to be ready.

Senator Mitchell: How could you characterize the risks of tanker traffic in and out of Vancouver's harbour? Let us say Kinder Morgan becomes successful.

Mr. Anderson: We have not had an incident in Canada for a very long time, so it is very low. On page 10, I have a chart of the types of incidents. These are worldwide. One of the things that have happened, due to all of the international rules, is that the number of tanker incidents worldwide has gone down really low. We do know from worldwide experience that, at a place like Kinder Morgan, in Vancouver Harbour, if you were to have a tanker incident, it would be more likely to occur during loading, unloading and discharging — small, spill-related issues. That is kind of what our current regulatory environment contemplates. Very small spills, which are fuel, occur when tankers get bunkered. There are other operations. You will notice that, in the column here, we have “unknown.” Unknown is not really unknown. Let us do the math on the supply chain. I am either at the port, at the terminal or bunking. I am either in confined waters or on the seas. The category of “other” is really responding to seas. What I see missing from the risk assessments, whether it is Kinder Morgan or anyone else — and I have done a little bit of work with Fairplay and it can be done with AIS data — you can break out incidences in the data now to describe exactly where they are and fine-tune your risk models. That has not been done in Canada.

Senator Lang: I was not going to ask this question, but I will to follow up on Senator Mitchell's point.

I do find interesting the Port of Vancouver and the oil tanker traffic going in there. One aspect that you have not touched on is that the number of tankers going into Vancouver is almost 50 per cent less than it was 10 years ago, in my understanding, because of the size of the tankers.

Mr. Anderson: Yes.

Senator Lang: It would seem to me that, for individuals such as yourself, with the expertise you have, very important factors with respect to calculating risk would be the fact that there is less traffic, the fact that there has been less traffic, the fact that the tankers are larger and compartmentalized and the fact that there are more technical services with respect to the total shipping industry. Is that not correct?

Mr. Anderson: Yes. We have not denied any of those points.

Senator Lang: I am not asking you to deny it. I do not understand why individuals such as yourself are not pointing this out because those on the other side of the question, who do not want any tanker traffic, are not bringing this information out so that the public can have a fair debate over the question of safety.

Mr. Anderson: Yes. I am a researcher, not an advocate. I am a policy researcher.

On page 12, we have gone broader and looked at the location of Pacific Northwest, including Vancouver and San Juan. You will see that we say that, even if Kinder Morgan proceeds, you will not see that much more increase in traffic.

Specifically into Vancouver, I could list all the kinds of terminal and operational procedures that I have on this page. It is in my notes, sorry, not yours. All those things exist, from tug escorts to training, navigational aids, vessel traffic schemes. They have clear, narrow requirements, pilotage, transit windows, traffic safety controls and decision-support tools. All of those things exist in Vancouver that account for the safety record.

I began my remarks by saying that we hardly have any incidents in Canada. The real issue now becomes whether you can you take that experience from Port Metro Vancouver and extend it to areas where we do not have port authorities and that same level of infrastructure and human capacity. You are right in terms of all of the things that exist in Port Metro Vancouver.

Senator Lang: I want to ask for a general statement from you. In your opening remarks, you say: “. . . may help establish Canada as an undisputed leader in the safe transportation of hydrocarbons.” Further on, you say: “I believe we can be leaders in the world in terms of ocean governance.”

We have had witnesses here, prior to your coming, who basically said that, if we are not leading, we are definitely one of the leaders in the world with respect to how we handle our marine traffic and our safety record.

I would like to ask you further, in order to become number one, as opposed to being in the top five or six countries around the world, what exactly would you do, if you were in charge, to make us number one?

Mr. Anderson: On page 17, I have a slide there called “Opportunities for Value Creation.” I think the point that we make in the subsequent slide is that there are some other very specific recommendations we could walk through. We are not suggesting in our research that Canada needs to adopt every single thing on this. In my opening remarks, I said that with great opportunity comes great responsibility. The more traffic you have, the more likely it is that you will have to go into the toolbox to apply some of these tools. The appendix that we have is actually a compendium of stuff at the back. You will see, at different phases of the risk management, where you can dip down in tools.

I will give you an example, let us say Washington State. The federal government announced in March that they will move to incident command structure. That was a long request of the Province of British Columbia. When you talk with the folks in Washington State, they have been at it systematically since Exxon Valdez. They do not necessarily use a formal risk strategy in answering the question about how to allocate resources, but

they do numerous scenarios at the state and county levels, including tribes and work with the U.S. Coast Guard. When you talk to them candidly, they have had growing pains. Where they are at now and where they started 20 years ago are two different places. I am saying that incident command structure is a great place to start, but, unless you fund it with resources, do the training and drill it down into the community, you are not far. Washington State also has an emergency tug assist program. That is another example of excellence. We are not, in our research, saying that Canada is bad. What we are saying is are there opportunities to do better. For instance, Norway has prescribed standards. In Norway, we have to distinguish between ship-source oil pollution spills and the offshore. I am referring to ship-source oil pollution here. They have a national program where local municipalities have a defined level of responsibility for handling waste oil. I asked that of a response organization, and they said that that is the shipowner's responsibility. I used to work with Fisheries and Oceans, and every year on the Queen Charlotte Islands the fishing fleet would change their oil. I had no legal place to dispose of that oil. If you go back through the Department of Justice's and Fisheries and Oceans' records for, roughly, 1991 — you can ask for the records — you will basically find, “Dear Mr. Anderson, you are currently breaking the law. I suggest you stop breaking the law.” I am a servant of the Crown. Every year, the fishing fleet changed, and that was small amounts of oil.

Getting back to the north coast, we do not have places where you can dispose of the oil readily. Those are just some examples. We can walk through the slides and be more specific in other areas.

Senator MacDonald: Thank you for being here.

In regard to spill response, I do not think there is any doubt that the regulatory system is stronger. The ships are certainly better constructed, but of course, all ships are liable to experience catastrophic problems. Any ship can sink. The *Titanic* was not supposed to sink, but it went down on its maiden voyage.

When it comes to a catastrophic loss of heavy oil, should part of the response be that there are certain ports on both the East and the West Coast that the largest vessels perhaps should not go out of when alternative ports are available that provide an environment more conducive to accepting and responding to a catastrophic loss of petroleum?

Mr. Anderson: You will find in the statistics that catastrophic loss seldom occurs at the location of where the port is. They tend to be during the at-sea voyage or on the approach segment. Therefore, I do not worry too much about the location of the port because by the time you have done the technical standards and all the other work, you have that one nailed pretty well; you have spent a lot of time and energy thinking about it.

What I worry about, though, is the opposite scenario, a catastrophic spill and unintended consequences where we have a poorly defined port-of-refuge policy and a remote location may have to respond to an incident from a passing ship. Do we have the right resources for that?

At the loading or discharging location of a marine terminal, the marine engineers and everyone else do a very good job of that. Citing a terminal is not an easy task. I hope I have answered your question.

Senator MacDonald: Somewhat, but I have a quick follow-up. I will give an example. You are well versed in this stuff; I am sure you are familiar with the loss of the *Arrow* in Chedabucto Bay in 1970 and the *Kurdistan* in 1979. The *Kurdistan* was lost off the Strait of Canso; it was heading to the refinery in Quebec. People hardly knew it disappeared; there was almost no residue. If that ship had gone down in the St. Lawrence River, it would have been a much different scenario, no question about that.

I am curious, on the West Coast — I know most of the your work is on the West Coast — if there was a large, catastrophic event, what would the difference be in a catastrophic event in Kitimat as opposed to one in Prince Rupert?

Mr. Anderson: That is where we talk about the ship to location. Right now, there are not the resources to deal with what is being contemplated. That is not to say the proponents do not have plans, but for a catastrophic loss on the north coast, currently we have gone through the voluntary tanker exclusion zone to deal with tankers because they were travelling further out in our territorial seas. We thought if we put in aerial surveillance and pushed them out further, that would be adequate. Those tools have worked in that situation.

As soon as you move inland, however, those tools become much less effective. You need other tools for a quick response, and you need to look beyond probability and frequency analysis. You need other risk management tools, which have been identified in the presentation.

Without people on the ground planning these things in the early stages, it is really difficult to do it. The marine world is known for doing things as a result of experiences from those types of incidents. When I talk to my aviation friends, they kind of have a different view of the world.

Senator Unger: Thank you, Mr. Anderson. This is very interesting.

I am from Alberta. On May 31, the Government of B.C. officially opposed the Northern Gateway because it was concerned with the pipeline route and spills. Do you share the province's safety concerns and response capacity?

Mr. Anderson: There are aspects of the province's issues that they have, but I do not speak to any one party's particular response to those issues.

If you were to ask whether the province's standards meet any of the issues that we have fully addressed in the research that my colleagues and I are doing, I would like to compare them the other way and say there is still room for improvement. I do not want to criticize someone else's effort. I want to say, “Darryl, you are short of your own efforts here, and this is the reason why.” I like to do the comparison the other way.

Senator Unger: What about concern about shipping dilbit? Does that raise a different set of concerns?

Mr. Anderson: I get emails from people all the time on the environmental side who are concerned about the properties of dilbit, absolutely, not so much on the shipment and transport but when it gets into the water. That is one area my colleagues and I — you need a biology background and not necessarily a shipping background — are concerned about.

I think it is a legitimate concern. I am aware that testing has been done. I am also aware that a fair amount of that product has already been shipped out of Kinder Morgan, and they may be in a better position in Vancouver to answer that question about the properties of it. When it gets into the actual marine environmental impact, it is not my area of expertise.

Senator Unger: Would that particular product be best shipped to the Port of Vancouver or further up the coast?

Mr. Anderson: I do not believe it is a question of the location of where it is shipped; it is a characteristic of the oil in the water and the marine environment that is the concern. If I were to ship it anywhere, I would want to know a lot about the marine environment to which I am shipping it rather than actually making it a terminal location decision. The ships, pipeline and railcars can handle those products; it is what happens when it gets into the natural environment that is a concern.

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Senator Unger: Thank you.

Senator Wallace: As you mentioned at the outset, the oil spill response regime we have in Canada resulted from changes to the Canada Shipping Act in the mid-1990s, and that was based on the Brander-Smith report. The spill response regime we have in Canada seems to be very comprehensive. It is clear on where the responsibility for spill response lies and the need to have response organizations be properly equipped, with the proper expertise to respond and so on.

Do you have any comment on the effectiveness of that regime in place today? Obviously, if there will be increased tanker traffic on the West Coast, it will build on that, but could you comment on the effectiveness and the capabilities of the regime as it exists today?

Mr. Anderson: I thought I would acknowledge that with the changes to the recent legislation, they offer a unified command. As it exists today, one key difference in Canada compared to the United States, even in Australia, actually, and the U.K., we have a polluter pay principle. At the beginning of the exercise, when the decisions have to be made, the polluter takes the lead role. Remember how I said in my opening remarks that a fast, efficient response is really needed? There is a tendency in Canada to ask, "Who is in charge here?" If you go to the U.S. and you point to a port captain and the U.S. Coast Guard commander, make no mistake, they are in charge.

The polluter still pays. If you have ever dealt with a U.S. port commander, they are in charge. In Canada, on a large-scale exercise, it is doubtful sometimes whether we have that same level of authority in those really tough choices, if it required beaching a vessel or taking a vessel that was in distress to a remote community, both to save property and reduce damage, if that was a really hard choice.

The U.K. has a model where they have the state's representative for salvage and intervention that has that authority in decision making. The concept is that other jurisdictions do a bit better job and are more effective, including Australia, at that early-stage response because time is everything.

In Canada, we have been fortunate because we have not had to test it, but if you ask people deep down if we are really up for game day on a big one, we would probably have a range of opinions, and I would rather see a unanimous group of opinions.

Senator Wallace: We heard yesterday from the Western Canada Marine Response Corporation, which has a spill response capability of 26,000 tonnes. The Canada Shipping Act requires a minimum spill response of 10,000 tonnes. Tankers that might pass on the West Coast could be as large as 300,000 tonnes. Do you have comments on the appropriateness of a 26,000-tonne response capability?

Mr. Anderson: That gets back to a philosophy of minimum standards versus prescribed outcomes. In terms of minimum standards, the Western Canada Marine Response Corporation does an excellent job. I know their people and I have had their training as a port person.

The question is, do we want a minimum standard approach, in which case we continue to do what we are doing? Having had discussions with them, the question, even if we have that response standard, is this: Have we done a model or created a scenario for the best places to deploy those resources in Canada? We have not done that.

Norway uses a risk management model from Sweden. They do not have a prescribed minimum standard. Rather, they work closer to a prescribed outcome approach based on spills and what their shipping traffic would be. The response organizations are capable. What target are we shooting for? I am not one to believe that the size of the ship represents the biggest risk. You will see that we also reference coastal barges and tanks. It is an often overlooked segment, but any remote community in Canada will take fuel in by barge. Ultra-large crude carriers get everyone's attention because they are so big, but I do not think we will see all tanks go simultaneously. Statistically, the evidence is not there.

Senator Wallace: In responding to an incident, the location of the response equipment would be critically important because of the obvious need for speed. Should it be left to the response organizations to decide where these resources should be located or should it be is imposed by regulatory authority or some combination of the two working together?

Mr. Anderson: It should be a combination of the two. I used the word "collaboration." This is a perfect example of collaboration. In my presentation I talked about value creation and opportunities. I would be the first to admit that if we tried to tackle this alone with a regulatory approach, we would fail. The reason is that people on the ground doing the technical work have the best understanding. No amount of second guessing by guys like me will get oil out of the ground. You need the right regulatory framework in collaboration with the people that do the work in the best jurisdictions in the world; and Canada is robust in that category of bringing those parties to bear and making those kinds decisions. Our record can be proud and strong, and other countries around the world are looking to us. That is why this work of the committee is important.

Senator Wallace: Thank you.

Senator Massicotte: On page 6 of your presentation, you talk about how tankers are governed internationally relative to the context. Summarize what we should take from that. What should we change relative to the way we govern ourselves internationally?

Mr. Anderson: Very little. The international approach fundamentally for the last 20 years has been on prevention, and the statistics prove it. We see worldwide great uniformity during the prevention stage of oil spill response and tanker and shipping governance. Canada has had some leaders in the IMO, so we are very good at that stage. Where countries start to diverge and differ significantly is during the mitigation, restoration and response stages — the latter stages — because of the domestic rules and regulations and the amount of shipping traffic.

From an international perspective, I would be one of the first to argue that the international community has done a very good job in this regard. I live in Victoria, where I have quite a few friends in environmental organizations that do not believe that fact, so I try not to have those discussions on the school playground. The evidence is clearly before us.

Senator Massicotte: Senator Lang raised the point about page 15 of your presentation where you say "somewhat" in quotations. The evidence we have is that there had been a significant decrease in Vancouver even with the opening of a pipeline should that occur. The result would still be significantly less than it was even seven or eight years ago.

Mr. Anderson: On page 12, I reference that the location of tanker traffic in the Strait of Juan de Fuca includes the straits going into it, and not just Vancouver, because the south coast of British Columbia has U.S. traffic coming in. I am trying to say generally on this point that one or two individuals have a condominium above a certain bridge in Vancouver, and they talk about a 70- or 80-fold increase in tanker traffic into Port Metro Vancouver. They happened to pick the lowest point in the recession. If you go back over a times series and look at this, in that whole body of water we would have to have a response regime. We have ebbed and flowed, but we are not talking about huge spikes in traffic.

Senator Massicotte: The evidence we have, even 15 years ago, is that the relative traffic, even with the proposed pipeline, would be less than it was historically.

Mr. Anderson: I do not think you would find that in terms of the specific Kinder Morgan. There is a range of increase in traffic at a bit of a different

location.

Senator Massicotte: You can choose a certain location, but obviously our concern is more macro.

Mr. Anderson: That is why I included the chart on page 12.

Senator Patterson: The federal government announced in March this year a new initiative to improve tanker safety, World-Class Tanker Safety System. With that initiative, there was a commitment to additional research on the impact of diluted bitumen on the marine environment. We have had some witnesses raise concerns about the impact of that product on the marine environment. Would you have any comments on whether current spill response organizations are equipped to respond to a bitumen spill?

Mr. Anderson: I was part of a presentation where the Western Canada Marine Response Corporation demonstrated to an audience how they handled the situation, but it did not come from a ship but from a pipeline above land.

The one area that is not my expertise is when that product hits the water.

Senator Patterson: Our system for tanker liability and compensation in Canada combines domestic and international funds. We have been told by Transport Canada that they are reviewing the adequacy of the amount of the ship-source pollution fund. Do you have any comments on whether the current tanker liability and compensation system is adequate and whether that ship-source pollution fund should be increased?

Mr. Anderson: I will preface it by saying that, I believe in 2015, the IMO will make changes overall that will increase those limits.

One of the charts shows where tanker spills occur. The liability limits when dealing with a small spill during terminal loading or bunkering at that stage of the journey are more likely to be adequate in an area that is not too heavily populated or where there is not a lot of valuable property because they are small-scale incidents. Marine terminal operators are certified response organizations and they have to have equipment. All the resources are right there to deal with those small-scale incidents.

However, a question remains unanswered, and I have seen some of the analytical work but am hesitant to draw a firm conclusion. There probably could be a scenario where those liability limits are not right. What people are missing in the discussion is not the adequacy of the liability limits but the key issue in public policy that we have moved to a strict liability regime that facilitates payment of money versus litigation where you had to prove your claim going the other way.

Let us focus on the public policy of strict liability for shipowners, and then if we need to fine-tune it in a specific situation based on real risk analysis, let us do it. Let us not lose sight of the important principle of having to litigate and prove a claim like you have to do in other parts of the world where they have not signed on to that. That would be three steps backwards. I am not suggesting you do it, but people often focus on the amounts. In some situations, people truly do not know but there is an important legal principle that went before determining the amount.

Senator Seidman: Thank you very much for your substantive presentation. I do agree with what you said very early on in your presentation that prevention is better than responding.

I was going to hone in on something in particular, but I would like to focus on your response to another colleague around the table regarding the chain of command. If I recall correctly, we have heard here that, very clearly, the Coast Guard is in charge at the top of the chain of command. You suggested that is not the case. I am referring to a spill response when there is actually a crisis and emergency that needs responding to and it is critical to know who is in command.

Mr. Anderson: The Coast Guard is in command, but in our system of polluter pays, the Coast Guard passes judgment on the adequacy of the polluter's efforts. If they are deemed inefficient, they can take action.

We have really dedicated people in the Coast Guard. It is not an easy call in a situation to say that someone's efforts are inadequate. While you want to give people the benefit of the doubt, time goes by.

I have an article here I will read for the committee. It is the U.S. Secretary of State's representative for Maritime Salvage and Intervention in the U.K. Australia has a separate system. In a catastrophic event, people talk about salvage at the end of the process and not the beginning; there is a government official that has the power to direct the resources of the polluter that pays, and their decisions are binding and final.

That is a very different level of accountability than our Coast Guard basically getting into a legal fight with their lawyer saying, “We are stepping in,” and the other party saying, “No, we are in command here.” It came about out of OPA-90 in the United States that the U.S. government did not want to go down that other road. In Canada, we adopted something between the American and the European approaches and we thought, “We will give them the benefit of the doubt.”

Senator Seidman: You say here that a robust and well-informed regulatory system is crucial for enforcement. Is there something that could be done in the regulatory system to improve enforcement and chain of command?

Mr. Anderson: The structure we have in Canada is great. How we have resourced it so our people can practise in different scales in the North, on the north coast of British Columbia — we do some joint exercises. Therefore, we have that part of the regulatory structure right, but we have tended to starve our institutions of the capacity to do what is the right structure. That is my opinion.

Senator Seidman: You mentioned practice, and that was going to be my question in terms of prevention. That is a sort of preventative approach in that you practise, and that you have to practise based on effectiveness, so there is a certain sort of basis for what you are practising. It could be a scientific basis or whatever is out there in terms of best practices from experiences internationally or even nationally.

In your understanding of the way things work, is there sufficient research and development, and a sufficient basis right now and sharing of best practices for practice and effective practice?

Mr. Anderson: In Canada, I think the answer is “no.” If I were to go south of the border into Washington State, the answer would be “yes.” There is good cooperation with the province.

I think it is known in the part of the application of the knowledge rather than knowing there is some real secret here that we need to do. It is like many things in life: We know what to do, but do we get around to doing it consistently enough? I am also concerned that we will have a generational change in people. If you do not have experience with this — doing it and practising — learning on the job is not where you want to do it.

All this literature that we have cited is existing literature. If I can find it, I am sure the policy people can find it, but it is implementing. Having been inside

the federal system and provincial governments, we in Canada tend to downplay this type of policy research, which is why my colleagues and I have tended to pick up our pens.

Senator Seidman: You are saying application of knowledge. That is interesting. That means sharing of best practices, and then having people actually implement and practise what these are.

Mr. Anderson: We tend to have a body of knowledge that is sufficiently robust regarding knowing what to do. Around the world other countries look to Canada and other jurisdictions for doing it. However, clearly Australia, Washington State and Norway put into practice much more what they are doing. One could argue they are more coastal states, and we will save that for another time as to the reason why.

The Chair: I have a question, and then I will go to the second round.

You said that tankers from Valdez regularly travel through Canadian waters. Where does that happen?

Mr. Anderson: They are going out from southern Alaska through our exclusive economic zone. Some will travel to California and some will go to one of the five refineries in Washington State. They use the Strait of Juan de Fuca.

The Chair: It is the Strait of Juan de Fuca you are referring to?

Mr. Anderson: Yes, but they will also use our exclusive economic zone, beyond the voluntary tanker exclusion zone. It is somewhere between the territorial sea and our exclusive economic zone. Outside the voluntary tanker exclusive zone, they will transit Canadian waters. This is why aircraft and surveillance are important, because they are out a long way from shore.

The Chair: We just had the response organization answer that question, and they say that they stay out of the 200-mile limit from Valdez and would only enter Canadian waters in the Strait of Juan de Fuca. Would that be correct?

Mr. Anderson: More or less, yes.

The Chair: You are saying they stay out of the 200-mile —

Mr. Anderson: Until they come into the approach —

The Chair: I want to get that straight; I do not want to mix it up with the economic zone.

Mr. Anderson: They will stay outside, and then when they come in, they will pass through our exclusive economic zone and territorial sea, and into the strait.

The Chair: Okay, good. Thank you.

When you talked about the fishing fleet and your experience on north coast with no place to deposit your used oil, I guess that goes to the old saying that a fishing fleet pollutes more than anyone in our waters. It is my personal experience from before I got into politics, which was quite a while ago — 25 years ago — that if you sold lubricants, you had to provide a place to actually bring them to. In fact, I was required to do that. That was 25 years ago. Can you explain what you meant by that?

Mr. Anderson: I started before the legislation came, and I had that. The reality is that fishing boats, particularly when they are in remote fishing areas, will have bought their lubricants. However, you get a combination of supplies and people down before you go fishing and they want to change oil. Quite frankly, they get an opening and they will change their oil and, let us say, it is their best intention to come back to it. Yet, when you have to catch the fish, sometimes coming back to get your oil you have left in a five-gallon drum is little bit further down the list.

The Chair: I guess anybody can use that for an excuse. The reality is that you have to. That regulation is in British Columbia. We can make all kinds of reasons why they cannot, but the regulation is that you should deposit it in a safe container. Hopefully, that meets with everyone's mindset to actually do that. I will leave it there.

Senator Mitchell: Are barges double-hulled?

Mr. Anderson: Some are. There may be a few that are not. I am trying to think history-wise if that is true.

There is also a large amount of fuel and other refined products that go back from the refinery — and aviation fuel, et cetera — between Puget Sound and Washington State. Therefore, if there are any single-hulled barges — The bigger issue is that I think they moved to double-hulled barges, but it is not illegal to put an oil tanker truck on top of a barge and transit.

I do not know how many people are familiar with Port McNeil and Robson Bight, where Leroy Trucking had a little incident and a barge went down and spilled right in an environmentally sensitive area. They have been creative in getting around the technical requirements for barging and doing something that you just shudder.

Senator Wallace: Mr. Anderson, I wanted to clarify your comment. You seemed to leave the impression that maybe there is confusion in the Canadian requirements as to who is in charge in the event of a spill occurrence, who is actually giving the direction. My understanding is that before any tanker carrying oil can enter Canadian waters, the shipowner would be required to prove that it has a contract with a response organization, and that that contract clearly sets out who is responsible, who is in command and the spill response capabilities that would be provided. That is my understanding.

If the Coast Guard felt at any time the response by the vessel owner or the response organization was inadequate, then Coast Guard, as you point out, could step in and take over. However, I just wanted to clarify. My understanding is that under the Canada Shipping Act, it does establish who is in command, who is responsible and who calls the shots.

Mr. Anderson: That is indeed how the Canada Shipping Act works. If it worked exactly like it does on paper, we would have no need for aerial surveillance to find those mystery spills where it is not clear. The closer the oil spill occurs to a terminal or the vessels in transit or in port, the system works really well. What you get is the potential for a large-scale event where it may not be an oil tanker but an oil spill from another vessel and you do not know the owner of it. Even though everyone has the paperwork, they will deny knowledge of it. The Coast Guard then has to decide: Do we step in now or spend more effort trying to find out who the legal owner is?

The Chair: Thank you, Mr. Anderson, for your presentation. We appreciate your taking time out of your busy schedule to come here.

(The committee adjourned.)

From:	Ken Crowl
To:	Barrett, David (PHMSA); Daniel Cerkoney; Ochs, Gregory (PHMSA); Butler, Karen (PHMSA); Bunn, James (PHMSA); Miller, Warren (PHMSA); McLaughlin, Mike (PHMSA); Hodill, Gabe (PHMSA)
Cc:	Vern Meier; Bruce Dupuis
Subject:	FW: Restart Authorization
Date:	Monday, October 22, 2012 3:57:23 PM
Attachments:	NPS 30 Keystone Pipeline - Salisbury to Patoka Repair Dec - Technical Memo - 10-22-12.pdf Keystone Pipeline Restart Operations Plan 2012 10 21.doc

David,

We have commenced the restart of the Keystone Pipeline. Attached is the restart plan and Vern's approval of the technical memorandum. The Media talking points discussed this morning will be provided as soon as I receive them.

Regards,

Ken Crowl

From: Vern Meier
Sent: Monday, October 22, 2012 2:12 PM

Subject: Restart Authorization

Based on the attached Engineering documentation and field verification of the completion of the final repair please accept this as authorization from Field Operations to commence the restarting of the Keystone Pipeline in accordance with the attached Restart Plan.

Regards,

Vern Meier

From: Tirso Gonzalez
Sent: Monday, October 22, 2012 12:12 PM
To: Tirso Gonzalez; James Baggs; Vern Meier; Bruce Dupuis; Erik Tatarchuk; Dale Wascherol; Richard Prior; Kevin Maloney; Trae Miller III; Dan King; Daniel Cerkoney; James Card; Jim Krause; David Chittick; James Card; Paul MacGregor; Tracy Schultz
Subject: RE: 1 Min update from site

Plidco clamp is torqued to specifications and complete. Sites 1-4 are complete.

Regards,

Tirso D. Gonzalez
TransCanada Pipelines
Project Manager
U.S. Integrity, Maintenance & Construction
[redacted]

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message. Thank you.

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Technical Memorandum

TransCanada
In business to deliver

Date: October 22, 2012
To: Vern Meier
From: Gabriela Rosca
Cc: Tirso Gonzales, Richard Kania, David Coker, David Chittick, Richard McGregor, Bruce Dupuis
Re:
Subject: NPS 30Keystone Pipeline – Salisbury to Patoka Repair Decision

---

Background

Based on the preliminary MFL inspection report of NPS 30 Salisbury to Patoka received from Baker Hughes on October 18, 2012 there were 4 immediate metal loss anomalies with a Peak depth greater than or equal to 70% W.T.

Baker ILI Immediate Feature summary

Valve	Feature	Peak Depth (%)	FPR	Length (In)
SNTPL+0.4_8-A0-MLV-001	DMA 204496	95	1.19	0.63
SNTPL+0.4_8-A0-MLV-001	DMA 205022	78	1.19	1.54
SNTPL+0.4_8-A0-MLV-001	CLS 30000	79	1.39	2.22
SNTPL+0.4_8-A0-MLV-001	DMA 210611	83	1.38	0.51

ILI versus Actual Data and Associated Mitigation Summary

Feature	ILI Peak Depth (%)	ILI Length (in)	WT (in)	Actual Peak Depth (%)	Actual Length (in)	AWT (In)	Repair Required	Repair Implemented	FPR
DMA 204496	95	0.63	0.386	96.9	1.0	0.386	pressure containing sleeve (Type B)	Plidco Clamp (temporary)	n/a
DMA 205022	78	1.54	0.386	73.8	2.01	0.393	recoat	Armor Plate	1.27
CLS 30000	79	2.22	0.386	59.9	1.01	0.397	recoat	Armor Plate	1.45
DMA 210611	83	0.51	0.386	61	1.01	0.393	recoat	Armor Plate	1.44

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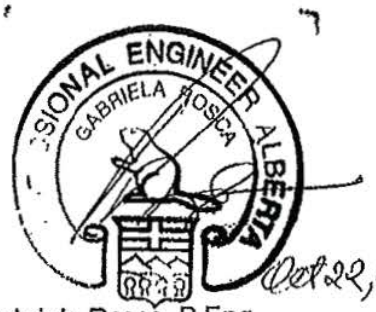
014140

Technical Memorandum

TransCanada
in business to deliver

All the immediate features have been mitigated to ensure the integrity of the pipeline (design MOP of 1440 psi).

Prepared by:



Oct 22, 2012

Gabriela Rosca, P.Eng
Pipe Integrity, Program Support

Reviewed by:

Oct 22, 2012

Bruce Dupuis, P.Eng
Program Manager, Liquid Pipeline Integrity

TC Permit to Practice: 7100

Approved By:

10/22/12

Vern Meier
Vice President

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Keystone Pipeline Restart Operations Plan

Following shutdown of the Keystone pipeline on October 17, 2012, repair of the identified anomalies downstream of Saint Paul pump station commenced under the direction of TransCanada's Integrity Management and Construction group. During this time period the Oil Control Center staff in Calgary continued to monitor pipeline pressures and confirm that no loss of pressure was observed due to a loss of oil from the pipeline.

The prerequisite to commence with pipeline restart operations will be formal confirmation from the Vice President of US Pipeline Operations that the all anomalies have been satisfactorily addressed and it is safe to proceed with remote operation of the pipeline.

In preparation for restarting the pipeline, voluntary pressure restrictions have been placed on the pipeline to ensure the pipeline operating pressure at the anomaly locations downstream of Saint Paul pump station cannot exceed a maximum of 80% of the 60 day high historical operating pressure. These line pressure control (LPC) settings have been engineered to account for transient operating conditions and have been installed at the Centralia, Middletown, Saint Paul, Hartford and Pierron pump stations on October 20, 2012.

Upon receipt of confirmation to safely restart the pipeline, the Oil Control Center will proceed to open all remote sectionalizing valves and proceed with pre start up system checks in accordance with established Oil Control Center procedures. These procedures for restarting the pipeline are the same procedures that are used for all pipeline restart operations.

Since the pipeline will have been shutdown for approximately 4.5 days on the Steele City to Patoka segment and approximately 3 days on the Hardisty to Steele City segment, approximately 2,000 m^3 (12,600 bbls) of column separation has been calculated on the pipeline. The regions of column separation have been distinctly identified by pressure transmitters located at each of Keystone's pump stations and Remote Mainline Valves.

During initial start up operations of the pipeline, the pipeline will be operated at a nominal operating flowrate of 2,200 to 2,500 m^3/hr (13,900 to 15,700 bbls/hr). The pipeline will be operated with select pump stations such that column is reconstituted in a predictable and safe fashion. This will be accomplished by closely monitoring all pressure locations on the pipeline to ensure the rate of pressure increase in the areas where the column is being reformed is commensurate with the pipeline injection rate at Hardisty, AB. If at any time during the column reconstitution process a pressure anomaly is discovered, the Oil Control Center operators will investigate the anomaly immediately and if necessary shut down pipeline operations until the anomaly has been reconciled and it is safe to resume restart operations.

Prepared for Release in PHMSA FOIA
2013-0174_000032

In addition to the diligence given to pipeline restart operations in the Oil Control Center, each anomaly that has been addressed will be visually observed to confirm the integrity of the repairs during restart operations. In addition, Keystone will complete an aerial surveillance of the pipeline via airplane during restart operations.

After the column has been reconstituted and the integrity of each repair has been confirmed, the pipeline flow rate will be increased in an orderly manner to continue regular scheduled operations.

Keystone is confident that all operational risks have been identified and mitigated through the restart operations plan.

October 21, 2012

Prepared for Release in PHMSA FOIA
2013-0174_000033

From:	Ken Crowl
To:	Barrett, David (PHMSA); Ochs, Gregory (PHMSA); Butler, Karen (PHMSA); Bunn, James (PHMSA); Miller, Warren (PHMSA); McLaughlin, Mike (PHMSA); Hodill, Gabe (PHMSA)
Cc:	Vern Meier; Bruce Dupuis; Daniel Cerkoney
Subject:	Keystone Restart
Date:	Monday, October 22, 2012 5:17:27 PM

The pipeline has completed the restart process as of 14:00 MST (16:00 Central). The liquid column has been reconstituted to Patoka and the flow rate has been increased to 2900 m3/h (438 KBPD).

Regards,

Ken Crowl

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Prepared for Release in PHMSA FOIA
2013-0174_000034

From:	Barrett, David (PHMSA)
To:	Hess, John (PHMSA); Seeley, Rodrick M. (PHMSA)
Cc:	PHMSA PHP300 CENTRAL
Subject:	Update on TC Oil (Keystone) shutdown
Date:	Thursday, October 18, 2012 6:27:59 AM
Attachments:	Spatial overview of sites.png

Late yesterday, October 17, 2012, TC Oil (Keystone) reported shutting down the pipeline in response to an anomaly indication preliminarily reported by an ILI vendor.

On September 28, 2012 a high resolution MFL tool run was completed from Salisbury, MO to Patoka, IL on the Keystone Pipeline. Yesterday, the ILI vendor contacted Keystone to report an external metal loss anomaly located in St. Charles County, MO (northwest of the St. Louis metro area). The anomaly is short and deep (95% deep). In response, TC Oil shut down and isolated the pipeline by closing valves. Personnel were sent to the location of the anomaly, and hydrocarbons have not been detected thus far at the site. As of last night, plans were to begin excavation this morning.

Subsequent to the originally reported 95% deep anomaly, three more similar anomalies have been identified within 4 miles downstream of the 95% deep ILI feature and will be investigated. These anomalies are also reported to be external metal loss ranging from 78% to 83% deep. The attached map shows the location of the anomalies (DMA 204496 is the 95% deep feature) in a rural area. The pipeline flows from west to east, and is approx. ½ to 1 mile south of the Mississippi River as shown on the map.

A PHMSA engineer will be en route to the site today from Kansas City.

TC Oil (Keystone) is one of the TransCanada companies, and transports crude oil from Canada to the US market. The pipe is 30-inch diameter, 0.386" w.t., X-70 at the location of the anomalies. The Keystone pipeline is subject to a PHMSA issued Special Permit that allows operation up to 80% SMYS. However, the pipeline has not operated at the 80% SMYS level, and has been operating no higher than 72% SMYS per Part 195 regulations.

OPS Central Region will provide further updates as more information becomes available.

Prepared for Release in PHMSA FOIA
2013-0174_000035

KEYSTONE PIPELINE SYSTEM IN SOUTH DAKOTA

EKALAKA
CARTER CO.
HARDING CO.
PERKINS CO.
PS-15 (Harding)
PS-16 (Buffalo)
PS-17 (Faith)
ZIEBACH CO.
BELLE FOURCHE
SPEARFISH
STURGIS
MEADE CO.
RAPID CITY
PENNINGTON CO.
NEWCASTLE
HAAKON CO.
PS-18 (Haakon)
FORT PIERRE
PS-19 (Murdo)
LYMAN CO.
JONES CO.
WHITE RIVER
PS-20 (Winner)
WINNER
TRIPP CO.
GREGORY
GREGORY CO.
PS-21 (Colome)
VALENTINE
KEYA PAHA CO.
AINSWORTH
BASSETT
ROCK CO.
ATKINSON
O'NEILL
HOLT CO.
PS-22 (Atkinson)
BUFFALO CO.
REDFIELD
ABERDEEN
GROTON
OAKES
MILNOR
SARGENT CO.
PS-32 (Ludden)
BRITTON
MARSHALL CO.
SISSETON
DAY CO.
WEBSTER
PS-33 (Ferney)
SUMMIT
WATERTOWN
CLARK CO.
PS-34 (Carpenter)
BEADLE CO.
HURON
KINGSBURY CO.
BROOKINGS
PS-35 (Roswell)
MADISON
MITCHELL
SALEM
HANSON CO.
MCCOOK CO.
SIOUX FALLS
PARKSTON
FREEMAN
PS-36 (Freeman)
HUTCHINSON CO.
MENNO
YANKTON CO.
YANKTON
PS-37 (Hartington)
CEDAR CO.
PLAINVIEW
WAYNE CO.
WAYNE

SOUTH DAKOTA
NEBRASKA
NORTH DAKOTA
SOUTH DAKOTA
MONTANA
SOUTH DAKOTA
SOUTH DAKOTA
WYOMING
SOUTH DAKOTA
MINNESOTA
IOWA
SOUTH DAKOTA

PREPARED BY:
exp Energy Services Inc.
1300 Metropolitan Boulevard
Tallahassee, Florida , USA 32308
Phone: 1-850-385-5441
Fax: 1-850-385-5523

TransCanada
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KEYSTONE PROJECT
U.S. PORTION

STATE LEVEL OVERVIEW MAP

DRAWN BY: PD CHECKED BY: JP

SCALE: 1 : 1,700,000

DWG: XL-46-P-7035

DATE: 2012/08/20 REVISION: 1

PROJECT: THES0050388X

Legend

- Keystone XL Pipeline
- Keystone
- = Pump Station
- State Line
- County Line
- Urban Area

SOUTH DAKOTA

0 5 10 20 30 40 50 60 Miles

014146

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Keystone Pipeline System

EMERGENCY RESPONSE PLAN

O'BRIEN'S
RESPONSE MANAGEMENT

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281-320-9796

John Hayes
Operations Manager
Keystone Pipeline

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john_hayes@transcanada.com

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NATURAL RESOURCES,
GROUND WATER PROGRAM

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EMERGENCY RESPONSE PLAN

Keystone Pipeline System

Produced by:

O'Brien's Response Management Inc.
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Spring, Texas 77379
281-320-9796
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TransCanada Keystone Limited Partnership

TC Oil Pipeline Operations Inc.
717 Texas Street
Houston, Texas 77002
800-830-9865

014147

EMERGENCY RESPONSE PLAN

Keystone Pipeline System

Prepared for:

TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.
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Prepared by:

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www.rmaworld.com

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Executive Summary

The 3,456-kilometre (2,148-mile) Keystone Pipeline will transport crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River and Patoka, Illinois and eventually to Cushing, Oklahoma. The Canadian portion of the project involves the conversion of approximately 864 kilometres (537 miles) of existing Canadian Mainline pipeline facilities from natural gas to crude oil transmission service and construction of approximately 373 kilometres (232 miles) of pipeline, pump stations and terminal facilities at Hardisty, Alberta. The U.S. portion of the project includes construction of approximately 2,219 kilometres (1,379 miles) of pipeline and pump stations.

The Keystone Pipeline will have an initial nominal capacity of 435,000 barrels per day in late 2009 and will be expanded to a nominal capacity of 590,000 barrels per day in late 2010. Keystone has contracts with shippers totaling 495,000 barrels per day with an average term of 18 years.

A critical aspect of operating the Keystone Pipeline system is to have a comprehensive Emergency Response Program A key component of the program includes having an Emergency Response Plan The plan was prepared to achieve a number of goals: ensure regulatory compliance, appropriate for all key stakeholders including field operations, include all emergencies and response measures, timely internal and external notification procedures, and training requirements. In addition, the plan contains information related to worst case discharge, company owned equipment, environmental sensitivities, contract resources, and public officials, and tactical control plans.

The plan will be distributed to key internal and external stakeholders and delivered to TransCanada personnel through a secure internet portal hosted by TransCanada's emergency response provider and preparer of the plan. The plan has been submitted to the National Energy Board in Canada and the United States Department of Transportation's Pipeline and Hazardous Material safety Administration office. The plan will be updated when substantial changes are made or when deemed necessary by either of the agencies.

The Keystone Emergency Response Plan combined with a rigorous training program, retention of and access to the industry's most known response experts, and a state of the art pipeline integrity and maintenance program make emergency response for the Keystone Pipeline system a priority fully endorsed at all levels within TransCanada pipeline.

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ACKNOWLEDGMENT AND PLAN APPROVAL

The information and procedures in this Plan must be treated as guidelines only. The user should determine to what extent it is practical and advisable to follow them. This decision may involve considerations not discussed in this Plan.

The information and procedures contained herein are considered to be accurate as of this date and are consistent with the National Contingency Plan (NCP) and applicable Area Contingency Plans (ACP) as detailed in Section 1.5.

CERTIFICATION OF QUALIFIED INDIVIDUAL AND ALTERNATE QUALIFIED INDIVIDUAL

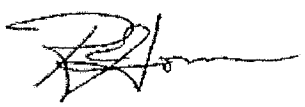
TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc. hereby certifies that the individuals identified as Qualified Individual and Alternate Qualified Individual in this Plan have the full authority in accordance with the applicable United States Federal and State regulations and as detailed in this Plan to:

1. Activate and engage in contracting with oil spill removal organizations.

2. Act as a liaison with the pre-designated Federal On-Scene Coordinate (OSC), and

3. Obligate funds required to carry out response activities.

Plan Approved:



Vice President, Keystone Pipeline Project

Signature	Title
Robert Jones	10/14/2008
Name (please type or print)	Date

NOTE: O'Brien's Response Management Inc. provided consulting and plan development services in the preparation of this Plan utilizing data provided by the owner/operator. O'Brien's assumes no liability for injury, loss, or damage of any kind resulting directly or indirectly from the use of the regulatory interpretation, response planning, or information contained in this plan.

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OPERATOR'S STATEMENT - SIGNIFICANT AND SUBSTANTIAL HARM AND CERTIFICATION OF RESPONSE RESOURCES

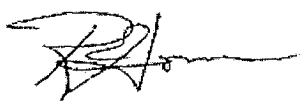
FACILITY NAME: Keystone Pipeline System

CORPORATE ADDRESS: 717 Texas Street
Houston, Texas 77002

1.	Is the pipeline greater than 6 and 5/8 inches (168 mm) in outside nominal diameter, greater than 10 miles (16.1 km) in length? and	Yes✓	No
2.	Has any line section experienced a release greater than 1,000 barrels (159 cubic meters) within the previous five years? or	Yes	No✓
3.	Has any line section experienced two or more reportable releases, as defined in 49 CFR 195.50, within the previous five years? or	Yes	No✓
4.	Does any line section contain any electric resistance welded pipe, manufactured prior to 1970 and operates at a maximum operating pressure established under 49 CFR 195.406 that corresponds to a stress level greater than 50 percent of the specified minimum yield strength of the pipe? or	Yes	No✓
5.	Is any line located within a 5-mile (8 km) radius of potentially affected public drinking water intakes and could reasonably be expected to reach public drinking water intakes? or	Yes✓	No
6.	Is any line located within a 1-mile (1.6 km) radius of potentially affected environmentally sensitive areas and could reasonably be expected to reach these areas?	Yes✓	No

Based on the U.S. DOT PHMSA criteria above, the Keystone Pipeline System is considered "Significant and Substantial Harm".

TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc. hereby certifies to the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation that we have identified and ensured, by contract or by other means, the availability of personnel and equipment to respond, to the maximum extent practicable, to a worst case discharge.



Vice President, Keystone Pipeline Project

Signature	Title
Robert Jones	10/14/2008
Name (please type or print)	Date

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NOTE: It is the responsibility of the holder of this Plan to ensure that all changes and updates are made. The Plan Holder must:

- Remove and discard obsolete pages.
- Replace obsolete pages with the updated pages.

REVISION RECORD		
CHANGE DATE	**AFFECTED PAGE NUMBER(S)**	**DESCRIPTION OF CHANGE(S)**
January 2009	Entire Plan	Initial Submission

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DISTRIBUTION LIST

COPY NUMBER	PLAN HOLDER[1]
1	TransCanada Keystone Limited Partnership Vice President, Operations 450 1st Street SW Calgary, Alberta T2P 5H1
2	TransCanada Keystone Limited Partners Emergency Management Specialist 450 1st Street SW Calgary, Alberta T2P 5H1
3	TransCanada Keystone Limited Partners Emergency Operations Center 450 1st Street SW Calgary, Alberta T2P 5H1
4, 5	TransCanada Keystone Limited Partnership Operations Manager 450 1st Street SW Calgary, Alberta T2P 5H1
6	TransCanada Keystone Limited Partnership U.S. Region Office 717 Texas Street Houston, Texas 77002
7	TransCanada Keystone Limited Partnership Central Region Office 104 Teracon Place Winnipeg, Manitoba R2J 4G7
8, 9, 10	National Energy Board Secretary 444 Seventh Avenue SW Calgary, Alberta T2P 0X8
11, 12 (electronic)	Office of Pipeline Safety - PHMSA Melanie Barber U.S. Department of Transportation 1200 New Jersey Avenue, SE-E-22-321 Washington, District Of Columbia 20590
13	O'Briens Response Management ePlanPro Manager 6620 Cypresswood Drive, Suite 200 Spring, Texas 77379
14	TransCanada-Keystone Limited Partnership Emergency Preparedness Coordinator 104 Teracon Place Winnipeg, Manitoba R2J 4G7
15	TransCanada Keystone Limited Partnership Emergency Preparedness Coordinator 717 Texas Street Houston, Texas 77002

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NOTE[1]: The Distribution of this Plan is controlled by the Copy Number located on the front cover or CD label. The Plan Distribution Procedures provided in Section 1.3 and the Plan Review and Update Procedures provided in Section 1.4 should be followed when making any and all changes.

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1.0 INTRODUCTION AND PLAN CONTENT

1.1 Plan Purpose/Objectives
1.2 Scope of Plan
1.3 Controlled Plan Distribution Procedures
1.4 Plan Review and Update Procedures

1.5 Regulatory Compliance

Figure 1.1 Facility Information

Figure 1.2 Piping System Overview

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1.1 PLAN PURPOSE/OBJECTIVES

The purpose of this Emergency Response Plan (ERP) is to assist TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.personnel in preparing for and responding quickly and safely to emergencies originating from the pipelines and associated facilities. The Plan provides techniques and guidelines for achieving an efficient, coordinated, and effective response to emergencies which may occur along the pipeline.

The specific objectives of the Plan are to:

- Establish Response Teams, assign individuals to fill the positions on the teams, and define the roles and responsibilities of team members.
- Define notification, activation, and mobilization procedures to be followed when a discharge occurs.
- Define organizational lines of responsibility to be adhered to during a response operation.
- Document equipment, manpower, and other resources available to assist with the response.
- Ensure compliance with Canadian Onshore Pipeline Regulations and the U.S. National Oil and Hazardous Substances Contingency Plan and associated Area Contingency Plan(s) for the area of operation.

1.2 SCOPE OF PLAN

This Plan has been developed in accordance with the regulation published in SOR/99-294, S. 32-34 – *Emergency Procedures Manual and 49 CFR Part 194 - Response Plans for Onshore Oil Pipelines.*

This Plan contains prioritized procedures for Company personnel to prevent or mitigate emergencies resulting from the operation of the pipeline. A description of the Pipeline's details is presented in Figure 1.1 with additional information provided in the sections, appendices and annexes.

1.3 CONTROLLED PLAN DISTRIBUTION PROCEDURES

Emergency Management Specialistis responsible for maintenance and distribution of the Plan. Distribution will be handled in the following manner:

- Distribution of controlled Plans is determined by the copy number assigned to agency and designated corporate Plan Holders. A distribution list is included in the Foreword.
- Company personnel who may be called upon to provide assistance during discharge response activities will have access to a copy of the Plan for their use and training.
- Any person holding a controlled copy of the Plan shall ensure that the copy is transferred to their replacement in the event of reassignment or change in responsibility.
- Various regulatory agencies will also be distributed a controlled copy of the Plan. The list of agencies is detailed in the Distribution List located in the Foreword.

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1.4 PLAN REVIEW AND UPDATE PROCEDURES

Review/Update

The Plan resides as a web-based document, which permits authorized Corporate and field staff access to make:

- Appropriate revisions as required by operational or organizational changes.
- Appropriate revisions as required by changes in the names and phone numbers detailed in Section 2.0.
- Appropriate revisions as required by improved procedures or deficiencies identified during response team tabletop exercises or actual emergency responses.

Incorporation of Plan Revisions

Email notification allows Authorized Plan Holders to update hard copy Plans as changes occur.

The Individual Plan Holder shall:

- Review and insert the revised pages into the Plan.
- Discard or archive the obsolete pages.

Agency Revision Requirements

Company shall revise and resubmit changes to the Canadian National Energy Board (CA NEB) and the U.S. DOT/PHMSA Pipeline Response Plans Officer within 30 days of each change that would substantially affect the implementation of the Response Plan. Additionally, the South Dakota Department of Environment and Natural Resources shall be notified within 30 days of any change. Examples of changes in operating conditions that would cause a significant change to the Plan include:

Requiring Changes

- An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved Plan.
- Relocation or replacement of portions of the pipeline, which in any way substantially affect the information included in this Plan, such as a change in the Worst Case Discharge volume.
- A change in the type of oil handled, stored, or transferred that materially alters the required response resources.
- A change in the name of the Oil Spill Removal Organization (OSRO).
- A material change in capabilities of the OSRO that provides equipment and personnel.
- A change in emergency response procedures.
- A change in the Qualified Individual.
- A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities.

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- As a result of post incident or drill evaluations.

1.5 Regulatory Compliance

CA NEB and U.S. DOT/PHMSA must be provided such revisions. The Company must submit the U.S. DOT/PHMSA issued Facility Control Number with the changes (the PHMSA Control Number is listed in Figure 1.1). In addition to periodic updates, when applicable, the Facility will resubmit the Emergency Response Plan to U.S. DOT/PHMSA every five years from the last approval date of the Plan.

Except as provided above, amendments to the following do not require approval by U.S. DOT/PHMSA:

- Personnel and telephone number lists included in the Plan.
- OSRO(s) change which does not result in a material change in support capabilities.

The development, maintenance, and use of this Plan implements Company policy and addresses the following regulatory requirements and guidelines:

- National Energy Board Act: CA Onshore Pipeline Regulations, 1999, SOR/99-294 - S. 32-34.
- Federal Oil Pollution Act of 1990: U.S. DOT Final Rule for Transportation Related On-shore Facilities (49 CFR Part 194).

The response zones have been reviewed for consistency with the following plans:

- Canada - United States Joint Inland Pollution Contingency Plan - Annex II CANUSCENT
- U.S. National Oil and Hazardous Substances Contingency Plan (NCP)
- CA National Environmental Emergencies Contingency Plan
- U.S. EPA Region 8 Regional Contingency Plan
- U.S. EPA Region 7 Regional Contingency Plan
- Greater St. Louis Sub-Area Plan
- U.S. EPA Region 5 Oil and Hazardous Substances Integrated Contingency Plan

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FIGURE 1.1

FACILITY INFORMATION

GENERAL INFORMATION	
Facility Name:	Keystone Pipeline System
U.S. DOT/PHMSA Control:	TBD
Owner Name:	(Canada)TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc. (U.S.)
Address:	***Physical Address*** 717 Texas Street Houston, Texas 77002 ***Operators Address*** 450 - 1st Street S.W. Calgary, Alberta T2P 5H1
Mainline Number:	(403) 920-6467(24 Hours)
Contact Person:	Robert Jones Vice President, Keystone Pipeline Project
Primary NAICS Code:	486910
Determination of Significant and Substantial Harm (U.S. DOT PHMSA):	All Response Zones meet the criteria for "Significant and Substantial Harm."
Operator Statement of (U.S.DOT PHMSA) "Significant and Substantial Harm":	It is the Company's goal to respond as quickly as possible to all uncontrolled releases of crude oil, regardless of the source point location along the system. Based upon this goal, and the overbreadth of the definitions provided in 49 CFR 194.103(c)(4) & (5), the Company is compelled to consider all the active line sections listed below in the Response Zone Annexes as capable of a release potentially causing "significant and substantial harm".

PIPELINE LOCATION	
Provinces/States/Counties:	The System covers 4 specific Response Zones covering 3 Provinces, 6 States and 49 Counties specifically detailed in this Figure 1.1.
Provinces Traversed:	Alberta, Saskatchewan, Manitoba
States Traversed:	North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois
Pipeline System Overview Diagram:	**See Figure 1.2**

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PYSICAL DESCRIPTION - PIPELINE

Response Zone(s):

- The Keystone Pipeline will transport crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River and Patoka, Illinois. The Canadian portion of the project involves the conversion of approximately 537 miles (864 km) of existing Canadian Mainline pipeline facilities from natural gas to crude oil transmission service and construction of approximately 232 miles (373 km) of pipeline, pump stations and terminal facilities at Hardisty, Alberta. The U.S. portion of the project includes construction of approximately 1,054 miles (2,219 km) of pipeline and pump stations.

- The Keystone Pipeline System is divided into 4 specific Pipeline Response Zones. The Response Zones are as follows (Specific information to Response Zones are provided later in the Response Zone Appendices):

    - Hardisty Pump Station/ Regina Pump Station
    - Regina Pump Station / Haskett Pump Station
    - North Dakota, South Dakota, Nebraska
    - Kansas, Missouri, Illinois

General:

- The Keystone Pipeline System includes pipeline sections of 30, 34 or 36-inch diameter as well as pump stations.

- This Plan is written in English and understood by personnel responsible for carrying out the Plan.

Pipeline Specifications:

- ***Products Type:***

- ***Pipe Detail:***The pipeline system consists of several pipeline sections with the following diameters.

    30 inch: 0 Km Point (KP) - 276 KP (Canada)
    34 inch: 276 KP - 1140 KP (Canada)
    36 inch: 1140 KP - 1150 KP (Canada, U.S.)
    30 inch: 1150 KP - 1738 KP (U.S.)

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RESPONSE ZONE INFORMATION

Response Resources:

Facility spill mitigation procedures and response guidelines are provided in Section 3.0 for discharges that could result from any of the following scenarios:

- Pipeline rupture/leak
- Explosion and/or fire
- Failure of facility piping
- Equipment failure (e.g. pumping system failure, relief valve failure, etc.)

Response Zone	Discharge Scenario	Provinces / Counties Traversed	Planning Volume
Hardisty Pump Station/ Regina Pump Station	63346.00	Alberta, Saskatchewan,Western Saskatchewan, Eastern Alberta, Eastern Saskatchewan	41,504
Regina Pump Station / Haskett Pump Station	79861.00	Saskatchewan, Manitoba,Eastern Saskatchewan, Southwestern Manitoba, Western Saskatchewan	51,413
North Dakota, South Dakota, Nebraska	39722.00	Cavalier, Pembina, Walsh, Nelson, Steele, Barnes, Ransom, Sargent, Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, Yankton, Cedar, Wayne, Stanton, Platte, Colfax, Butler, Seward, Jefferson, Saline, Gage	27,329
Kansas, Missouri, Illinois	34289.00	Marshall, Nemaha, Brown, Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, St. Charles, Madison, Bond, Fayette, Marion, Doniphan	24,069

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FIGURE 1.2
PIPING SYSTEM OVERVIEW

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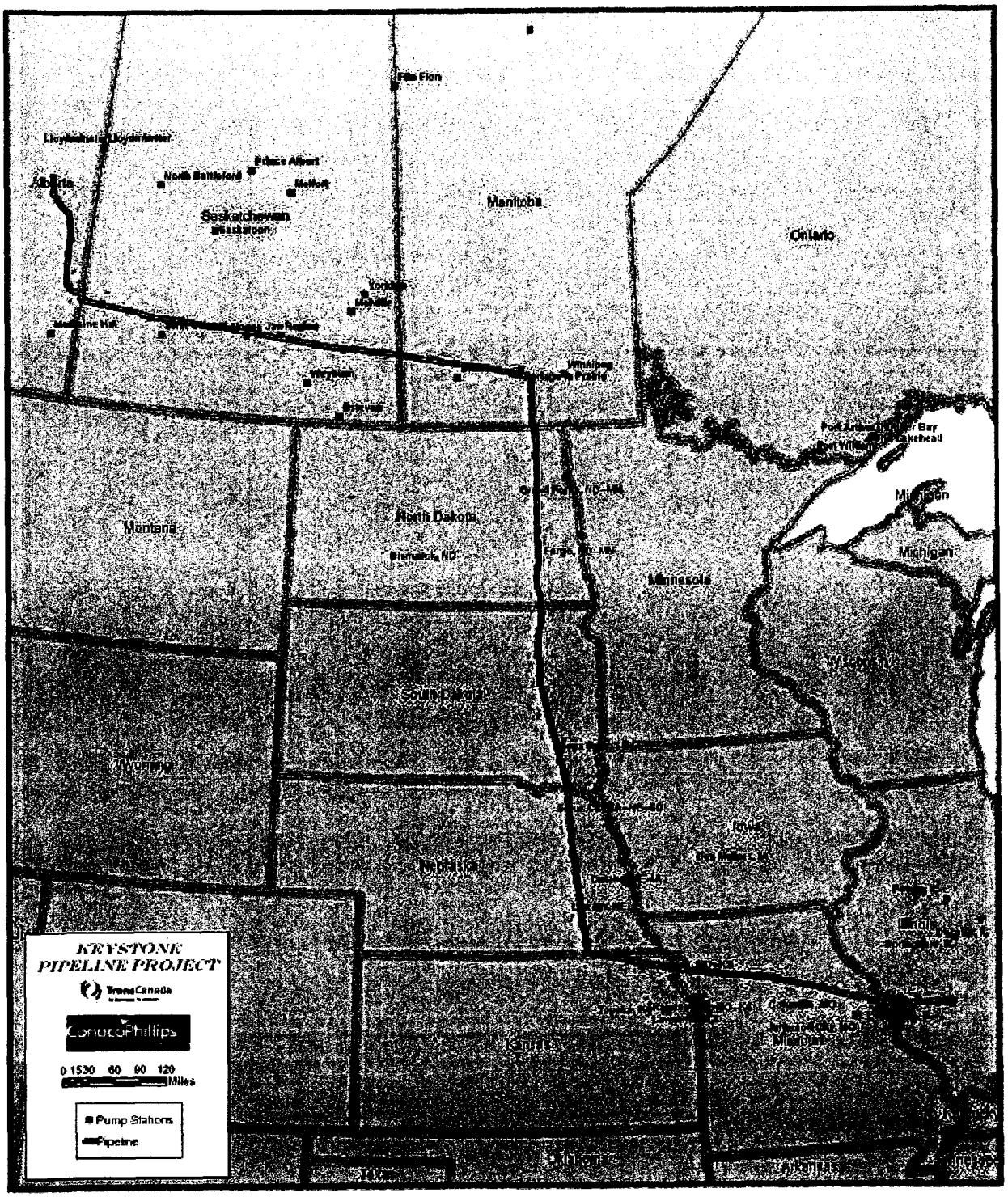
N

Figure 1.2 System Overview Map

Map Prepared By
Response Management Associates
(281) 320 9796



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2.0 NOTIFICATION PROCEDURES

2.1 Internal Notifications
2.2 External Notifications
Figure 2.1 Internal Notification Sequence
Figure 2.2 Internal Notification References
Figure 2.3 Notification Data Sheet
Figure 2.4 External Notification Flowchart
Figure 2.5 External Notification References
Figure 2.6 Possible Command Post Locations

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This Section is a guide for notification procedures that should be implemented immediately after discovering a discharge incident and, if possible, securing the source. Internal and external notifications are described separately for clarification purposes only. All notifications are of extreme importance and must be completed in a timely manner.

2.1 INTERNAL NOTIFICATION

The following internal notifications should be made for each emergency incident to the extent that the incident demands (telephone reference is provided in Figure 2.2). In no event shall notification be delayed because the immediate supervisor is inaccessible. Authorization is given to bypass management levels if necessary to provide timely notification to appropriate management. The typical internal notification responsibilities for each person potentially involved in the initial response are as follows:

Employee Discovering Discharge

- Immediately notify the Keystone Console (contact information is listed in Figure 2.2).
- Notify the local fire department, police department, and rescue, as needed.
- Notify the contracted Spill Management Team, the O' Briens Group at (985) 781-0804.
- **Notify the Spill Response Contractor, National Response Corporation at (800) 337-7455.**

Keystone Console

- Verify emergency.
- Immediately notify the Keystone Console Manager and Regional On-Call Manager.
- Notify the emergency response contractor if the employee that discovered the discharge has not already made the notification.
- Notify: U.S. National Response Center, the CA Transportation Safety Board National Response Center, CA National Energy Board, appropriate Federal agencies, County Emergency Management, Province/State Environmental Agency, and the Utilities One-Call, as needed (notification requirements and contact information are listed in Figure 2.5).

Calgary Emergency Operation Center Manager

- Determine whether emergency seems to meet "crisis" criteria. If yes, follow procedures outlined in Incident Management System Manual.
- Contact Corporate Security and Calgary Emergency Operations Center.
- Activate Corporate / Business support departments.
- Provide support to region.

Corporate Security

- Confirm emergency meets "crisis" criteria.
- Notify the Executive VP of Operations and Engineering.

Regional Emergency Operations Center

- Provide support to the on-scene personnel.
- Completes local notifications.
- Facilitates communication between Incident Command Corporate EOC.

Emergency Management Team

- Immediately notify the Emergency Operations Center Management Staff.

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FIGURE 2.1

INTERNAL NOTIFICATION SEQUENCE

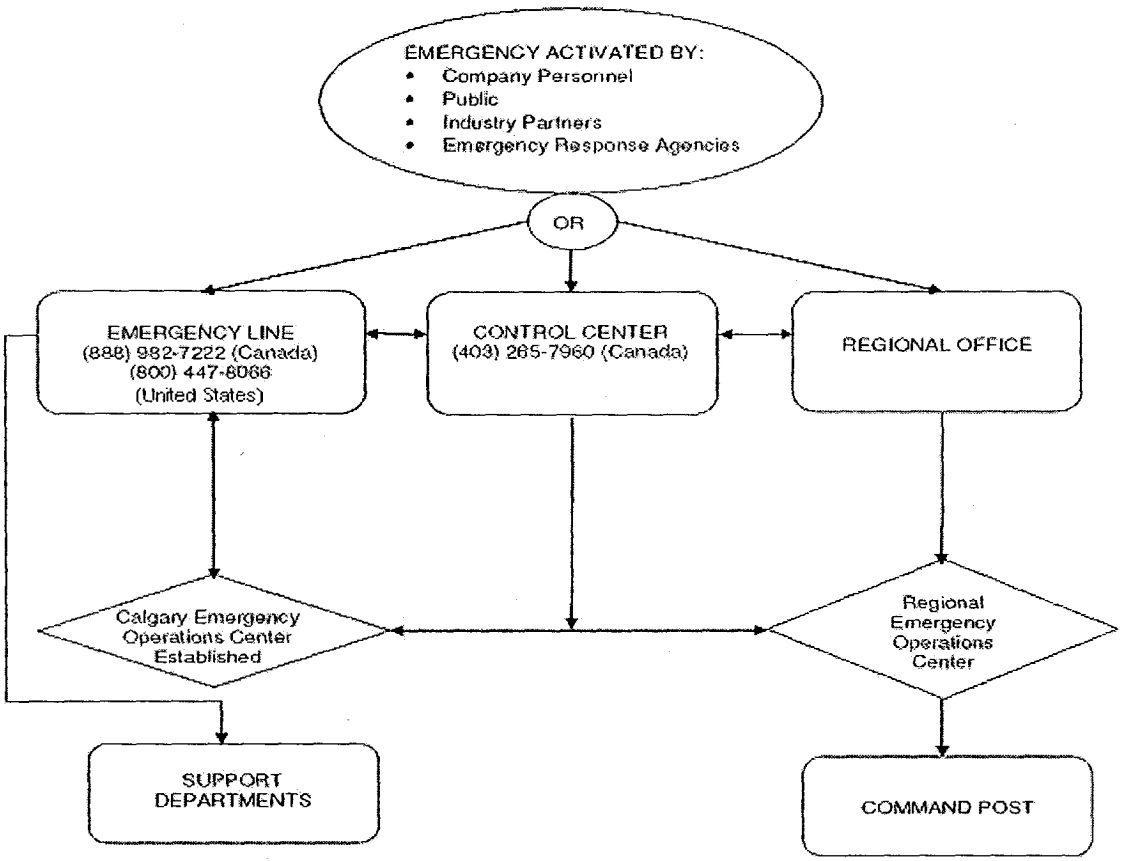

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FIGURE 2.2

INTERNAL NOTIFICATION REFERENCES

CORPORATE RESPONSE PERSONNEL / OTHER COMPANY CONTACTS INTERNAL NOTIFICATIONS					
POSITION/TITLE	NAME	OFFICE	HOME	CELL	PAGER

Hardisty Pump Station/ Regina Pump Station					
POSITION/TITLE	NAME	OFFICE	HOME	CELL	PAGER
Director, Central Region	Randall W. Schmidgall	(204) 957-6832			
Regina Pump Station / Haskett Pump Station					
POSITION/TITLE	NAME	OFFICE	HOME	CELL	PAGER
Director, Central Region	Randall W. Schmidgall	(204) 957-6832			
North Dakota, South Dakota, Nebraska					
POSITION/TITLE	NAME	OFFICE	HOME	CELL	PAGER
Operations Manager	Rodrick McGillivray	(605) 692-1415 X3311	(605) 692-4306	(605) 695-0214	
US Mechanic 4	Wayne Barreth	(406) 787-6372 ext. 26		(701) 770-6540	
Kansas, Missouri, Illinois					
POSITION/TITLE	NAME	OFFICE	HOME	CELL	PAGER
Operations Manager	Rodrick McGillivray	(605) 692-1415 X3311	(605) 692-4306	(605) 695-0214	
US Mechanic 4	Wayne Barreth	(406) 787-6372 ext. 26		(701) 770-6540	

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2.2 EXTERNAL NOTIFICATIONS

External notifications are those made to entities outside of the Company including Federal, Province/State and local regulatory agencies, as well as railroad and utility companies. These notifications include both verbal and written requirements.

Verbal Notification Requirements

Immediate internal notification is to be made in accordance with the Internal Notification Procedures found in Section 2.1 when a system operational failure or other type of incident occurs. This will allow immediate evaluation and classification of incidents and prompt immediate telephonic notification as detailed in Figure 2.4 and 2.5 to the Transportation Safety Board, National Response Center (NRC), Province/State agencies, local agencies, and other Federal agencies as required. The information found on the Notification Data Sheet, Figure 2.3, should be used to disseminate incident information to the appropriate agencies.

For the purpose of this procedure, immediate reporting means reporting the instant a person has knowledge of an actual or suspected leak, uncontrolled release of product, any unplanned spill or other pipeline system failure. Information that causes any employee to reasonably suspect a leak or uncontrolled release of product must be immediately reported, even when the actual existence or location of a leak or release cannot yet be confirmed.

Written Notification Requirements

In the United States, a written report is to be filed as soon as practical, but not later than 30 days after discovery of the incident to the Information Resources Manager, Office of Pipeline Safety, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation. Information concerning the event shall be reported on Pipeline and Hazardous Materials Safety Administration Form 7000-1 on-line on the Pipeline and Hazardous Materials Safety Administration website via log-in. Paper reports are not required. This report is to be filed for all incidents reported telephonically and other incidents required to be reported in accordance with the criteria listed below.

The information required for completing the 30-day written report will be furnished by the Area Offices to the Department of Transportation Regulatory Compliance Department for submission to the Department of Transportation. Any subsequent or additional information that was not reported on the initial written report must be reported to the Department of Transportation Regulatory Compliance Department by the Area Office. This information will be utilized in filing a supplemental written report to the Department of Transportation as soon as possible, but no later than 30 days after its discovery.

In Canada, a detailed written incident report is required as soon as practicable.

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Citation	Description
Extracts from Transportation Safety Board Regulations Sections 5(1) and 5 (5)	When a reportable pipeline accident or incident takes place, the operator and any employee of the operator having direct knowledge of the accident or incident shall report to the Board as soon as possible and by the quickest means available. Where any person mentioned above makes a report, no other person referred to is required to make such a report.
Transportation Safety Board Regulations Section 2(1)	A "reportable pipeline accident" is an accident resulting directly from the operation of a pipeline, where (a) a person sustains a serious injury or is killed as a result of being exposed to i. a fire, ignition or explosion, or ii. a commonly released from the pipeline, or (b) the pipeline i. sustains damage affecting the safe operation of the pipeline as a result of being contacted by another object or as a result of a disturbance of its supporting environment, ii. causes or sustains an explosion, or a fire or ignition that is not associated with normal operating circumstances, or iii. sustains damage resulting in the release of any commodity.
Transportation Safety Board Regulations Section 2(1)	A "reportable pipeline incident" means an incident resulting directly from the operation of a pipeline where (a) an uncontained and uncontrolled release of a commodity occurs, (b) the pipeline is operated beyond design limits, (c) the pipeline causes an obstruction to a ship or to a surface vehicle owing to a disturbance of its supporting environment, (d) any abnormality reduces the structural integrity of the pipeline below design limits, (e) any activity in the immediate vicinity of the pipeline poses a threat to the structural integrity of the pipeline, or (f) the pipeline, or a portion thereof, sustains a precautionary or emergency shut-down for reasons that relate to or create a hazard to the safe transportation of a commodity.

NOTE: Refer to Figure 2.5 for any additional Province/State written reporting requirements.

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FIGURE 2.3

NOTIFICATION DATA SHEET

Date: *Time:*

INCIDENT DESCRIPTION

Reporter's Full Name: *Position:*
Day Phone Number: *Evening Phone Number:*
Company: *Organization Type:*
Facility Address: *Owner's Address:*

Facility Latitude: *Facility Longitude:*
Spill Location:
(if not at Facility)
Responsible Party's Name: *Phone Number:*
Responsible Party's Address:
Source and/or cause of discharge:

Nearest City:
County: *State:* *Zip Code:*
Section: *Township:* *Range:*
Distance from City: *Direction from City:*
Container Type: *Container Storage Capacity:*
Facility Oil Storage Capacity:
Material:

Total Quantity Released	Water Impact (*YES or NO*)	Quantity into Water

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Incident:

Number of Injuries: *Number of Deaths:*
Evacuation(s): *Number Evacuated:*
Damage Estimate:
More information about impacted medium:

Possible hazards to human health or the environment outside of the Facility:

CALLER NOTIFICATIONS

National Response Center (NRC): 1-800-424-8802 *Transportation Safety Board:* 819-997-7887
Additional Notifications (Circle all applicable): *USCG* *NEP* *EPA* *Province* *State* *Other*
National Response Center
Incident Assigned No.

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in this report including estimated quantity and disposition of recovered material:

NOTE: DO NOT DELAY NOTIFICATION PENDING COLLECTION OF ALL INFORMATION.

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FIGURE 2.4

EXTERNAL NOTIFICATION FLOWCHART

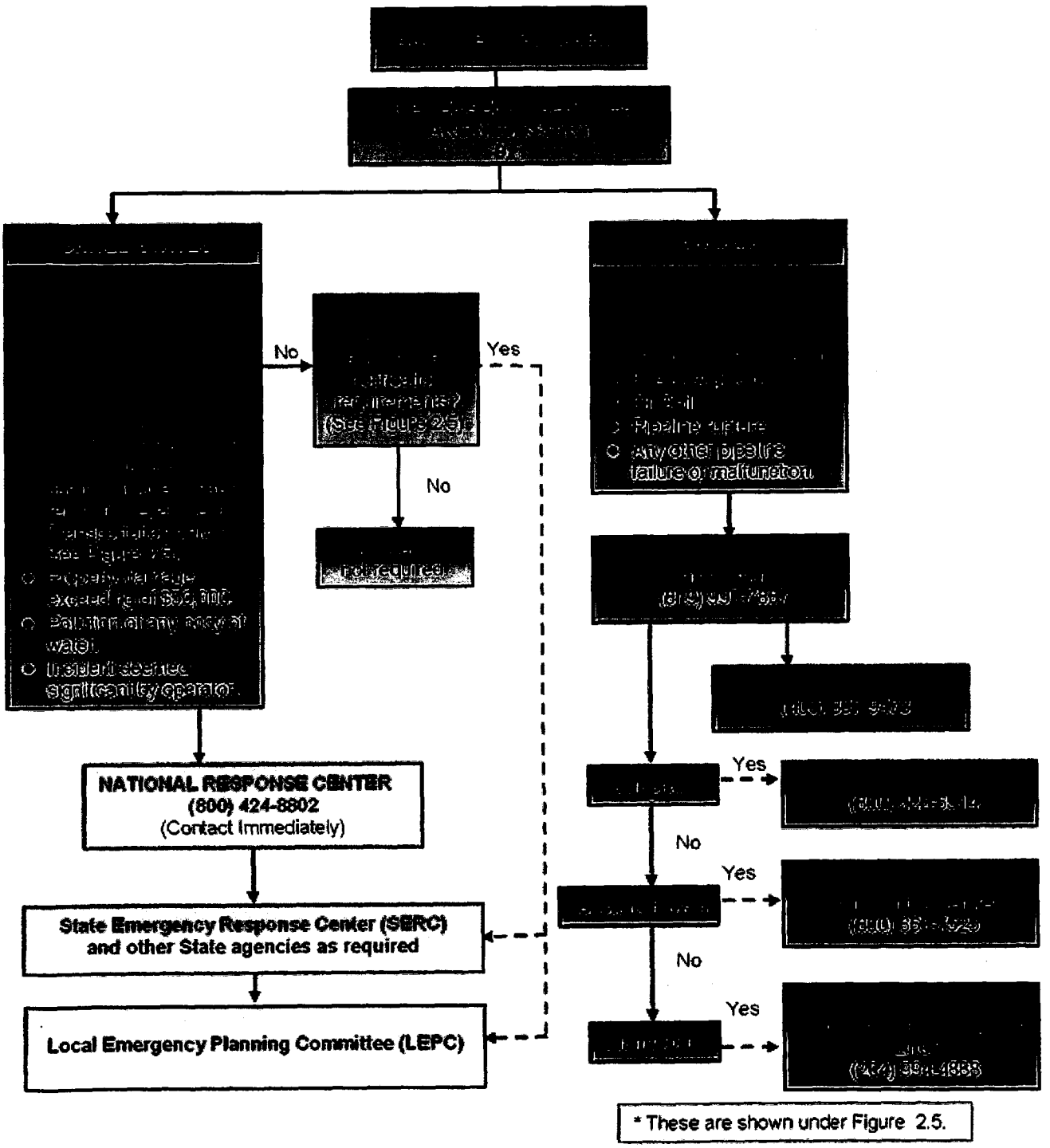

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FIGURE 2.5

EXTERNAL NOTIFICATION REFERENCES

REQUIRED NOTIFICATIONS	
Office of Pipeline Safety and Hazardous Materials U.S. Department of Transportation 1200 New Jersey Avenue SE-E-22-321 Washington, District Of Columbia 20590	(202) 366-4000
REPORTING REQUIREMENTS TYPE: In addition to the reporting of accidents to the NRC as noted below, a written accident report PHMSA Form 7000-1. VERBAL: Call to the NRC meets the required verbal notification under DOT reporting requirement. WRITTEN: Reported on PHMSA Form 7000-1 no later than 30 days, submit a report resulting from explosion/ fire/ hospitalization, death, property damage greater than $50,000, or above reportable quantity. NOTE:	
National Response Center (NRC) c/o United States Coast Guard (CG-3RPF-2), 2100 2nd Street Southwest - Room 2111-BC Washington, District Of Columbia 20593-0001	(800) 424-8802 (202) 267-2675 (800) 337-7455
REPORTING REQUIREMENTS TYPE: Any oil discharge that has impacted or threatens to impact navigable waters or release of a hazardous substance in an amount equal to or greater than the reportable quantity (RQ). VERBAL: Immediately. WRITTEN: Not required. NOTE:	
Transportation Safety Board (TSB) of Canada 200 Promenade du Portage, Place du Centre, 4th Floor Gatineau, Quebec 1K8	(819) 997-7887 (800) 387-3557
REPORTING REQUIREMENTS TYPE: All pipeline accidents with fatality or serious injury, fire or explosion, oil spill, pipeline rupture or any other pipeline failure or malfunction. VERBAL: Immediately. WRITTEN: Within 30 days. NOTE:	
Saskatchewan Environment and Resource Management Box 3003, 800 Central Avenue. Prince Albert, Saskatchewan S5V 6G1	(800) 667-7525
REPORTING REQUIREMENTS TYPE: Any oil spill to water or oil spill greater than or equal to 50 L. to land. VERBAL: Immediately WRITTEN: Within 7 days.	

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NOTE:

Alberta Environment
9915 -108 Street 10th Floor, Petroleum Plaza South Tower
Edmonton, Alberta T5K 2G8
(800) 222-6514

REPORTING REQUIREMENTS
TYPE: All spills to water or exceeds a reportable quantity or emission level.
VERBAL: Immediately.
WRITTEN: Within 7 days.
NOTE:

Canadian National Energy Board (CA NEB)
444 Seventh Avenue SW
Calgary, Alberta T2P OX8
(403) 807-9473
(800) 899-1265

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE:

Manitoba Conservation Environmental Emergency Line
Winnipeg, Manitoba
(204) 994-4888

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE:

North Dakota Dept. of Health-Environmental Health
918 East Divide Avenue
Bismarck, North Dakota 58501-1947
(701) 328-5150
(701) 328-5210

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

North Dakota Industrial Commission
State Capitol, 14th Floor, 600 E. Boulevard Ave., Dept 405
Bismarck, North Dakota 58505-0840
(701) 328-8020

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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South Dakota DENR, Div of Environmental Services 523 East Capitol Ave. Pierre, South Dakota 57501-3182	(605) 773-3296 (605) 773-3231

REPORTING REQUIREMENTS
TYPE: Any Spill or discharge greater than reportable quantity.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

South Dakota DENR, Division of Oil and Gas South Dakota	(605) 394-2229

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

South Dakota Department of Environment and Natural South Dakota	(605) 773-6035

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

South Dakota Department of Transportation, RR	(605) 773-3046 (605) 773-3921

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

South Dakota Department of Transportation, ROW South Dakota	(605) 773-3710 (605) 773-4249

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

South Dakota Division of Emergency Management South Dakota	(605) 773-3231

REPORTING REQUIREMENTS

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TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

South Dakota Public Utilities Commission South Dakota	(605) 773-3201

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Environmental Health Section, Div. of Water Qualit North Dakota	(701) 328-5253

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Nebraska Emergency Management Agency Lincoln, Nebraska	(402) 471-7176

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Nebraska Game & Parks Commission Lincoln, Nebraska	(402) 471-5423 (402) 271-5440

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

City of Fargo Fargo, North Dakota	(701) 241-1310

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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Tri-County Water District North Dakota	(701) 345-8240

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Game & Fish, Conservation and Communication Divisi North Dakota	(701) 328-6612

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Game, Fish and Parks South Dakota	(605) 345-3381

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

U.S. Environmental Protection Agency Region 8 999 18th Street Suite 500 Denver, Colorado 80202-246	(303) 312-6312

REPORTING REQUIREMENTS

TYPE:	Immediately for spills that impact or threaten navigable water or adjoining shoreline.
VERBAL:	Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN:	In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav
NOTE:	In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav

Public Service Commission, Public Utilities Divisi North Dakota	(701) 328-4077

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Department of Environmental Quality	(402) 471-2186

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1200 N Street Suite 400 / PO Box 98922 Lincoln, Nebraska 68509-8922	(402) 471-4545

REPORTING REQUIREMENTS
TYPE: Any Discharge that leaves the Facility or threatens to impact navigable waters.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As Requested by the Agency
NOTE:

Department of Natural Resources Nebraska	(402) 494-2363

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

City of South Sioux Nebraska	(402) 494-7517

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

North Dakota Division of Emergency Management PO Box 5511 Bismarck, North Dakota 58506-5511	(701) 328-8100

REPORTING REQUIREMENTS
TYPE: Any spill or discharge above RQ.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

Environmental Protection Agency - IL Office Illinois	(217) 524-3908 (217) 785-9250

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

U.S. Environmental Protection Agency Region 5 77 W. Jackson Blvd., 5th Floor Chicago, Illinois 60604	(312) 353-2318 (312) 353-2000

REPORTING REQUIREMENTS
TYPE: Immediately for spills that impact or threaten navigable water or adjoining shoreline.

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VERBAL:	Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN:	In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon navi
NOTE:	In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon navi

New Madrid County Commission New Madrid, Missouri	(573) 748-2524

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Nodaway County Commission Maryville, Missouri	660-582-2251

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

U.S. Army Corps of Engineers, Missouri Office Missouri	(573) 634-5667

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Taney County Missouri	(417) 546-7200

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Kansas Dept. of Transportation Dwight D. Eisenhower State Office Building, 700 S.W. Harrison Street Topeka, Kansas 66603-3754	(785) 296-3566

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.

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NOTE:

Vernon County Commission Missouri	(417) 448-2500

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Missouri U.S. Fish and Wildlife Service Columbia, Missouri	(573) 234-2132

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Illinois Department of Transportation (IDOT) 2300 S. Dirksen Parkway Springfield, Illinois 62764	(217) 782-7820

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

City of Troy Troy, Missouri	(636) 528-4712 x.227 (636) 528-7562

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Missouri DNR, Environmental Improvement and Energy PO Box 176 Jefferson City, Missouri 65102	(573) 751-4919

REPORTING REQUIREMENTS
TYPE: Any Spill or discharge that meets or exceeds the Federal reportable quantity.
VERBAL: Immediately, within 30 minutes
WRITTEN: As requested by Agency.
NOTE:

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Hickory County Commission Missouri	(417) 745-6450

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Illinois Department of Natural Resources (IDNR) Illinois	(618) 462-1181

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Illinois Emergency Management Agency 110 East Adams Springfield, Illinois 62701-1109	(800) 782-7860 (217) 782-7860

REPORTING REQUIREMENTS
TYPE: Any Discharge or sighting of oil, or hazardous substances exceeding a reportable quantity.
VERBAL: Immediately.
WRITTEN: As sson as practicable after the release.
NOTE:

Douglas County Commission Missouri	(417) 683-4714

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

U.S. Corps of Engineers - Illinois Illinois	(309) 794-5351

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Kansas Department of Health & Environment Curtis State Office Building 1000 SW Jackson Topeka, Kansas 66612	(785) 296-1679

REPORTING REQUIREMENTS
TYPE: All Spills that impact soil, surface water or groundwater.

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VERBAL: Immediately, within one hour.
WRITTEN: As requested by Agency.
NOTE:

Kansas Dept. of Wildlife and Parks Kansas	(620) 672-5911 (620) 672-0795

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

DeKalb County PWSD No 1 Missouri	(816) 393-5311

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Pike County Commission Missouri	573-324-2412

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

McDonald County Commission Missouri	(417) 223-4717

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Polk County Commission Missouri	(417) 326-4031

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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ADDITIONAL RESPONSE RESOURCES

Planning and Incident Support

COMPANY	LOCATION	TELEPHONE
National Response Corporation	3500 Sunrise Hwy Ste. T103 Great River, New York 11739	(800) 899-4672
ENSR	Fort Collins, Colorado	(800) 722-2440
Western Canadian Spill Services	Calgary, Alberta	(403) 250-9606
Saskatchewan Co-op Area 1 Chairman	Saskatchewan	(780) 573-7350
Saskatchewan Co-op Area 1 Alt. Chairman	Saskatchewan	(306) 387-6449
Saskatchewan Co-op Area 2 Chairman	Box 1132 Kindersley, Saskatchewan S0L 1S0	(306) 968-2503
Saskatchewan Co-op Area 2 Co-Chairman	Box 5 Coleville, Saskatchewan S0L 0K0	(306) 965-2731
Saskatchewan Co-op Area 2 Custodian	Saskatchewan	(306) 834-7898
Saskatchewan Co-op Area 3 Chairperson	Saskatchewan	(306) 773-0234
Saskatchewan Co-op Area 3 Secretary	Saskatchewan	(306) 773-9381
Saskatchewan Co-op Area 3 Custodian	Saskatchewan	(306) 672-3723
Saskatchewan Co-op Area 4&5 Chair	Saskatchewan	(306) 842-1818
Saskatchewan Co-op Area 4&5 Vice-Chair	Saskatchewan	(306) 842-3088
Saskatchewan Co-op Area 6 Call-out	Saskatchewan	(306) 791-5058
O'Brien's Response Management Inc.	Spring, Texas	(281) 320-9796
Alberta Coop Area 2U Custodian	Hardisty, Alberta	(780) 888-3845
Alberta Coop Area 1S Equip. Custodian	Brooks, Alberta	(403) 362-6551
Albert Coop Area 1S Regional Custodian	Lethbridge, Alberta	(403) 329-0427
Euroway Industrial Svc Co. Ltd	Winnipeg, Manitoba	(204) 661-0500

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FIGURE 2.6

POSSIBLE COMMAND POST LOCATIONS

Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Numbers	Size of conference Room
Hardisty PS/Lakesend PS	Lakeland Inn PO Box 1050 Stn Main Cold Lake, AB T9M 1P3, Canada	(780) 594-3311	Meeting Room accomodates 450 people
Lakesend PS/Monitor PS	La Biche Inn PO Box 321 Lac La Biche, AB T0A 2C0, Canada	(780) 623-4427	Meeting Room accomodates 30 people
Monitor PS/Oyen PS	Super 8 - Provost 3611 57th Avenue Provost, AB T0B 3S0, Canada	(780) 753-2255	Meeting Room accomodates 55 people
	Lucky Lake Hotel Main St Lucky Lake, SK S0L 1Z0, Canada	(306) 858-2008	Meeting Room accomodates 40 people
Oyen PS/Bindloss PS	None Available		
Blindloss PS/Cabri PS	Super 8 Motel Junction of Hwy 9 & 41 Oyen, AB T0J 2J0, Canada	(403) 664-3010	Meeting Room accomodates 65 people
	Swift Current Travelodge 605 North Service Road East Swift Current, SK S9H 3T8, Canada	(306) 773-3101	Meeting Room accomodates 20 people
Cabri PS/Herbert PS	Super 8 Motel 405n Service Rd E Swift Current, SK S9H 0A1, Canada	(306) 778-6088	Meeting Room accomodates 20 people
	Best Western Inn 105 George St W Swift Current, SK S9H 0K4, Canada	(306) 773-4660	Meeting Room accomodates 35 people
Herbert PS/Caron PS	Howard Johnson Inn - Swift Current 1150 South Service Road East Swift Current, SK S9H 3X6, Canada	(306) 773-2033	Meeting Room accomodates 55 people
	Days Inn Hwy 1 E Swift Current, SK S9H 3X6, Canada	(306) 773-4643	Meeting Room accomodates 250 people

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Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Number(s)	Size of Conference Room
Caron PS/Regina PS	Comfort Inn & Suites 155 Thatcher Drive W. Moose Jaw, SK S6J 1M1, Canada	(306) 692-2100	Meeting Room accomodates 40 people
	Hotel Saskatchewan Radisson Plaza 2125 Victoria Avenue Regina, SK S4P 0S3, Canada	(306) 522-7691	Meeting Room accomodates 100-800 people
Regina PS/Kendal PS	Best Western Seven Oaks Inn 777 Albert St Regina, SK S4R 2P6, Canada	(306) 757-0121	Meeting Room accomodates 150 people
	Holiday Inn Express Hotel & Suites Regina 1907 11th Avenue Regina, SK S4P 0J2, Canada	(877) 863-4780	Meeting Room accomodates 50 people
Kendal PS/Grenfell PS	Holiday Inn Hotel & Suites Regina 1800 Prince Of Wales Drive Regina, SK S4Z 1A4, Canada	(877) 863-4780	Meeting Room accomodates 80 people
	The Prince William Suites Hotel Box 1030 21 Mall Road, Melville, SK S0A 2P0, Canada	(306) 728-4546	Meeting Room accomodates 300 people
Grenfell PS/Moosomin PS	Katepwa Beach Resort Hotel Lebret, SK S0G 2Y0 Canada	(306) 332-4696	Meeting Room accomodates 30 people
	Whitewood Inn Hwy 1 & 9 Whitewood, SK S0G 5C0, Canada	(306) 735-2651	Meeting Room accomodates 250 people
Moosomin PS/Rapid City PS	The Russell Inn Hwy 16 & 83 MB R0J 1W0, Canada	(204) 773-2186	Meeting Room accomodates 150 people
	Royal Oak Inn & Suites Brandon 3130 Victoria Avenue Brandon, MB R7B 0N2, Canada	(204) 728-5775	Meeting Room accomodates 50 people

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Transcanada Command Posts			
Pump station to Pump Station	Hotel Name	Contact Numbers	Size of Conference Room
Rapid PS/Portage La Prairie PS	Canadian Inn 150 5th Street Brandon, MB R7A 3K4, Canada	(204) 727-6404	Meeting Room accomodates 200 people
	Super 8 Portage La Prairie MB Saskatchewan Avenue West Portage la Prairie, MB R1N, Canada	(204) 857-8883	Meeting Room accomodates 20 people
La Prairie PS/XCarman PS	Days Inn Highway 1 Quill Trail Portage la Prairie, MB R1N 3C3, Canada	(204) 857-9791	Meeting Room accomodates 50 people
	Days Inn & Suites-Winkler 395 Boundary Trail Winkler, MB R6W 4B1, Canada	(204) 325-8888	Meeting Room accomodates 40 people
Carman PS/Haskett PS	Super 8 Motel 400 Main St S MB R0G 1K0, Canada	(204) 746-6879	Meeting Room accomodates 30 people
	Heartland Inn 651 Main St Winkler, MB R6W 2L8, Canada	(204) 325-4381	Meeting Room accomodates 300 people
Haskett PS/Edinburg PS	Holiday Mountain Ski Resort & Golf Course Holiday Mountain La Riviere, MB R0G 1A0, Canada	(204) 242-2172	Meeting Room accomodates 70 people
	Cedar Inn Steak House & Motel 502 Division Ave S Cavalier, ND 58220	(701) 265-8341	Meeting Room accomodates 50 people
Edinburg PS/Niagara PS	Forestwood Inn 504 Sunset Ave Walhalla, ND 58282	(701) 549-2651	Meeting Room accomodates 30 people
	Holiday Inn Grand Forks 1210 N. 43rd St. Grand Forks, ND 58203	(877) 863-4780	Meeting Room accomodates 100 people
Niagara PS/Luverne PS	Holiday Inn Express Hotel & Suites Grand Forks 4051 32nd Ave South Grand Forks, ND 58201	(877) 863-4780	Meeting Room accomodates 30 people
	Quality Inn & Suites 507 25th St. SW Jamestown, ND 58401	(701) 252-3611	Meeting Room accomodates 325 people

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Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Numbers	Size of Conference Room
Luverne PS/Fort Ransom PS	Governors Inn & Conference Center 2050 Governors Dr Casselton, ND 58012	(701) 347-4524	Meeting Room accomodates 450 people
	Americ Inn 280 Wintershow Rd SW Valley City, ND 58072	(701) 845-5551	Meeting Room accomodates 60 people
Fort Ransom PS/Ludden PS	Holiday Inn Express Jamestown 803 20th St. S.W. Jamestown, ND 58401	(701) 251-2131	Meeting Room accomodates 25 people
	Ramada Aberdeen 2727 6th Avenue Se Aberdeen, SD 57401	(605) 225-3600	Meeting Room accomodates 25 people
Ludden PS/Ferney PS	Best Western-Ramkota Hotel 1400 8th Ave NW Aberdeen, SD 57401-2602	(605) 229-4040	Meeting Room accomodates 150 people
	Ramada 2727 6th Ave SE Aberdeen, SD 57401 US	605-225-3600	Meeting Room accomodates 400 people
Ferney PS/Carpenter PS	Holiday Inn Express Hotel & Suites Aberdeen 1330-1399] 7th Ave SE Aberdeen, SD 57401	(877) 863-4780	Meeting Room accomodates 100 people
	Country Inn Suites Watertown Reviews 100 S Maple Watertown, SD 57201	(605) 886-8900	Meeting Room accomodates 70 people
Carpenter PS/Roswell PS	Best Western Of Huron 2000 Dakota Ave S Huron, SD 57350-4027	(605) 352-2000	Meeting Room accomodates 50 people
	Super Deluxe Inn & Suites 288 US Highway 14 W De Smet, SD 57231	(605) 854-9388	Meeting Room accomodates 100 people
Roswell PS/Freeman PS	Days Inn Mitchell 1506 South Burr St. Mitchell, SD 57301	(605) 996-6208	Meeting Room accomodates 50 people
	Best Western Ramkota Hotel Sioux Falls 3200 West Maple Street Sioux Falls, SD 57107	(605) 336-0650	Meeting Room accomodates 700-1500 people
Freeman PS/Hartington PS	Cameron Inn 131 E Main St Canistota, SD 57012	(605) 296-3555	Meeting Room accomodates 25 people
	Best Western Kelly Inn 1607 East Highway 50 Route Yankton, SD 57078	(605) 665-2906	Meeting Room accomodates 125 people

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Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Numbers	Size of Conference Room
Hartington PS/Stanton PS	Holiday Inn Express Hotel & Suites Vermillion 1200 N. Dakota St. Vermillion, SD 57069	(877) 863-4780	Meeting Room accomodates 100 people
	Holiday Inn Express Hotel & Suites Norfolk 920 South 20th Street Norfolk, NE 68701	(877) 863-4780	Meeting Room accomodates 200 people
Stanton PS/David City PS	New World Inn & Conference Center 265 33rd Ave Columbus, NE 68601	(402) 564-1492	Meeting Room accomodates 1000 people
	Holiday Inn Express Hotel & Suites Columbus 524 E 23rd St Columbus, NE 68601	(877) 863-4780	Meeting Room accomodates 200 people
David City PS/Wilber PS	Sleep Inn & Suites 303 23rd St Columbus, NE 68601	(402) 562-5200	Meeting Room accomodates 35 people
	Holiday Inn Lincoln-Downtown 141 N. 9th St Lincoln, NE 68508	(877) 863-4780	Meeting Room accomodates 500-1000 people
Wilbur PS/Steele City PS	Embassy Suites Hotel Lincoln 1040 P Street Lincoln, NE 68508	(402) 474-1111	Meeting Room accomodates 500-1000 people
	Hotel Wilber 203 S Wilson St Wilber, NE 68465	(402) 821-2020	Meeting Room accomodates 30 people
Steele City (to State Line)	Travelers Lodge 3500 North 6th Street Beatrice, NE 68310	(402) 223-4074	Meeting Room accomodates 30 people
	Holiday Inn Express Hotel & Suites Beatrice 4005 N 6th Street Beatrice, NE 68310	(402) 228-7000	Meeting Room accomodates 350 people
State Line to Seneca	Hiawatha Lodge 101 Lodge Rd Hiawatha, KS 66434	(785) 742-7401	Meeting Room accomodates 50 people
	Oak Tree Inn 1127 Pony Express Hwy # A Marysville, KS 66508	(785) 562-1234	Meeting Room accomodates 40 people
Seneca PS/Severance PS	Marysville Surf Motel 2105 Center Street Marysville, KS 66508	(785) 562-2354	Meeting Room accomodates 30 people
	Big Lake Resort Big Lake State Park 200 Lake Shore Drive, Big Lake, MO 64437-4477	(660) 442-5432	Meeting Room accomodates 35, Can use dinning hall which adds an additional 100 people

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Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Numbers	Size of Conference Room
Severance PS/Turney PS	Days Inn St. Joseph Frederick Ave. 4312 Frederick Ave. Saint Joseph, MO 64506	(816) 279-1671	Meeting Room accomodates 40 people
	Crowne Plaza Hotel Kansas City Downtown 1301 Wyandotte St. Kansas City, MO 64105	(888) 444-0401	Meeting Room accomodates 200-250 people
Turney PS/Tina PS	Radisson Hotel Kansas City Airport 11828 NW Plaza Cir Kansas City, MO 64153	(816) 464-2423	Meeting Rooms accomodates 200 people
	Comfort Inn 1803 Comfort Lane Cameron, MO 64429	(816) 632-5655	Meeting Room accomodates 30 people
Tina PS/Salisbury PS	Comfort Inn Marshall Station 1356 W. College Ave. Marshall, MO 65340	(660) 886-8080	Meeting Room accomodates 25 people
	Holiday Inn Express Hotel & Suites 1801 West Outer Road Moberly, MO 65270	(877) 863-4780	Meeting Room accomodates 30 people
Salisbury PS/Centralia PS	Holiday Inn Express 1801 West Outer Road Moberly, MO 65270		Meeting Room accomodates 30 people
	Country Inns & Suites 817 N Keene St Columbia, MO 65201	(573) 445-8585	Meeting Room accomodates 50 people
Centralia PS/Middletown PS	Holiday Inn Wentzville -O'Fallon 900 Corporate Parkway Wentzville, MO 63385	636 327-7001	5 Meeting Rooms Accomodates 10-250 people
	Days Inn Conference Center Columbia 1900 I-70 Drive SW I-70 & Stadium Blvd Columbia, MO, 65203 US	Phone: 573-445-8511 Fax: 573-445-7991	Accomodates 400 people
Middletown PS/Saint Paul PS	Comfort Inn 425 E. Veterans Memorial Pkw Warrenton, MO, US, 63383	(636) 456-6000 Fax: (636) 456-3603	Meeting Room accomodates 25 people
	Comfort Inn & Suites - O'Fallon/St Charles 100 Comfort Inn Court O'Fallon, MO 63366	Tel: (636) 696-8000/ Fax: (636) 696-8001	Meeting Romm acomodates 35 people

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Transcanada Command Posts			
Pump Station to Pump Station	Hotel Name	Contact Numbers	Size of Conference Room
Saint Paul PS/Hartford PS	Holiday Inn Express St. Louis Airport - Riverport 13735 Riverport Drive St. Louis, MO 63043		Meeting 120 Classroom Style
	Best Western Airport Plaza Inn & Conf. Center 4530 N. Lindbergh Blvd. Bridgeton, MO 63044	314-731-3800	Accomodates 300 people
Hartford PS/Pierron PS	Mariners Village Resort 1 Resort Dr, Carlyle, IL	618-594-7666	
	Holiday Inn Express HIGHLAND 20 CENTRAL BLVD HIGHLAND, IL 62249		
Pierron PS/Patoka Terminal	Holiday Inn Express Hotel & Suites VANDALIA 21 MATTES AVENUE VANDALIA, IL 62471	877 410 6681 618 283-0010 Phone 618-2830011 Fax	Meeting room
	Ramada Vandalia 2707 Veterans Ave. Vandalia, IL, 62471	618-283-1400 Phone 618-283-1922 Fax	Meeting room (30 people)

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3.0 RESPONSE ACTIONS

3.1 Initial Response Actions

Figure 3.1 Spill Classification

Initial Response
Line Break Or Leak
Fire
Severe Thunderstorm/Flash Flooding/Landslide
Tornadoes
Earthquake
Winter Storm
Volcanic Eruptions
Bomb Threat

3.2 Documentation of initial Response Actions

3.3 Oil Containment, Recovery and Disposal/Waste Management

Figure 3.2 Product Specific Response Considerations

3.4 Storage/Disposal

3.5 Sampling and Waste Analysis Procedures

3.6 Safety Awareness

3.7 Emergency Medical Treatment and First Aid

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3.1 INITIAL RESPONSE ACTIONS

Initial response actions are those taken by local personnel immediately upon becoming aware of a discharge or emergency incident, before the Initial Response Team (described in Section 4.0) is formed and functioning. Timely implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

The pages that follow discuss initial response actions for a variety of emergencies that have the possibility of occurring. These emergencies are discussed in the order listed below:

- Initial Response
- Line Break or Leak
- Fire
- Severe Thunderstorm/Flash Flooding/Landslide
- Tornadoes
- Earthquake
- Winter Storm
- Volcanic Eruptions
- Bomb Threat
- Release to Ground Water
- Abnormal Operations

It is important to note that **these actions are intended only as guidelines** . The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note, that **without exception, employees and public safety is first priority.**

The first Company person on scene will function as the Incident Commander (IC) until relieved by an authorized supervisor who will assume the IC position. Transfer of command will take place as more senior management respond to the incident. The role of IC will typically be assumed and retained by area management.

The person functioning as **Incident Commander** during the initial response period **has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.**

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INITIAL RESPONSE ACTIONS - SUMMARY PERSONNEL AND PUBLIC SAFETY IS FIRST PRIORITY			
RESPONSE TIMES*			
US DOT Tier	1	2	3
High Volume Area	6 HR	30 HR	54 HR
All Other Areas	12 HR	36 HR	60 HR

CONTROL

- Eliminate sources of ignition
- Isolate the source of the discharge, minimize further flow

NOTIFY

- Make internal and external notifications
- Activate local Company personnel as necessary
- Activate response contractors and other external resources as necessary

CONTAIN

- Begin spill mitigation and response activities
- Monitor and control the containment and clean-up effort
- Protect the public and environmental sensitive areas

* Response resources and personnel available to respond withing time specified after discovery of a worst case discharge per US DOT 49 CFR Part 194.115

In addition to the potential emergency events outlined in this Section, the Company has identified several "abnormal operations" that could be expected in the pipeline facilities. The Company has defined the events and established procedures to identify, eliminate or mitigate the threat of a worst case discharge due to these events. In compliance with 49 CFR 195.402(d), these procedures are defined in the Company's Operations Manual.

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FIRST COMPANY PERSON NOTIFIED / ON SCENE

- Verify emergency exists.
- Follow the appropriate "***Specific Incident Response Checklist***" in Figure 3.1 and "***Product Specific Response Considerations***" in Figure 3.2.
- Notify the Keystone Console of the incident.
- Contact / Utilize local emergency services as necessary (police, fire, medical).

REGIONAL EMERGENCY OPERATION CENTER

- Ensure local emergency agencies have been contacted (police, fire, medical).
- Assign personnel immediately to the discharge site to assist with emergency response (QI) and spill containment.
- Activate additional company and response contractors to site as situation demands.
- Confirm safety aspects at site, including need for personal protective equipment, sources of ignition, and potential need for evacuation.
- Evaluate the severity, potential impact, safety concerns and response requirements based on the initial data provided by the first person on scene. Refer to the spill response evaluation Flowchart in this section.
- Perform notifications using Figure 2.1 as appropriate.

AREA MANAGEMENT - EMERGENCY SITE MANAGEMENT

- Proceed to spill site and coordinate response and clean-up operations.
- Assume the role of Incident Commander.
- Coordinate/perform activation of additional spill response contractors, as the situation demands (telephone reference is provided in Figure 2.5).
- Direct containment, dispersion, and/or clean-up operations in accordance with the ***"Product Specific Response Considerations"*** provided in Figure 3.2.
- Complete the ***"Product Release Report"*** provided in Appendix F.

LOCAL COMPANY PERSONNEL

- Assigned personnel will immediately respond to a discharge from the Pipeline or Facility, as the situation demands.
- Assist as directed at the spill site.

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FIGURE 3.1

SPILL CLASSIFICATION

Spills/Releases to Environment:

Minor

- A spill/release, onsite, that poses no adverse affect to the environment nor impact neither to a water body nor to groundwater. The spill may or may not be reportable to a regulatory agency.

Serious

- A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment but no impact to a water body nor to groundwater.

Major

- A spill/release, onsite or off-site/off ROW, that poses an adverse affec to the environment including an impact to a water body or to groundwater.

Critical

- Emergency response for containment or clean up is required. A spill/release, onsite or off-site/off ROW, that poses an adverse affect to teh environment including an impact to a water body or to groundwater.

Complaints - Health & Safety:

Minor

- Unverified community complaint from a Landowner, Police, Fire, Municipality, or a Ministry.
- Verified employee complaint where an investigation is required to obtain resolution.

Serious

- Verified community complaint likely to cause danger/risk to the public, employees or TransCanada facilities.

Major

- Employee work refusal based on belief of unhealthy or unsafe work conditions.

Critical

- Regulatory body notified of employee complaint (by employee) and investigates employee work refusal.

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SPECIFIC INCIDENT RESPONSE CHECKLIST

INITIAL RESPONSE

- Take appropriate personal protective measures.
- Secure site.
- Call for medical assistance if an injury has occurred.
- Notify Keystone Console and area management of the incident.
- Eliminate possible sources of ignition in the near vicinity of the spill.
- Take necessary fire response actions.
- Advise personnel or public in the area of any potential threat and/or initiate evacuation procedures.
- Identify/isolate the source and minimize the loss of product.
- Restrict access to the spill site and adjacent area as the situation demands. Take additional steps necessary to minimize any threat to health and safety.
- Verify the type of product and quantity released. (Material Safety Data Sheet(s) are provided in Appendix G).

All personnel are reminded that outsiders other than emergency services will not be allowed in the area during the time of an emergency and that statements issued to the media or other interested parties should be given by designated Company Management. Be courteous with media representatives and direct them to the designated spokesperson.

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LINE BREAK OR LEAK, SPECIFIC RESPONSE (Including Piping Rupture/ Leak Valve Rupture/Leak and Manifold Failure)

- Shut down Pipeline.
- Close upstream and downstream block valves.
- Mitigate spreading of the product, as the situation demands. See Release to Groundwater, Specific Response for more detailed information. Potential containment land-based strategies include:
  - Earthen dike/berm
  - Ditching
  - Spreading sorbent material over the spill
- Prevent the spill from entering the waterways, sewer, etc. to the greatest extent possible.
- Determine the direction and expected duration of spill movement. Refer to the maps in Section 6.0.
- Review the location of socio-economic and environmentally sensitive areas identified in Section 6.0 and the Area Contingency Plan (ACP). Determine which of these may be threatened by the spill and direct the response operation to these locations. Initiate protection and recovery actions.
- Response contractor under TransCanada direction utilizes Combustible Gas Indicator, Oxygen meter, proper colormetric indicator tubes and/or other air sampling measurements to assure that areas are safe to enter for continued response operations. Refer to Vapor Cloud Specific Response, later in this Figure, if flammable vapors are detected.
- Drain the line section, as the situation demands.
- Inform local operators of utilities such as the power company, telephone company, railway.
- Clean up spilled product to eliminate any possible environmental problems. Be alert for underground cables.
- Make all necessary repairs.
- Return the line to service when repairs are complete, if or when approved.
- Complete follow-up and written reporting, as the situation demands.

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FIRES (MINOR, MAJOR, EXPLOSION) SPECIFIC RESPONSE

Be aware of Fire Weather conditions.

- Watch - Critical fire weather conditions are forecast to occur.
- Red Flag Warning - Critical Fire weather conditions are either occurring or will shortly.

INDIVIDUAL DISCOVERING THE FIRE - (All Employees)

Call the Local Emergency Response Agency (911).

Note: Pipeline right-of-ways are used by Firefighters as a fire break (barrier) to isolate fires and prevent them from growing in size. Right-of-ways are commonly used to access to fire areas. Many times Firefighters will need to increase the size of the cleared space over the Pipeline right-of-way to prevent the fire from leaping from tree top to tree top. To do this, heavy equipment may be used to quickly increase the amount of cleared space between the fire area and unignited forest. The following are steps to consider when working with the local authority on creating these fire breaks.

- Use your best judgment to ensure the safety of staff, fire ground workers and the public when determining if this activity is safe to perform;
- Call and confirm with Asset Reliability if this activity is safe and implement any instructions provided by Asset Reliability. Asset Reliability's role is to provide directions to protect the health and safety of those involved as well as pipeline integrity;
- Be physically on site to coordinate the activities related to any pipeline crossings;
- Stake the pipeline to identify the location of the pipe(s) in the right-of-way.
- First preference is to use already existing pipeline crossing areas;
- Gather the appropriate information to complete a formal pipeline crossing agreement. In Canada, send required information to the Land Department in Calgary.
- Notify Keystone Console and area management.
- Shut off pumps.
- Coordinate with the Keystone Console to close appropriate valves to isolate fire, if necessary.
- Isolate Pump Station from Mainline.
- Evacuate site as safety considerations dictates.
- Notify Keystone Console of evacuation route and final destination.
- Notify Keystone Console of safe arrival.
- Inspect pump station, equipment and controls after the fire is extinguished and safe to return.
- Evaluate pipeline, monitoring or control systems for evidence of heat damage.
- Notify engineering to conduct further investigation if damage is found.
- Make appropriate repairs and return Pipeline to service.

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SEVERE THUNDERSTORM (Flash Flooding/Landslide) SPECIFIC RESPONSE

Thunderstorms are a year round occurrence with lightning a major threat. The potential of flash flooding is also possible when one area is affected for an extended period.

- Be aware of changing weather conditions.
  - Severe Thunderstorm Watch - Conditions are favorable to the development of thunderstorms.
  - Severe Thunderstorm Warning - A severe thunderstorm has been observed or is imminent.
  - Flash Flood Watch- Flash flooding is possible within 6 hours after heavy rains have ended.
  - Flash Flood Warning - Flash flooding is occurring or imminent.
- Terminate outdoor work when lightning is occurring and move to shelter.
- Avoid areas subject to sudden flooding until the thunderstorm passes.
- Evaluate the situation after weather event.
  - Does standing water prevent visual inspection?
  - Have flood waters damaged the Pipeline?
  - Have flood waters exposed buried piping?
  - Has soil shifted that could lead to a landslide?
- Initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs.

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TORNADO/STRAIGHT LINE WINDS SPECIFIC RESPONSE

Although many disasters cannot be prevented or predicted, preparation can significantly reduce losses. In the event of a severe weather condition or a natural disaster, the Area Manager or assigned designee will be the Emergency Coordinator.

- **Be Aware of Changing Weather Conditions**
  - Tornado watch - Conditions are right for the formation of a tornado.
  - Tornado warning - A tornado has been sighted but is not in the area at this time.
  - Tornado alert - A tornado has been sighted in the immediate area, take cover immediately.

- **If Severe Weather Conditions Threaten**
  - Carry a battery operated portable radio and monitor conditions.
  - If a tornado is observed and time permits, evacuate the area.
  - If the tornado is approaching a pump station, notify the Keystone Console to remotely isolate the station.
  - In vehicle, drive away from tornado at right angle. Get out of car and seek shelter if tornado cannot be avoided.
  - If outdoors, shelter in ditch, excavation or other low spot and lie flat, face down.
  - Make certain that all personnel are aware of the condition.
  - Stay in shelter until conditions are safe.

- **Immediately After the Storm**
  - Account for all personnel.
  - Survey for damages.
  - Initiate team for any repairs.
  - Refer to this Plan for additional response guidance regarding fires, spills, etc., as needed.

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EARTHQUAKE SPECIFIC RESPONSE

The actual movement of the ground in an earthquake is rarely the direct cause of death or injury. Most casualties result from falling objects and debris because the shocks can shake, damage or demolish buildings and other structures.

- **Stay calm. Don't panic.**
- If you are indoors, stay there. Do not run outside.
- If you are in a building, take cover under a heavy furniture or stand in an inside doorway away from windows. (A door frame or the inner core of a building is its strongest point and least likely to collapse.)
- Exit building as situation determines.
- If you are outside, stay there. Move away from buildings to avoid falling debris. Avoid damaged utility lines.
- If you are driving, stop quickly and stay in your car. If possible, do not stop on a bridge, overpass or where buildings can fall on you. Your car can provide protection from falling debris.
- Do not reenter damaged buildings. Walls may collapse after the original shaking has ceased.
- Evaluate the situation and initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs as resources and conditions allow.

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SEVERE WINTER STORM SPECIFIC RESPONSE

- Be aware of Changing Weather Conditions
  - Winter Storm Watch - Conditions are expected but not imminent.
  - Winter Storm Warning - A significant winter storm is occurring, imminent, or likely.
  - Blizzard Warning - Winds at least 35 mph, blowing snow frequently reducing visibility to 0.25 miles or less, and dangerous wind chills are expected.
- Listen to local radio stations for weather advisory and road condition reports, carry a survival kit, and start the trip with a full tank of gasoline.
- Inspect pump station, equipment, and controls after storm for damage.
- Make any repairs as necessary.

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VOLCANIC ERUPTIONS SPECIFIC RESPONSE

If a volcanic eruption ejects a large ash plume and the wind carries the ash to the pipeline facilities, this may cause a disruption of operations by making travel difficult or impossible due to reduced visibility.

- Begin gathering information from news media, field personnel, etc. to assess any ash cloud size, location, heading and speed as soon as news of an eruption breaks.
- Consider recalling crews prior to the expected arrival of the ash cloud while it is still clear to travel. If a crew is at a station when an ash fall begins, they should probably stay there for the duration and not travel until it is determined to be safe after the event.
- Advise contract aerial patrol service of the situation if contacted for the beginning of a pipeline patrol or if an aerial patrol is in progress.
- Inspect pump station, equipment and controls after eruption for damage.
- Make any repairs as necessary.

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BOMB THREATS SPECIFIC RESPONSE

The following pages provide guidelines for actions to be taken in the event a bomb threat is received. A bomb threat to the pipeline system or personnel may present itself in any of several ways:

- Phone
- E-mail
- Fax
- Radio
- Mail
- Word-of-mouth
- Increase in the Homeland Defense Status

Other threats to pipeline system or personnel are often treated in the same manner as bomb threats. These may include:

- Terrorist threats
- Workplace violence threats
- General threat to an industry
- Civil disturbances

The following steps should be used as guidance when responding to the above situations. Actions during a real event will vary based on differences in circumstances, response activities, good judgment, etc.

PHONE / WRITTEN (Fax, Letter, Telegram) THREATS

Person Receiving the Call

- Immediately open the Bomb Threat form, (this should be kept next to the phone), so you can use it during the conversation with the individual making the bomb threat call. If possible, complete the form during the call.
- Remain calm and be engaging when talking to the caller.
- Keep the caller on the line as long as possible in order to obtain as much information as possible. Ask him/her to repeat the message. Try to write down every word spoken by the person. If you have a small hand-held tape recorder available, try to tape the conversation.
- If the caller does not indicate the location of the bomb or the time of detonation/attack, ask for this information.
- Inform the caller that the incident could result in death or serious injury to innocent people.
- Pay particular attention to background noises, such as motors, music, and any other noise that may give a clue as to the location of the caller.
- Listen closely to the voice (male, female), voice quality (calm, excited), accents, and speech impediments.

AFTER THE CALLER HANGS UP AND WRITTEN THREATS

- Immediately report the threat call to the Keystone Console or the Company person designated by

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management to receive such information.

Pipelines and Pump Stations - Additional Guidance

- If the caller does not indicate the location of the bomb / substance or the time of possible detonation/attack, ask him / her for this information. Try to determine the Provice / State, pipeline system, and specific location involved if possible.
- For offices and control center, inform the caller that the building/facility is occupied and the incident could result in death or serious injury to innocent people.
- For pipeline and pump stations, inform the caller that an incident could result in death of the innocent general public or significant environmental impact.

Area Manager/Designee

- Based upon discussion with Corporate Security, determine if the threat is credible. Then decide what actions to take, which can include:
  - Do Nothing
  - Attempt to determine which facility(s) are at risk
  - Stay and Search
  - Partial Evacuation or Internal Evacuation (offices or control center)
  - External Evacuation to an offsite Command Post (offices or control center)
- If a full or partial facility evacuation is necessary, activate Building Evacuation Plan immediately. When in doubt, evacuate. Encourage personnel to be vigilant for suspicious or out-of-place objects as they evacuate and leave their workstations.
- Initiate operations "shut down" procedures, as necessary.
- Secure the location and limit access to essential personnel only.
- Call the appropriate local and/or government agencies (fire, police, etc.) listed in Figure 2.5 and inform them of the threat and your Command Post location.
- Set up a Command Post at a pre-determined offsite location. Ensure you have:
  - Emergency Response Plan
  - Facility maps
  - Access keys
  - Cell Phones, Pagers & Radios
- Direct all members of the press to the designated spokesperson.

PIPELINES AND PUMP STATIONS SEARCH GUIDELINES

- Additional actions to consider taking upon credible threats against pipelines and pump stations:
  - Which if any system(s) should be shutdown
  - When any system(s) should be shutdown
- Survey from a distance with the aid of binoculars:
  - valves

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- station piping

- Due to the expanse of Pipeline facilities, aircraft should be considered to aid in the surveying pipeline ROW.

- Notify the appropriate local and/or government agencies listed in Figure 2.5 upon discovery of suspicious or out-of-place object(s).

SUSPICIOUS MAIL / DELIVERED PACKAGES

- Frequently seen explosive devices have been incorporated, hidden, or camouflaged in letters, soft cover pocketbooks, hard cover books, manila envelopes, and cardboard boxes. While many are delivered by Canadian or U.S. mail, they may arrive by private courier or express service. Be alert to recognize suspicious-looking or unexpected items especially those that have:

  - Special handling marks (special delivery, air mail, registered, certified)
  - Restrictive markings (personal, confidential, addressee only)
  - Excessive postage
  - Handwritten or poorly typed address
  - Incorrect title, or title but no names
  - Misspelling of common words
  - Oily stains, discolorations, or odor
  - No return address
  - Excessive weight
  - Lopsided, uneven, or ridged envelope
  - Protruding wires or tin foil
  - Excessive securing material (tape, string, etc.)
  - Any evidence that the envelope has been opened and re-glued
  - Mail item from a new or strange source

- If you receive or find a suspicious-looking letter or package:

  - **DO NOT TRY TO OPEN IT.**
  - Isolate the area around the letter or package to the degree possible, and make emergency notifications as previously outlined, and evacuate personnel to a safe distance, as directed.
  - DO NOT MOVE NOR HANDLE unless absolutely necessary.
  - If opened, preserve, BUT DO NOT TOUCH FURTHER all original envelopes, twine, shipping documents, or packaging materials for evidence and release to the police as requested.
  - Report the call to the Regional Manager or their designee.

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RELEASE TO GROUNDWATER SPECIFIED RESPONSE

- Evaluate the topography and evidence of surface contamination.
- Notify local public that may be impacted by potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.
- Procure appropriate equipment based on local geology and resources available.
- Dig intercept trench down gradient to release point.
- Line trench and stage vacuum truck to remove contaminated oil/water mixture.
- Excavate surface catchment up gradient to the intercept trench and near leading edge of visible contamination.
- Excavate until contaminated soil is completely removed and clean soil is encountered or conditions prohibit continued digging.
- Line the catchment to limit or prohibit further groundwater contamination.
- Move vacuum truck from intercept trench to catchment to recover oil and/or oily water.
- Line drop down area to stage contaminated soil as excavated.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.
- Begin in-situ treatment of subsoil.

Options for Long term Remediation

- Air sparging - inject air into contaminated soil/groundwater and use extraction pumps to remove contamination.
- Vacuum extraction - using suction pumps extract oil and contaminated groundwater for further treatment.
- Conventional pump and treat
- Bioslurping
- Excavation
- Enhanced biodegradation/bioremediation
- Chemical addition/oxidation

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- Enlist additional experts, as appropriate, for continuing remediation.

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ABNORMAL OPERATIONS SPECIFIC RESPONSE

- If operating design limits have been exceeded (increase or decrease pressure or flow) and no emergency condition exists, stop operations and immediately investigate the pipeline.
- Verify whether a true safety problem, equipment malfunction, or operator error is present. **Note: In all cases, safety to operations, the general public, and property will govern actions taken.**
- Make appropriate repairs before continuing operations. **Note: Corrective action will only be done by qualified personnel to perform the type of work involved.**
- Monitor affected systems until normal operations are resumed.
- Complete follow-up and written reporting, as the situation demands.

Note: It is the responsibility of the pipeline operator to carry out the response procedures abnormal pipeline operations as outlined in their respective Operations and Maintenance Manual.

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3.2 DOCUMENTATION OF INITIAL RESPONSE ACTIONS

It is difficult, particularly during the first few minutes of an initial response operation, to think about the importance of documentation. A log should be maintained which documents the history of the events and communications that occur during the response. When recording this information, it is important to remember that the log may become instrumental in legal proceedings, therefore:

- Record only facts, do not speculate.
- Do not criticize the efforts and/or methods of other people/operations.
- Do not speculate on the cause of the spill.
- Do not skip lines between entries or make erasures. If an error is made, draw a line through it, add the correct entry above or below it, and initial the change.
- Record the recommendations, instructions, and actions taken by government/regulatory officials.
- Document conversations (telephone or in person) with government/regulatory officials.
- **Request that government/regulatory officials document and sign their recommendations or orders (especially if company personnel do not agree with the suggestions, instructions, or actions).**

3.3 OIL CONTAINMENT, RECOVERY AND DISPOSAL/WASTE MANAGEMENT

After initial response has been taken to stop further spillage and notifications made to the required agencies, the Company will begin spill containment, recovery, and disposal operations.

The Incident Commander will assess the size and hazards of the spill(see Figure 3.2). The type of product, the location of the spill, and the predicted movement of the spill will be considered.

Based on this assessment, additional clean-up personnel and equipment will be dispatched to the site and deployed to control and contain the spill. Boom may be deployed in waterways to contain the spill and to protect socio-economic and environmentally sensitive areas. Booms may also be used in waterways to deflect or guide the spill to locations where it can more effectively be cleaned up using skimmers, vacuum trucks, or sorbent material. Clean-up equipment and material will be used in the manner most effective for rapid and complete clean-up of all spilled product.

Response and clean-up will continue until all recoverable product is removed, the environment is returned to its pre-spill state, and the Unified Command of the Company Incident Commander and the Federal and/or State On-Scene Coordinators determine that further response and cleanup is no longer necessary.

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FIGURE 3.2

FLAMMABLE LIQUIDS
(Non-Polar/Water-Immiscible)

The following information is intended to provide the initial responder(s) with data that may be useful in making quick decisions and executing prompt response actions. The information is intended for guideline purposes only.

PRODUCTS: **Crude Oil**

HAZARD IDENTIFICATION / RECOGNITION

GUIDE NO. 128

DANGERS

1. HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
2. Vapors may form explosive mixtures with air.
3. Vapors may travel to source of ignition and flash back.
4. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
5. Vapor explosion hazard indoors, outdoors or in sewers.
6. Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.
7. Runoff to sewer may create fire or explosion hazard.
8. Containers may explode when heated.
9. Many liquids are lighter than water.
10. Substance may be transported hot.
11. If molten aluminum is involved, refer to Emergency Response Guide No. 169.

HEALTH

1. Move victim to fresh air. Call 911 or emergency medical service.
2. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult.
3. Remove and isolate contaminated clothing and shoes.
4. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
5. Wash skin with soap and water.
6. Keep victim warm and quiet.
7. Ensure that medical personnel are aware of the material(s) involved, and take precautions.

PUBLIC SAFETY

1. Isolate spill or leak area immediately for at least 50 meters (150 feet) in all directions.
2. Keep unauthorized personnel away.
3. Stay upwind.
4. Keep out of low areas.
5. Ventilate closed spaces before entering.

EVACUATION	**Large Spill 1. Consider initial downwind evacuation for at least 300 meters (1,000 feet). Fire 1.** If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Information provided by the Emergency Response Guidebook 2008.

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3.4 STORAGE/DISPOSAL

Strict rules designed to ensure safe and secure handling of waste materials govern the Company waste disposal activities. To ensure proper disposal of recovered oil and associated debris, the following guidelines should be considered:

- In the event of a product spill, Facilities have limited capacity to store recovered product and water. Separated product is pumped to frac tanks or to trucks to be carried to the Facility for processing.
- Oily debris will be segregated on site and containerized for temporary storage prior to disposal in accordance with hazardous waste regulations.
- Transportation of waste material will be performed in accordance with all applicable Federal and State Regulations.
- Waste associated with the spill will be disposed at sites that have the necessary permits to accept the type of waste to be discharged.

The Company's Community, Safety and Health Administration Department will coordinate activities and secure the necessary permits to ensure proper disposal or recycling of recovered product and debris.

3.5 SAMPLING AND WASTE ANALYSIS PROCEDURE

The Company's sampling and waste analysis practices are governed by the regulations for the applicable Province/State and Federal agency. These regulations outline methods and procedures for determining the chemical and physical characteristics of wastes generated by the Facility, including waste associated with spills, so that they may be properly stored, treated, or disposed.

3.6 SAFETY AWARENESS

It is the corporate policy of the Company to provide a safe workplace for all workers. All employees and contractors are responsible for maintaining the safety and health of all workers on the pipeline and the response operations.

Prior to engaging in any spill response activity:

- All employees/contractors must have received orientation from the Company Safety Plan.
- All U.S. contractor response personnel must be in compliance with Occupational Safety and Health Administration training requirements.
- All other personnel will have completed appropriate training for their position as outlined in Section 4.0.
- No employee/contractor shall engage in activities which place them at risk without the appropriate protective equipment and training.

Response Safety

All Company and contractor personnel are expected to comply with the Site Safety Plan for each spill incident.

- Any concern regarding health or safety issues should be immediately addressed.
- The First Responder must consider the spill site as dangerous and the local atmosphere

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explosive until air monitoring procedures prove that the area is safe.

- The First Responder must exit the area against or across the wind, if possible, and must also evacuate others who are working in the area.
- All injuries, no matter how minor, must be reported to the Incident Commander in a timely manner.
- Prior to entering a spill area, a qualified person must perform an initial safety and health evaluation of the site.

Air Monitoring

A Safety Monitor shall be designated who is trained in the operation of air monitoring equipment. The Incident Commander must ensure that Safety Monitors are trained and that their equipment is maintained and ready for use.

- The air monitoring equipment shall be activated and checked at the location in which it is stored.
- Calibration of instruments should be performed before use.
- Air monitoring measurements which are to be made prior to entry into the spill area include:
  - Oxygen content
  - Lower Explosive Limit (LEL)
  - Benzene level
- Lower Explosive Limit readings above 10% require immediate evacuation of the area and elimination of ignition sources.
- Oxygen readings below 19.5% require the use of air supplied respiratory protection.
- After assuring that there are no hazards relating to explosion or oxygen depletion, sampling for benzene or total petroleum hydrocarbons shall dictate the appropriate respiratory devices to be used by persons entering the area.
- Hydrogen Sulfide is an extremely hazardous toxic compound that is present in most crude oils that are transported through the pipeline.

  Passive air monitoring for Hydrogen Sulfide will be done by all personnel working on or near the pipeline and during any cleanup operation.

  - Hydrogen Sulfide is characterized by a rotten egg smell.
  - The gas causes rapid temporary paralysis of the olfactory system leading to the loss of the sense of smell.
  - Permissible exposure limits in many countries is 10 ppm.
  - Symptoms of exposure to Hydrogen Sulfide are:
    - 0-10 ppm causes Irritation of the eyes, nose and throat
    - 10-50 ppm can cause headache, dizziness, nausea, vomiting and breathing difficulty
    - 50-100 ppm can cause severe respiratory irritation, shock, convulsions, coma and

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even death.

- The Incident Commander is responsible for industrial hygiene monitoring in the post discovery period.

Decontamination

Through training programs, Facility personnel know and understand the importance of the removal of hazardous substances from their person if they are contaminated. Eyewash stations and safety showers provide a means to quickly remove gross contamination of harmful agents, including gasoline. Personnel must immediately shower and remove any clothing which is wet or otherwise contaminated. Showers in the change room are to be used for thorough cleansing. Persons should inspect themselves thoroughly before donning a fresh change of clothing.

Contaminated clothing should be properly disposed. Contaminated personal protective equipment must be washed and sanitized before re-using. The washing of contaminated equipment is performed in a "contained area" to assure that the disposal of the wash water can be handled properly.

Establishing "Exclusion - Hot", "Decontamination - Decon", and "Support - Safe" Zones are required to prevent the removal of contaminants from the contaminated area as well as unauthorized entry into contaminated areas.

- Regardless of the decontamination facilities available, all efforts to minimize personnel exposure should be taken.

- Decontamination facilities should be positioned prior to employee/ contractor entrance to areas where the potential for exposure to contamination exists. The appropriate Material Safety Data Sheets (MSDS) are available to aid health professionals treating the injured parties. Material Safety Data Sheets are located in Appendix G.

- Decontamination facilities should be designed to prevent further contamination of the environment and should have a temporary storage area for items that will be reused in the contaminated area.

- Particular attention should be paid to personal hygiene prior to eating, drinking, or smoking.

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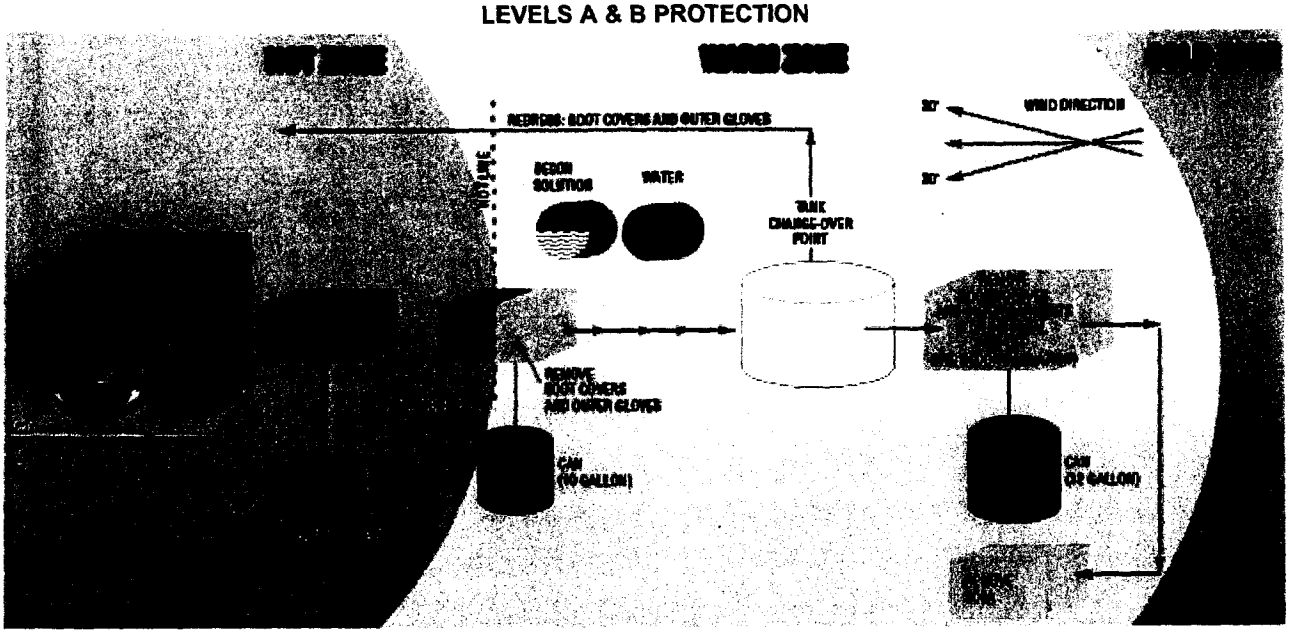
MINIMUM DECONTAMINATION LAYOUT
LEVELS A & B PROTECTION



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Personal Protective Equipment (PPE)

The following represents OSHA/USEPA designated PPE levels for responding to emergencies, post emergency cleanup sites, and/or Temporary Storage and Disposal (TSD) sites. The responder's PPE should be chosen based on his/her level of training and assigned job duties.

Personal Protective Equipment (PPE)	
LEVEL A • Self Contained Breathing Apparatus (SCBA) (worn inside suit) • Encapsulated Chemical Protective Suit • Chemical Protective Gloves • Chemical Protective Boots • Hard Hat • Safety Toe Footwear • Safety Glasses	To be selected when the greatest level ok skin, respiratory, and eye protection is required.
LEVEL B • SCBA (worn outside suit) • Chemical Protective Suit w/Hood • Chemical Protective Boots • Chemical Protective Gloves • Hard Hat • Safety Toe Footwear • Safety Glasses	To be selected when the highest level of respiratory protection is necessary but a lesser level ok skin is needed.
LEVEL C • Air Purifying Respirator (APR) • APR a½ Face / Full Face • Hard Hat • Glasses (worn with a½ face APR) • Chemical Protective Boots • Chemical Protective Gloves • Chemical Protective Suit/Tyvek • Safety Toe Footwear • Safety Glasses	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
MODIFIED LEVEL C Same as level C except no APR requirements.	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
LEVEL D • Hard Hat • Safety Glasses • Work Uniform / Clothes • Leather Gloves • Safety Boots • Nomex (if required by the Company)	The atmosphere contains no known hazard and work functions preculde the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

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3.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Call 911 immediately. On-site emergency medical response requires the same rapid assessment of the patient as any other situation, but requires the responders to be aware of other considerations that may affect the way they handle the patient. These considerations include the following:

- The potential for contamination of the patient, responders, and equipment should be addressed. Responders should arrange to treat all patients **AFTER** the injured party has been decontaminated according to the Site Safety Plan.
- Site personnel should make the initial assessment of the patient and determine the severity of the injury/illness.
- If the treatment needed is critical care or "life saving" treatment, rapid decontamination of the injured/ill party should be started. Refer to the Site Safety Plan for steps to be taken in an "abbreviated" decontamination for medical treatment.
- **The need for full decontamination should be carefully weighed against the need for prompt medical treatment.**
- The ambulance responding to medical emergencies shall be contacted as soon as possible and instructed exactly where to respond when needed and the nature of the contaminant. Telephone reference is provided in Annexes.
- Material Safety Data Sheet information will be available from the Incident Commander and should be provided to medical personnel to alert them of decontamination requirements.
- Report all injuries, incidents or close calls.
- If emergency medical treatment is needed, the Incident Commander, or his designated representatives, will request assistance from trained medical personnel.

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4.0 RESPONSE TEAMS

4.1 Introduction

4.2 Qualified Individual

4.3 Initial Response Team (IRT)

4.4 Regional Emergency Preparedness Team (REPT)

4.5 Incident Command System (ICS)

4.6 Unified Command

Figure 4.1 Incident Command System

4.7 ICS Roles and Responsibilities

Figure 4.2 Operational Period Planning Cycle

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4.1 INTRODUCTION

This Section describes organizational features and duties of the local responders, the Regional Emergency Preparedness Team (EPT), and the broader Emergency Management Team (EMT) as defined in TransCanada's Incident Management System (IMS). The Incident Management System integrates Incident Management, Emergency Management and Crisis Management and is maintained separately.

The key to an effective emergency response is a rapid, coordinated, tiered response by the affected Facility, the Regional Emergency Operations Center, and the Corporate Emergency Operations Center, consistent with the magnitude of an incident.

First response to an incident at the Facility will be provided by the local responders. The Regional EOC will respond, to the degree necessary, to incidents exceeding local capability.

Our response teams will use the National Incident Management System (NIMS) Incident Command System (ICS) to manage the emergency response activities. Because Incident Commander System is a management tool that is readily adaptable to incidents of varying magnitude, it will typically be used for all emergency incidents. Staffing levels will be adjusted to meet specific response team needs based on incident size, severity, and type of emergency.

An explanation of Incident Commander System and the roles and responsibilities for primary members of the response teams are provided in Section 4.7 per CAN/CSA-2731-03. The USCG Incident Management Handbook (IMH) contains an in-depth description of all Incident Commander System positions, Incident Commander System development, response objectives and strategies, command responsibilities, Incident Commander System specific glossary/acronyms, resource typing, the Incident Action Plan process, and meetings. The IMH can be located on the USCG's Homeport Website.

4.2 QUALIFIED INDIVIDUAL

It is the responsibility of the Qualified Individual (QI) or his/her designee to coordinate with the Federal On-Scene Coordinator (FOSC) and State On-Scene Coordinator (SOSC) throughout the response, if applicable.

Vital duties of the Qualified Individual (QI) include:

- Notify all response personnel, as needed.
- Identify the character, exact source, amount, and extent of the release, as well as the other items needed for notification.
- Assess the interaction of the spilled substance with water and/or other substances stored at the Facility and notify response personnel at the scene of that assessment.
- Assess the possible hazards to human health and the environment due to the release. This assessment must consider both the direct and indirect effects of the release (i.e., the effects of any toxic, irritating, or asphyxiating gases that may be generated, or the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosion).
- Assess and implement prompt removal actions to contain and remove the substance released.
- Coordinate rescue and response actions as previously arranged with all response personnel.

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- Activate and engage in contracting with oil spill removal organizations.
- Use authority to immediately access Company funding to initiate cleanup activities.
- Direct cleanup activities until properly relieved of this responsibility.
- Arrangements will be made to ensure that the Qualified Individual (QI) or the Alternate Qualified Individual (AQI) is available on a 24-hour basis and is able to arrive at the Facility in a reasonable time.
- The AQI shall replace the QI in the event of his/her absence and have the same responsibilities and authority.

4.3 INITIAL RESPONSE TEAM (IRT)

The first Company person on scene will function as the Incident Commander and person-in-charge until relieved by an authorized supervisor who will then assume the position of Incident Commander (IC). Transfer of command will take place as more senior management contract support respond to the incident. For response operations within the control of the Initial Response Team, the role of IC will typically be assumed and retained by the Qualified Individual.

The number of positions/personnel required to staff the Initial Response Team will depend on the size and complexity of the incident. The duties of each position may be performed by the IC directly or delegated as the situation demands. The IC is always responsible for directing the response activities and will assume the duties of all the primary positions until the duties can be delegated to other qualified personnel.

A complete functional ICS organization is shown in Figure 4.1. The Initial Response Team should try to fill the necessary positions and request additional support from the Crisis Response Team to fill/back up all the positions as the incident may dictate. Detailed job descriptions of the primary response team positions are provided in Section 4.7.

4.4 REGIONAL EMERGENCY PREPAREDNESS TEAM (EPT)

The Emergency Preparedness Team (EPT) supports the Initial Response Team. The number of positions/personnel required to staff the EPT will depend on the size and complexity of the incident.

The Regional Emergency Preparedness Team is staffed by personnel from various Regional locations. The EPT provides necessary information to the appropriate Federal, State/Province, and Local authorities with designated response roles, including the National Response Center (NRC), the Canadian National Energy Board (NEB), if necessary, State Emergency Response Commission (SERC) Provincial Ministry, and local response agencies.

4.5 INCIDENT COMMAND SYSTEM (ICS)

The Incident Command System is intended to be used as an emergency management tool to aid in mitigating all types of emergency incidents. This system is readily adaptable to very small emergency incidents as well as more significant or complex emergencies. The Incident Command System utilizes the following criteria as key operational factors:

- Assigns overall authority to one individual
- Provides structured authority, roles and responsibilities during emergencies

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- The system is simple and familiar, and is used routinely at a variety of incidents
- Communications are structured
- There is a structured system for response and assignment of resources
- The system provides for expansion, escalation, and transfer/transition of roles and responsibilities
- The system allows for "Unified Command" where agency involvement at the command level is required

Effective establishment and utilization of the Incident Command System during response to all types of emergencies can:

- Provide for increased safety
- Shorten emergency mitigation time by providing more effective and organized mitigation
- Cause increased confidence and support from local, State, Federal, and public sector emergency response personnel
- Provide a solid cornerstone for emergency planning efforts

Section 4.7 provides a comprehensive list of every response team member's duty assignment.

4.6 UNIFIED COMMAND

As a component of an Incident Commander System, the Unified Command (UC) is a structure that brings together the Incident Commanders of all major organizations involved in the incident to coordinate an effective response while still meeting their own responsibilities. The Unified Command links the organizations responding to the incident and provides a forum for the Responsible Party and responding agencies to make consensus decisions. Under the Unified Command, the various jurisdictions and/or agencies and responders may blend together throughout the organization to create an integrated response team. The Incident Commander System process requires the Unified Command to set clear objectives to guide the on-scene response resources.

Multiple jurisdictions may be involved in a response effort utilizing Unified Command. These jurisdictions could be represented by any combination of:

- Geographic boundaries
- Government levels
- Functional responsibilities
- Statutory responsibilities

The participants of Unified Command for a specific incident will be determined taking into account the specifics of the incident and existing response plans and/or decisions reached during the initial meeting of the Unified Command. The Unified Command may change as an incident progresses, in order to account for changes in the situation.

The Unified Command is responsible for overall management of an incident. The Unified Command directs incident activities and approves and releases resources. The Unified Command structure is a vehicle for coordination, cooperation and communication which is essential to an effective response.

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Unified Command representatives must be able to:

- Agree on common incident objectives and priorities
- Have the capability to sustain a 24-hour-7-day-per-week commitment to the incident
- Have the authority to commit agency or Company resources to the incident
- Have the authority to spend agency or Company funds
- Agree on an incident response organization
- Agree on the appropriate Command and General Staff assignments
- Commit to speak with "one voice" through the Public Information Officer or Joint Information Center
- Agree on logistical support procedures
- Agree on cost-sharing procedures

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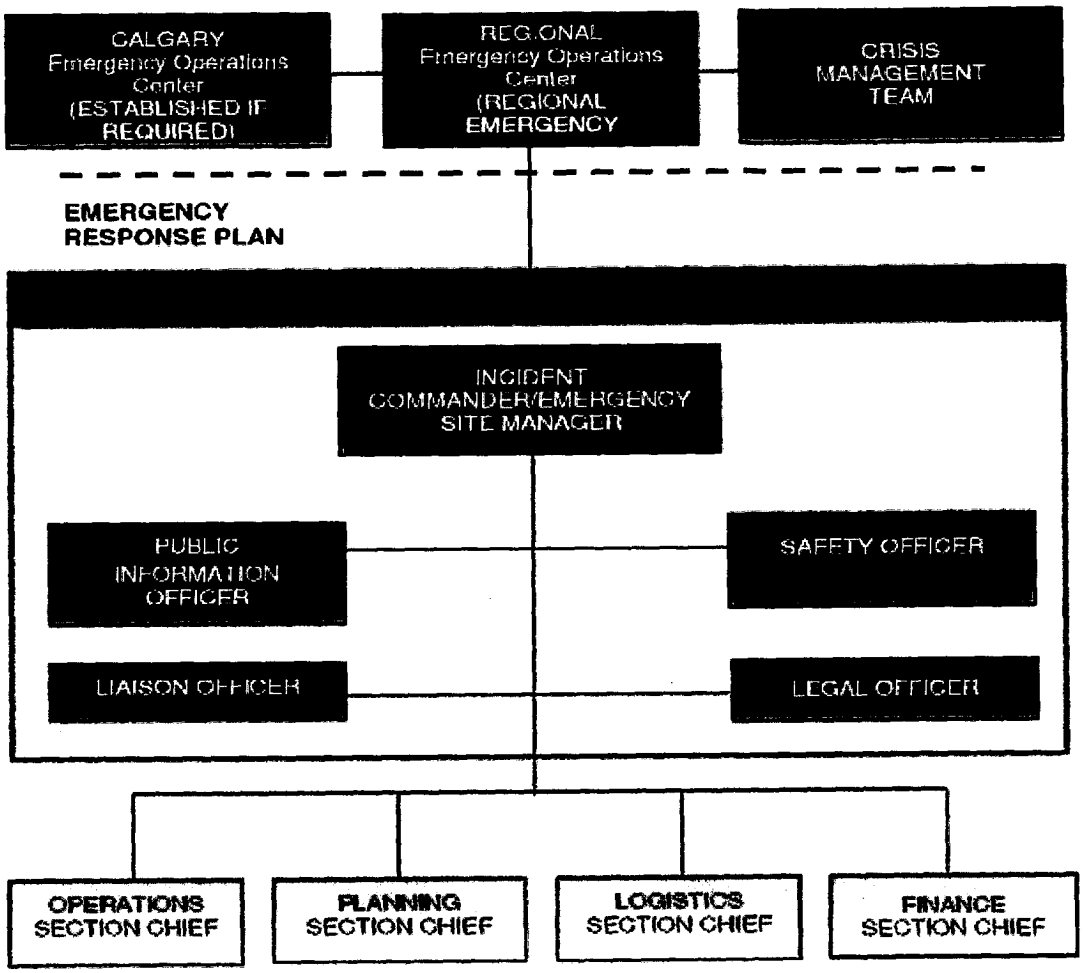
FIGURE 4.1

INCIDENT COMMAND SYSTEM

INCIDENT MANAGEMENT SYSTEM



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4.7 ICS ROLES AND RESPONSIBILITIES

COMMON RESPONSIBILITIES

The following is a checklist applicable to all personnel in an Incident Commander System organization:

- Receive assignment, including:
  - Job assignment
  - Resource order number and request number
  - Reporting location
  - Reporting time
  - Travel instructions
  - Special communications instructions
- Upon arrival, check-in at designated check-in location.
- Receive briefing from immediate supervisor.
- Acquire work materials.
- Supervisors maintain accountability for assigned personnel.
- Organize and brief subordinates.
- Know your assigned radio frequency(s) and ensure communications equipment is operating properly.
- Use clear text and Incident Commander System terminology (no codes) in all communications.
- Complete forms and reports required of the assigned position and send to Documentation Unit.
- Maintain unit records, including Unit Log (ICS Form 214).
- Respond to demobilization orders and brief subordinates regarding demobilization.

UNIT LEADER RESPONSIBILITIES

In Incident Commander System, a Unit Leader's responsibilities are common to all units in all parts of the organization. Common responsibilities of Unit Leaders are listed below.

- Review common responsibilities.
- Receive briefing from Incident Commander, Section Chief or Branch Director, as appropriate.
- Participate in incident planning meetings, as required.
- Determine current status of unit activities.
- Order additional unit staff, as appropriate.
- Determine resource needs.
- Confirm dispatch and estimated time of arrival of staff and supplies.
- Assign specific duties to staff; supervise staff.
- Develop and implement accountability, safety and security measures for personnel and resources.
- Supervise demobilization of unit, including storage of supplies.
- Provide Supply Unit Leader with a list of supplies to be replenished.
- Maintain unit records, including Unit Log (ICS Form 214).

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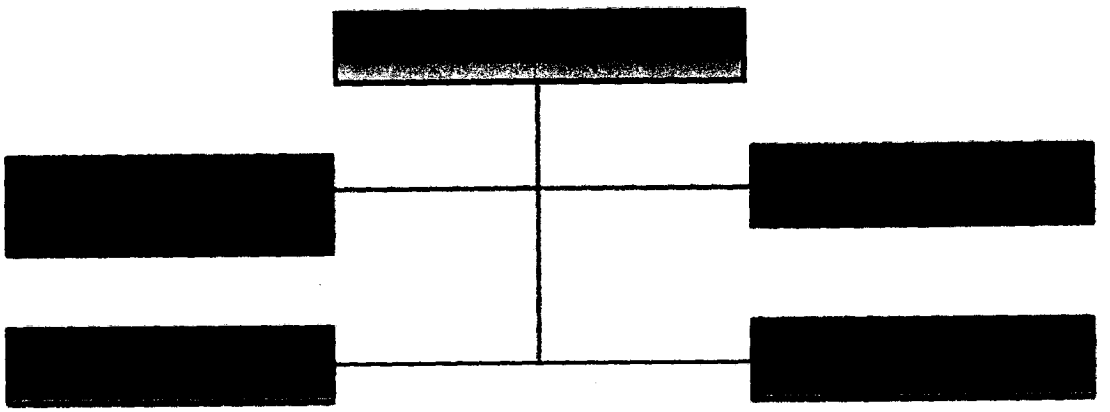
COMMAND



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INCIDENT COMMANDER

- Assess the situation and/or obtain a briefing from the prior Incident Commander.
- Determine Incident Objectives and strategy.
- Establish the immediate priorities.
- Establish an Incident Command Post.
- Brief Command Staff and Section Chiefs.
- Review meetings and briefings.
- Establish an appropriate organization.
- Ensure planning meetings are scheduled as required. (Refer to Figure 4.3 "Operational Period Planning Cycle" for assistance.
- Approve and authorize the implementation of an Incident Action Plan.
- Ensure that adequate safety measures are in place.
- Coordinate activity for all Command and General Staff.
- Coordinate with key people and officials.
- Approve requests for additional resources or for the release of resources.
- Keep agency administrator informed of incident status.
- Approve the use of trainees, volunteers, and auxiliary personnel.
- Authorize release of information to the news media.
- Ensure incident Status Summary (ICS Form 209-CG) is completed and forwarded to appropriate higher authority.
- Order the demobilization of the incident when appropriate.
- Assign any of the Incident Commander roles and responsibilities to a Deputy Incident Commander as needed.

PUBLIC INFORMATION OFFICER

- Determine from the Incident Commander if there are any limits on information release.
- Develop material for use in media briefings.
- Obtain Incident Commander approval of media releases.
- Inform media and conduct media briefings.
- Arrange for tours and other interviews or briefings that may be required.
- Obtain media information that may be useful to incident planning.
- Maintain current information summaries and/or displays on the incident and provide information on the status of the incident to assigned personnel.

LIAISON OFFICER

- Be a contact point for Agency Representatives.
- Maintain a list of assisting and cooperating agencies and Agency Representatives. Monitor check-in sheets daily to ensure that all Agency Representatives are identified.
- Assist in establishing and coordinating interagency contacts.
- Keep agencies supporting the incident aware of incident status.
- Monitor incident operations to identify current or potential inter-organizational problems.
- Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources.
- Coordinate response resource needs for Natural Resource Damage Assessment and Restoration (NRDAR) activities with the Operations during oil and HAZMAT responses.
- Coordinate response resource needs for incident investigation activities with the Operations.

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- Ensure that all required agency forms, reports and documents are completed prior to demobilization.
- Coordinate activities of visiting dignitaries.

SAFETY OFFICER

- Participate in planning meetings.
- Identify hazardous situations associated with the incident.
- Review the Incident Action Plan for safety implications.
- Exercise emergency authority to stop and prevent unsafe acts.
- Investigate accidents that have occurred within the incident area.
- Review and approve the medical plan.
- Develop the Site Safety Plan and publish Site Safety Plan summary (ICS Form 208) as required.

LEGAL OFFICER

- Participate in planning meetings, if requested.
- Advise on legal issues relating to in-situ burning, use of dispersants, and other alternative response technologies.
- Advise on legal issues relating to differences between Natural Resource Damage Assessment Restoration (NRDAR) and response activities.
- Advise on legal issues relating to investigations.
- Advise on legal issues relating to finance and claims.
- Advise on legal issues relating to response.

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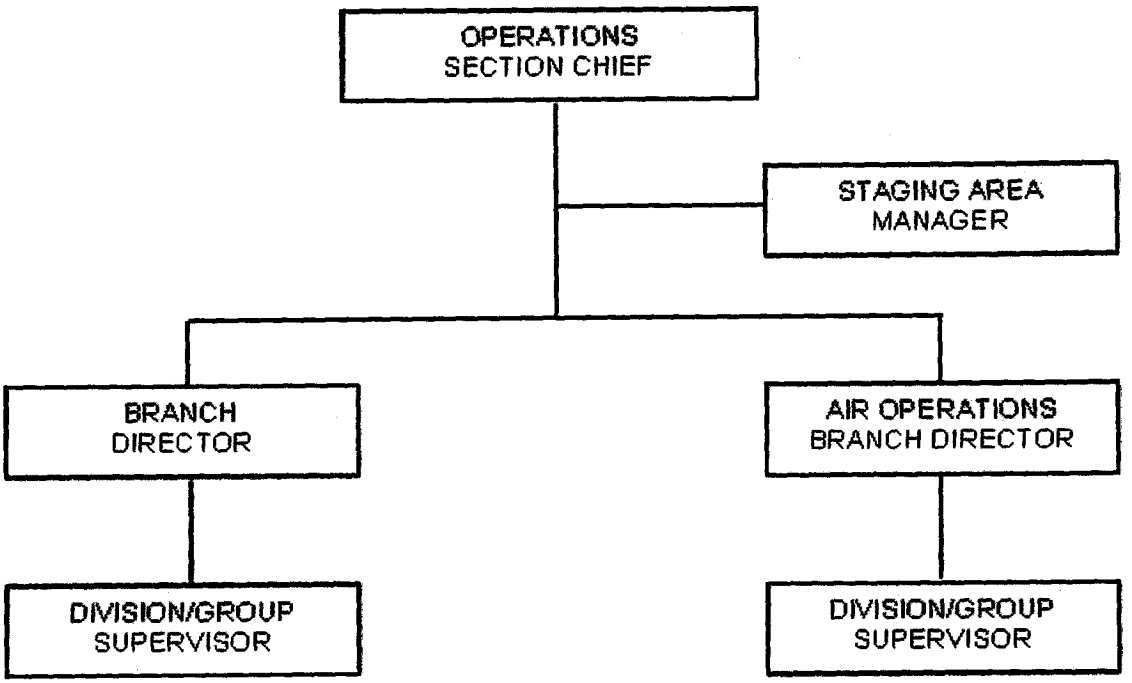
OPERATIONS



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OPERATIONS SECTION GENERAL FUNCTIONS

- Responsible for managing tactical operations at the incident site directed toward reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations.
- Directs and coordinates all incident tactical operations.
- Executes the Incident Action Plan.

OPERATIONS SECTION CHIEF

- Develop operations portion of Incident Action Plan.
- Brief and assign Operations Section personnel in accordance with the Incident Action Plan.
- Supervise Operations Section.
- Determine need and request additional resources.
- Review suggested list of resources to be released and initiate recommendation for release of resources.
- Assemble and disassemble strike teams assigned to the Operations Section.
- Report information about special activities, events, and occurrences to the Incident Commander.
- Respond to resource requests in support of National Resource Damage Assessment and Restoration activities.

BRANCH DIRECTOR

- Develop with subordinates alternatives for Branch control operations.
- Attend planning meetings at the request of the Operations.
- Review Assignment List (ICS Form 204-CG) for Divisions/Groups within the Branch. Modify lists based on effectiveness of current operations.
- Assign specific work tasks to Division/Group Supervisors.
- Supervise Branch operations.
- Resolve logistic problems reported by subordinates.
- Report to Operations when: the Incident Action Plan is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- Approve accident and medial reports originating within the Branch.

DIVISION/GROUP SUPERVISOR

- Implement Incident Action Plan for Division/Group.
- Provide the Incident Action Plan to Strike Team Leaders, when available.
- Identify increments assigned to the Division/Group.
- Review Division/Group assignments and incident activities with subordinates and assign tasks.
- Ensure that the Incident Commander and/or Resources Unit is advised of all changes in the status of resources assigned to the Division/Group.
- Coordinate activities with adjacent Division/Group.
- Determine need for assistance on assigned tasks.
- Submit situation and resources status information to the Branch Director or the Operations.
- Report hazardous situations, special occurrences, or significant events (e.g., accidents, sickness, discovery of unanticipated sensitive resources) to the immediate supervisor.
- Ensure that assigned personnel and equipment get to and from assignments in a timely and orderly manner.

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- Resolve logistics problems within the Division/Group.
- Participate in the development of Branch plans for the next operational period.

STAGING AREA MANAGER

- Establish Staging Area layout.
- Determine any support needs for equipment, feeding, sanitation and security.
- Establish check-in function as appropriate.
- Post areas for identification and traffic control.
- Request maintenance service for equipment at Staging Area as appropriate.
- Respond to request for resource assignments.
- Obtain and issue receipts for radio equipment and other supplies distributed and received at Staging Area.
- Determine required resource levels from the Operations.
- Advise the Operations when reserve levels reach minimums.
- Maintain and provide status to Resource Unit of all resources in Staging Area.
- Demobilize Staging Area in accordance with the Incident Demobilization Plan.

AIR OPERATIONS BRANCH DIRECTOR

- Organize preliminary air operations.
- Request declaration (or cancellation) of restricted air space
- Participate in preparation of the Incident Action Plan through the Operations. Insure that the air operations portion of the Incident Action Plan takes into consideration the Air Traffic Control requirements of assigned aircraft.
- Perform operational planning for air operations.
- Prepare and provide Air Operations Summary (ICS Form 220) to the Air Support Group and Fixed-Wing Bases.
- Determine coordination procedures for use by air organization with ground Branches, Divisions, or Groups.
- Coordinate with appropriate Operations Section personnel.
- Supervise all air operations activities associated with the incident.
- Evaluate helibase locations.
- Establish procedures for emergency reassignment of aircraft.
- Schedule approved flights of non-incident aircraft in the restricted air space area.
- Coordinate with the Operations Coordination Center (OCC) through normal channels on incident air operations activities.
- Inform the Air Tactical Group Supervisor of the air traffic situation external to the incident.
- Consider requests for non-tactical use of incident aircraft.
- Resolve conflicts concerning non-incident aircraft.
- Coordinate with Federal Aviation Administration.
- Update air operations plans.
- Report to the Operations on air operations activities.
- Report special incidents/accidents.
- Arrange for an accident investigation team when warranted.

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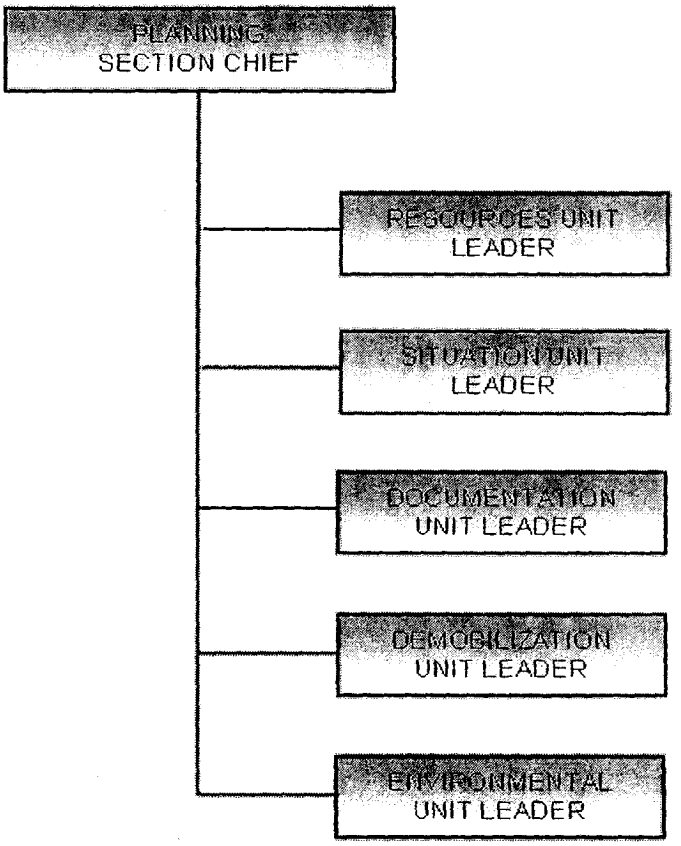
PLANNING



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PLANNING SECTION GENERAL FUNCTIONS

- Responsible for gathering, evaluating, and disseminating tactical information and intelligence critical to the incident.
- Maintaining incident documentation and providing documentation services.
- Preparing and documenting Incident Action Plans.
- Conducting long-range and/or contingency planning.
- Developing alternative strategies.
- Tracking resources assigned to the incident.
- Developing plans for waste disposal.
- Developing plans for demobilization.

PLANNING SECTION CHIEF

- Collect and process situation information about the incident.
- Supervise preparation of the Incident Action Plan.
- Provide input to the Incident Commander and the Operations in preparing the Incident Action Plan.
- Chair planning meetings and participate in other meetings as required. (Refer to Figure 4.5 "Operational Period Planning Cycle" for assistance.
- Reassign out-of-service personnel already on-site to Incident Commander System organizational positions as appropriate.
- Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation Units).
- Determine the need for any specialized resources in support of the incident.
- If requested, assemble and disassemble Strike Teams and Task Forces not assigned to Operations.
- Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- Assemble information on alternative strategies.
- Provide periodic predictions on incident potential.
- Report any significant changes in incident status.
- Compile and display incident status information.
- Oversee preparation and implementation of the Incident Demobilization Plan.
- Incorporate plans (e.g., Traffic, Medical, Communications, Site Safety) into the Incident Action Plan.

RESOURCES UNIT LEADER

- Establish the check-in function at incident locations.
- Prepare Organization Assignment List (ICS Form 203-CG) and Incident Organization (ICS Form 207-CG).
- Prepare appropriate parts of Assignment List (ICS Form 204).
- Prepare and maintain the Incident Command Post display (to include organization chart and resource allocation and deployment).
- Maintain and post the current status and location of all resources.
- Maintain master roster of all resources checked in at the incident.

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SITUATION UNIT LEADER

- Begin collection and analysis of incident data as soon as possible.
- Prepare, post, or disseminate resource and situation status information as required, including special requests.
- Prepare periodic predictions or as requested by the Planning Section Chief.
- Prepare the Incident Status Summary (ICS Form 209-CG).
- Provide photographic services and maps if required.

DOCUMENTATION UNIT LEADER

- Set up work area; begin organization of incident files.
- Establish duplication service; respond to requests.
- File all official forms and reports.
- Review records for accuracy and completeness; inform appropriate units of errors or omissions.
- Provide incident documentation as requested.
- Store files for post-incident use.

DEMOBILIZATION UNIT LEADER

- Participate in planning meetings as required.
- Review incident resource records to determine the likely size and extent of demobilization effort.
- Based on the above analysis, add additional personnel, workspace, and supplies as needed.
- Coordinate demobilization with Agency Representatives.
- Monitor the on-going Operations Section resource needs.
- Identify surplus resources and probable release time.
- Develop incident check-out function for all units.
- Evaluate logistics and transportation capabilities to support demobilization.
- Establish communications with off-incident facilities, as necessary.
- Develop an Incident Demobilization Plan detailing specific responsibilities and release priorities and procedures.
- Prepare appropriate directories (e.g., maps, instructions, etc.) for inclusion in the demobilization plan.
- Distribute demobilization plan (on and off-site).
- Provide status reports to appropriate requestors.
- Ensure that all Sections/Units understand their specific demobilization responsibilities.
- Supervise execution of the Incident Demobilization Plan.
- Brief the Planning Section Chief on demobilization progress.

ENVIRONMENTAL UNIT LEADER

- Participate in Planning Section meetings.
- Identify sensitive areas and recommend response priorities.
- Following consultation with natural resource trustees, provide input on wildlife protection strategies (e.g., removing oiled carcasses, pre-emptive capture, hazing, and/or capture and treatment).
- Determine the extent, fate and effects of contamination.
- Acquire, distribute and provide analysis of weather forecasts.
- Monitor the environmental consequences of cleanup actions.

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- Develop shoreline cleanup and assessment plans. Identify the need for, and prepare any special advisories or orders.
- Identify the need for, and obtain, permits, consultations, and other authorizations including Endangered Species Act (ESA) provisions.
- Following consultation with the Federal OnScene Commander's Historical/Cultural Resources Technical Specialist identify and develop plans for protection of affected historical/cultural resources.
- Evaluate the opportunities to use various response technologies.
- Develop disposal plans.
- Develop a plan for collecting, transporting, and analyzing samples.

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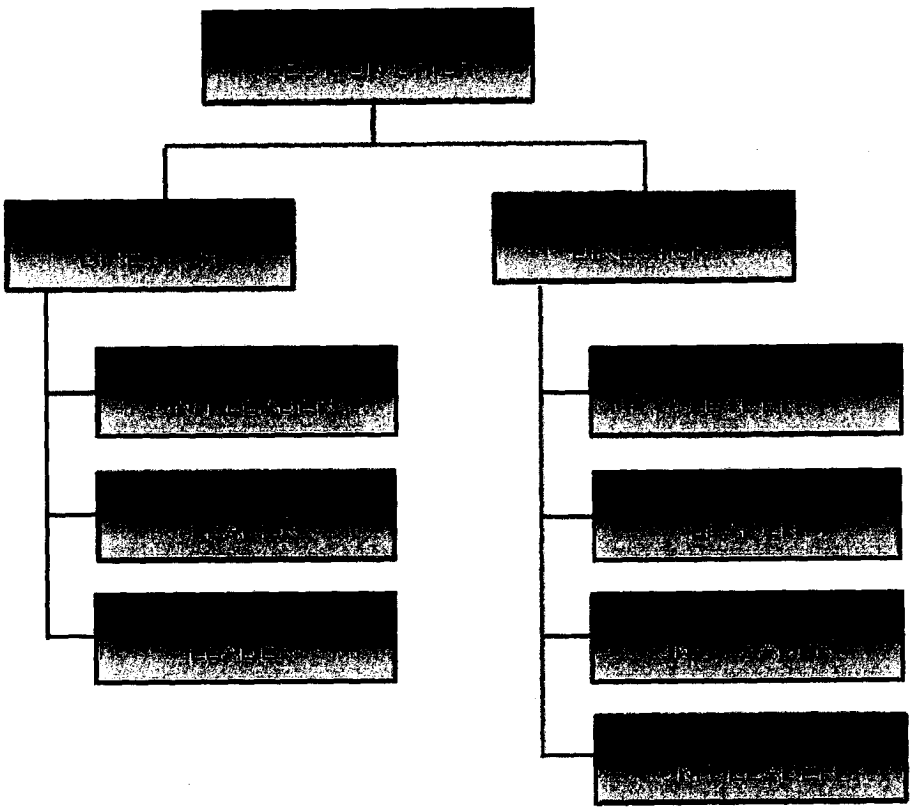
LOGISTICS



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LOGISTICS SECTION GENERAL FUNCTIONS

- Responsible for all support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident locations.
- Ordering, obtaining, maintaining, and accounting for essential personnel, equipment, and supplies.
- Providing communication planning and resources.
- Setting up food services.
- Setting up and maintaining incident facilities.
- Providing support transportation.
- Providing medical services to incident personnel.

LOGISTICS SECTION CHIEF

- Plan the organization of the Logistics Section.
- Assign work locations and preliminary work tasks to Section personnel.
- Notify the Resources Unit of the Logistics Section units activated including names and locations of assigned personnel.
- Assemble and brief Branch Directors and Unit Leaders.
- Participate in preparation of the Incident Action Plan.
- Identify service and support requirements for planned and expected operations.
- Provide input to and review the Communications Plan, Medical Plan and Traffic Plan.
- Coordinate and process requests for additional resources.
- Review the Incident Action Plan and estimate Section needs for the next operational period.
- Advise on current service and support capabilities.
- Prepare service and support elements of the Incident Action Plan.
- Estimate future service and support requirements.
- Receive Incident Demobilization Plan from Planning Section.
- Recommend release of Unit resources in conformity with Incident Demobilization Plan.
- Ensure the general welfare and safety of Logistics Section personnel.

SERVICE BRANCH DIRECTOR

- Determine the level of service required to support operations.
- Confirm dispatch of Branch personnel.
- Participate in planning meetings of Logistics Section personnel.
- Review the Incident Action Plan.
- Organize and prepare assignments for Service Branch personnel.
- Coordinate activities of Branch Units.
- Inform the Loigistic Section Chief of Branch activities.
- Resolve Service Branch problems.

COMMUNICATIONS UNIT LEADER

- Prepare and implement the Incident Radio Communications Plan (ICS Form 205-CG).
- Ensure the Incident Communications Center and the Message Center is established.
- Establish appropriate communications distribution/maintenance locations within the Base/Camp(s).
- Ensure communications systems are installed and tested.
- Ensure an equipment accountability system is established.

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- Ensure personal portable radio equipment from cache is distributed per Incident Radio Communications Plan.
- Provide technical information as required on:
    - Adequacy of communications systems currently in operation.
    - Geographic limitation on communications systems.
    - Equipment capabilities/limitations.
    - Amount and types of equipment available.
    - Anticipated problems in the use of communications equipment.
- Supervise Communications Unit activities.
- Maintain records on all communications equipment as appropriate.
- Ensure equipment is tested and repaired.
- Recover equipment from Units being demobilized.

MEDICAL UNIT LEADER

- Participate in Logistics Section/Service Branch planning activities.
- Prepare the Medical Plan (ICS Form 206-CG).
- Prepare procedures for major medical emergency.
- Declare major emergency as appropriate.
- Respond to requests for medical aid, medical transportation, and medical supplies.
- Prepare and submit necessary documentation.

FOOD UNIT LEADER

- Determine food and water requirements.
- Determine the method of feeding to best fit each facility or situation.
- Obtain necessary equipment and supplies and establish cooking facilities.
- Ensure that well-balanced menus are provided.
- Order sufficient food and potable water from the Supply Unit.
- Maintain an inventory of food and water.
- Maintain food service areas, ensuring that all appropriate health and safety measures are being followed.
- Supervise caterers, cooks, and other Food Unit personnel as appropriate.

SUPPORT BRANCH DIRECTOR

- Determine initial support operations in coordination with the Loigistic Section Chief and Service Branch Director.
- Prepare initial organization and assignments for support operations.
- Assemble and brief Support Branch personnel.
- Determine if assigned Branch resources are sufficient.
- Maintain surveillance of assigned units work progress and inform the Loigistic Section Chief of their activities.
- Resolve problems associated with requests from the Operations Section.

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SUPPLY UNIT LEADER

- Participate in Logistics Section/Support Branch planning activities.
- Determine the type and amount of supplies en route.
- Review the Incident Action Plan for information on operations of the Supply Unit.
- Develop and implement safety and security requirements.
- Order, receive, distribute, and store supplies and equipment.
- Receive and respond to requests for personnel, supplies, and equipment.
- Maintain an inventory of supplies and equipment.
- Service reusable equipment.
- Submit reports to the Support Branch Director.

FACILITY UNIT LEADER

- Review the Incident Action Plan.
- Participate in Logistics Section/Support Branch planning activities.
- Determine requirements for each facility, including the Incident Command Post (See Figure 2.6 for list of hotels).
- Prepare layouts of incident facilities.
- Notify Unit Leaders of facility layout.
- Activate incident facilities.
- Provide Base and Camp Managers and personnel to operate facilities.
- Provide sleeping facilities.
- Provide security services.
- Provide facility maintenance services (e.g., sanitation, lighting, clean up).
- Demobilize Base and Camp facilities.
- Maintain facility records.

GROUND SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Develop and implement the Traffic Plan.
- Support out-of-service resources.
- Notify the Resources Unit of all status changes on support and transportation vehicles.
- Arrange for and activate fueling, maintenance, and repair of ground resources.
- Maintain Support Vehicle Inventory and transportation vehicles (ICS Form 218).
- Provide transportation services, In accoradance with requests from the Loigistic Section Chief or Support Branch Director.
- Collect information on rented equipment.
- Requisition maintenance and repair supplies (e.g., fuel, spare parts).
- Maintain incident roads.
- Submit reports to Support Branch Director as directed.

VESSEL SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Coordinate development of the Vessel Routing Plan.
- Coordinate vessel transportation assignments with the Protection and Recovery Branch or other

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sources of vessel transportation.
- Coordinate water-to-land transportation with the Ground Support Unit, as necessary.
- Maintain a prioritized list of transportation requirements that need to be scheduled with the transportation source.
- Support out-of-service vessel resources, as requested.
- Arrange for fueling, dockage, maintenance and repair of vessel resources, as requested.
- Maintain inventory of support and transportation vessels.

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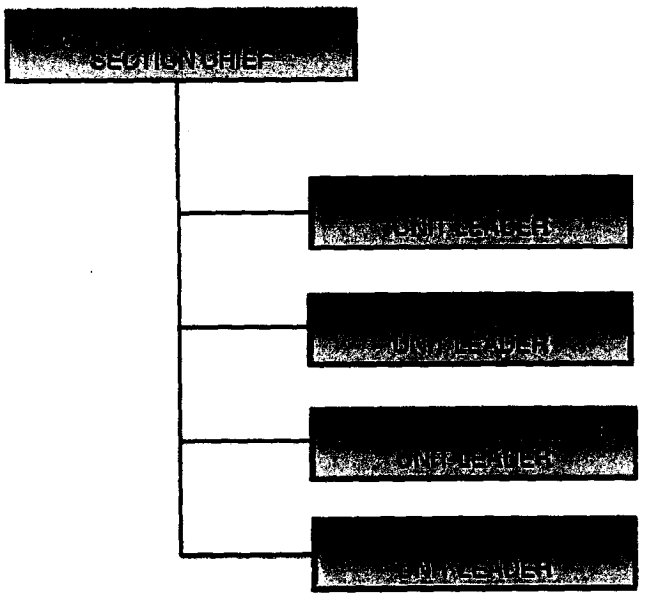
FINANCE/ADMINISTRATION



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FINANCE/ADMINISTRATION SECTION GENERAL FUNCTIONS

- Responsible for all financial and cost analysis aspects of an incident. (Note: Not all incidents will require a separate Finance/Administration Section. In cases that require only one specific function (e.g., cost analysis), this service may be provided by a member of the Planning Section.)
- Administering any contract negotiation.
- Providing cost analysis as it pertains to the Incident Action Plan.
- Maintaining cost associated with the incident.
- Tracking personnel and equipment time.
- Addressing compensation for injury or damage to property issues.

FINANCE/ADMINISTRATION SECTION CHIEF

- Attend planning meetings as required.
- Manage all financial aspects of an incident.
- Provide financial and cost analysis information as requested.
- Gather pertinent information from briefings with responsible agencies.
- Develop an operating plan for the Finance/Administration Section; fill supply and support needs.
- Determine the need to set up and operate an incident commissary.
- Meet with assisting and cooperating agency representatives, as needed.
- Maintain daily contact with agency(s) administrative headquarters on Finance/ Administration matters.
- Ensure that all personnel time records are accurately completed and transmitted, according to policy.
- Provide financial input to demobilization planning.
- Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- Brief administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.

TIME UNIT LEADER

- Determine incident requirements for time recording function.
- Determine resource needs.
- Contact appropriate agency personnel/representatives.
- Ensure that daily personnel time recording documents are prepared and in compliance with policy.
- Establish time unit objectives.
- Maintain separate logs for overtime hours.
- Establish commissary operation on larger or long-term incidents as needed.
- Submit cost estimate data forms to the Cost Unit, as required.
- Maintain records security.
- Ensure that all records are current and complete prior to demobilization.
- Release time reports from assisting agency personnel to the respective Agency Representatives prior to demobilization.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

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PROCUREMENT UNIT LEADER

- Review incident needs and any special procedures with Unit Leaders, as needed.
- Coordinate with local jurisdiction on plans and supply sources.
- Obtain the Incident Procurement Plan.
- Prepare and authorize contracts and land-use agreements.
- Draft memoranda of understanding as necessary.
- Establish contracts and agreements with supply vendors.
- Provide for coordination between the Ordering Manager, agency dispatch, and all other procurement organizations supporting the incident.
- Ensure that a system is in place that meets agency property management requirements. Ensure proper accounting for all new property.
- Interpret contracts and agreements; resolve disputes within delegated authority.
- Coordinate with the Compensation/Claims Unit for processing claims.
- Coordinate use of impress funds, as required.
- Complete final processing of contracts and send documents for payment.
- Coordinate cost data in contracts with the Cost Unit Leader.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

COMPENSATION/CLAIMS UNIT LEADER

- Establish contact with the incident Security Officer and Liason Officer (or Agency Representatives if no Liason Officer is assigned).
- Determine the need for Compensation for Injury and Claims Specialists and order personnel as needed.
- Establish a Compensation for Injury work area within or as close as possible to the Medical Unit.
- Review Medical Plan (ICS Form 206-CG).
- Ensure that Compensation/Claims Specialists have adequate workspace and supplies.
- Review and coordinate procedures for handling claims with the Procurement Unit.
- Brief the Compensation/Claims Specialists on incident activity.
- Periodically review logs and forms produced by the Compensation/Claims Specialists to ensure that they are complete, entries are timely and accurate and that they are in compliance with agency requirements and policies.
- Ensure that all Compensation for Injury and Claims logs and forms are complete and routed appropriately for post-incident processing prior to demobilization.
- Keep the Finance/Administration Section Chief briefed on Unit status and activity.
- Demobilize unit in accordance with the Incident Demobilization Plan.

COST UNIT LEADER

- Coordinate cost reporting procedures.
- Collect and record all cost data.
- Develop incident cost summaries.
- Prepare resources-use cost estimates for the Planning Section.
- Make cost-saving recommendations to the Finance/Administration Section Chief.
- Ensure all cost documents are accurately prepared.
- Maintain cumulative incident cost records.
- Complete all records prior to demobilization.

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- Provide reports to the Finance/Administration Section Chief.

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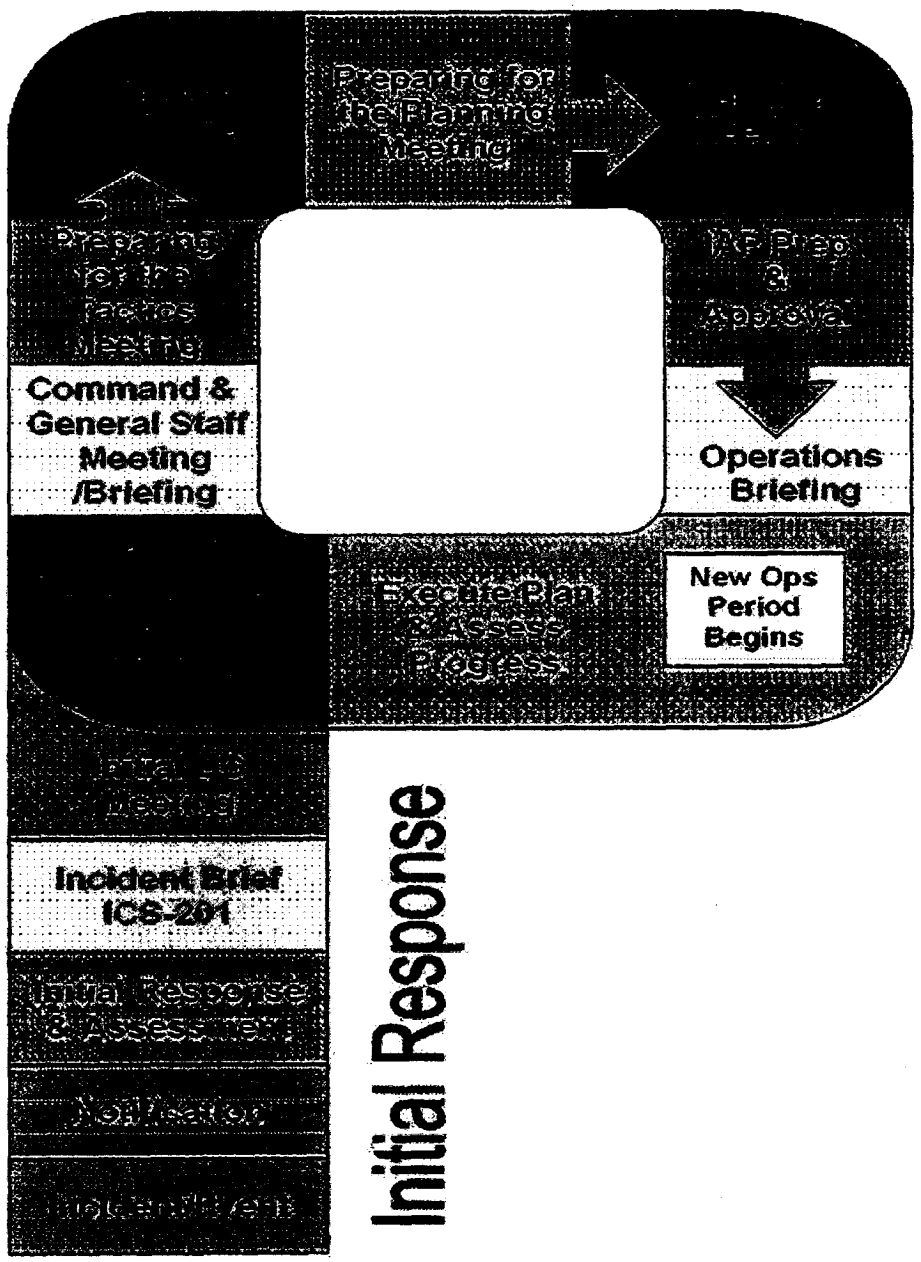
FIGURE 4.2

UNITED STATES COAST GUARD
Operations Period Planning

The Operational Planning "P"



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5.0 RESPONSE PLANNING

5.1 **Incident Action Plan**

5. 2 **Site Safety Plan**

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5.1 INCIDENT ACTION PLAN

Emergency response activities are planned and coordinated through the use of an Incident Action Plan (IAP), which is developed for each Operational Period of a response by the Initial Response Team. For small responses, an ICS 201 may be used as the Incident Action Plan and, for all incidents, the ICS 201 will serve as the initial Incident Action Plan.

For larger or more complex incidents, a more complete Incident Action Plan will be necessary. These Incident Action Plans are generally created through the completion and compilation of several standard Incident Command System forms. These forms include, but are not limited to:

ICS FORM NUMBER	FORM TITLE	PREPARED BY
IAP Cover Sheet	ICS IAP Cover Sheet	**Planning Section** - Situation Unit Leader
201-CG	Incident Briefing	**Command Section** - Initial Response Incident Commander
202-CG	Incident Objectives	**Planning Section** - Planning Section Chief
203-CG	Organization Assignment List	**Planning Section** - Resources Unit Leader
204-CG	Assignment List	**Operations Section** - Chief & Resources Unit Leader
204a-CG	Assignment List Attachment	**Operations Section** - Chief & Resources Unit Leader
205-CG	Incident Radio Communication Plan	**Logistics Section** - Communication Unit Leader
205a-CG	Communications List	**Logistics Section** - Communication Unit Leader
206-CG	Medical Plan	**Logistics Section** - Medical Unit Leader
207-CG	Incident Organization	**Planning Section** - Resources Unit Leader
209-CG	Incident Status Summary	**Command Section** - Incident Commander
211-CG	Check-In List	
213-RR CG	Resource Request Message	
214-CG	Unit Log	**Planning Section** - Situation Unit Leader
215-CG	Operational Planning Worksheet	
215A-CG	Incident Action Plan Safety Analysis	
218	Support Vehicle Inventory	**Logistics Section** - Ground Support Unit Leader
220-CG	Air Operations Summary	**Operations Section** - Air Operations Branch Director
230-CG	Daily Meeting Schedule	
232-CG	Resources at Risk Summary	**Planning Section** - Situation Unit Leader
232a-CG	ACP Site Index	
233-CG	Incident Open Action Tracker	
234-CG	Work Analysis Matrix	
235-CG	Facility Needs Assessment Worksheet	

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	Site Safety Plan	**Command Section** - Safety Officer
	Employee Certification Page	
	Media Statement	

Depending on the nature and severity of the emergency, additional documents may be included in the Incident Action Plan. These may include:

- Sensitivity Maps (Provided in Section 6)
- Waste Management and Disposal Plans (Provided in Appendix E)
- Plans for use of Alternative Technologies (Dispersant/In-situ Burning/ Bioremediation)
- Security Plans
- Decontamination Plans
- Traffic Plans

5.2 SITE SAFETY PLAN

Site Safety Plans (SSPs) are required by United States Occupational Safety and Health Administration (29 CFR 1910.120(b)(4)) for all hazardous waste operations. The Site Safety Plan should address all on-site operations and hazardous as well as on-site emergency procedures.

The Site Safety Plan is typically prepared by the Safety Officer and approved by the Incident Commander. All personnel must be familiar with the contents of the Site Safety Plan and the Site Safety Plan must be updated as conditions, operations and hazards associated with the response change.

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1. Incident Name	2. Operational Period to be covered by IAP (Date/Time)	IAP COVER SHEET
	From: To:	

3. Approved by:

FOSC _____

SOSC _____

RPIC _____

_____ _____

_____ _____

INCIDENT ACTION PLAN

The items checked below are included in this Incident Action Plan:

- ☐ ICS 202-OS (Response Objectives)
- ☐ ICS 203-OS (Organization List) – OR – ICS 207-OS (Organization Chart)
- ☐ ICS 204-OSs (Assignment Lists)
  One Copy each of any ICS 204-OS attachments:
  - ☐ Map
  - ☐ Weather forecast
  - ☐ Tides
  - ☐ Shoreline Cleanup Assessment Team Report for location
  - ☐ Previous day's progress, problems for location
- ☐ ICS 205-OS (Communications List)
- ☐ ICS 206-OS (Medical Plan)
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

4. Prepared by: _____ Date/Time _____

IAP COVER SHEET June 2000

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1. Incident Name	2. Prepared by: (name)	INCIDENT BRIEFING ICS 201-CG
	Date: Time:	

3. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, overflight results, trajectories, impactec shorelines, or other graphics depicting situational and response status)

4. Current Situation:

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1. Incident Name	2. Prepared by: (name) Date: Time:	INCIDENT BRIEFING ICS 201-CG

5. Initial Response Objectives, Current Actions, Planned Actions

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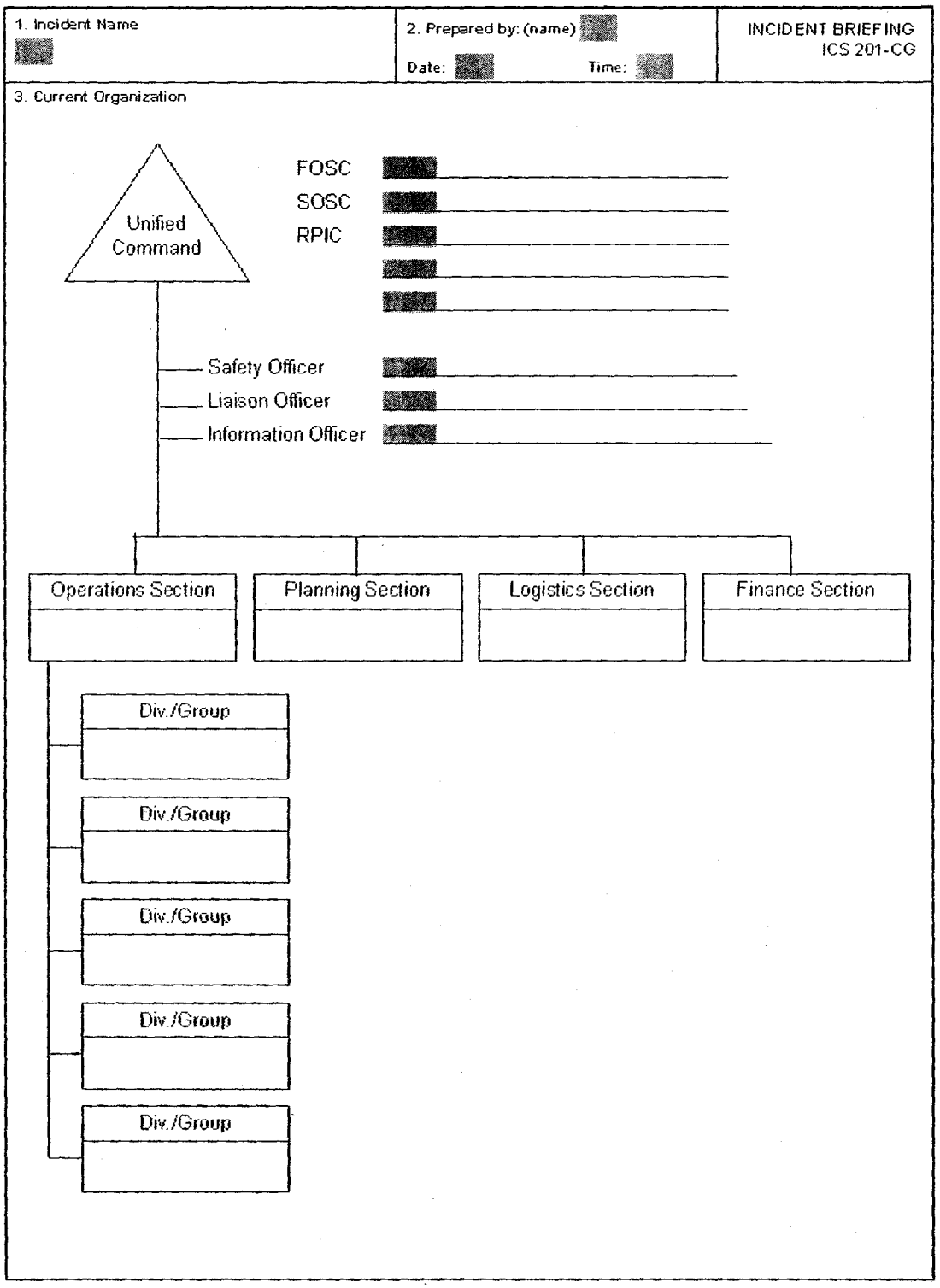

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1. Incident Name [redacted]	2. Prepared by: (name) [redacted] Date: [redacted] Time: [redacted]	INCIDENT BRIEFING ICS 201-CG

7. Resources Summary Resource	Resource Identifier	Date Time Ordered	ETA	On-Scene (X)	NOTES: (Location/Assignment/Status)
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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1. Incident Name	2. Operational Period (Date/Time)	INCIDENT OBJECTIVES ICS 202-CG
	From: To:	

3. Objective(s)

4. Operational Period Command Emphasis (Safety Message, Priorities, Key Decisions/Directions)

Approved Site Safety Plan Located at:

5. Prepared by: (Planning Section Chief) Date/Time

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1. Incident Name	2. Operational Period (Date/Time) From: To:	ORGANIZATION ASSIGNMENT LIST ICS 203-CG

3. Incident Commander(s) and Staff		
Agency	IC	Deputy
Safety Officer:		
Information Officer:		
Liaison Officer:		

4. Agency Representatives	
Agency	Name

5. PLANNING/INTEL SECTION	
Chief	
Deputy	
Resources Unit	
Situation Unit	
Environmental Unit	
Documentation Unit	
Demobilization Unit	
Technical Specialists	

6. LOGISTICS SECTION	
Chief	
Deputy	
a. Support Branch	
Director	
Supply Unit	
Facilities Unit	
Vessel Support Unit	
Ground Support Unit	
b. Service Branch	
Director	
Communications Unit	
Medical Unit	
Food Unit	

7. OPERATION SECTION		
Chief		
Deputy		
Deputy		
Staging Area Manager		
Staging Area Manager		
Staging Area Manager		
a. Branch – Division Groups		
Branch Director		
Deputy		
Division Group		
Division Group		
Division Group		
Division/Group		
Division/Group		
b. Branch – Division/Groups		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
c. Branch – Division/Groups		
Branch Director		
Deputy		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
Division/Group		
d. Air Operations Branch		
Air Operations Br. Dir		
Helicopter Coordinator		

8. FINANCE/ADMINISTRATION SECTION	
Chief	
Deputy	
Time Unit	
Procurement Unit	
Compensation/Claims Unit	
Cost Unit	

9. Prepared By: (Resources Unit)	Date/Time

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date / Time) From: To:	MEDICAL PLAN ICS 206-CG

3. Medical Aid Stations

Name	Location	Contact #	Paramedics On site (Y/N)

4. Transportation

Ambulance Service	Address	Contact #	Paramedics On board (Y/N)

5. Hospitals

Hospital Name	Address	Contact #	Travel Time		Burn Ctr?	Heli-Pad?
			Air	Ground		

6. Special Medical Emergency Procedures

7. Prepared by: (Medical Unit Leader) Date/Time	8. Reviewed by: (Safety Officer) Date/Time

MEDICAL PLAN ICS 206-CG (Rev.07/04)

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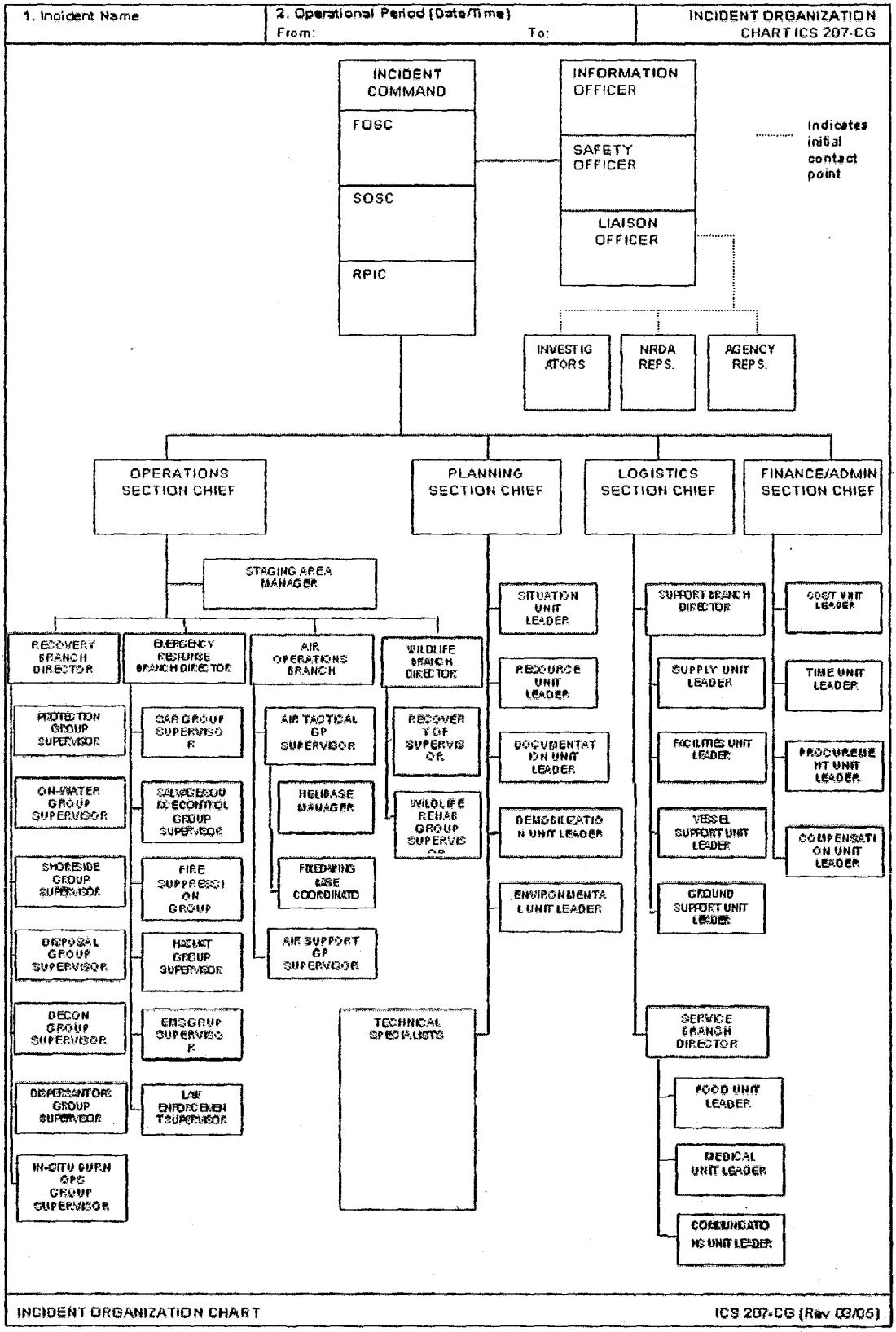

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SITE SAFETY PLAN

I. General

☐ Pump Station ☐ Pipeline Spill ☐ Spill to Water ☐ Excavation ☐ Other: _____

Location: _____

Work to be performed: _____

Issuing Date: _____ Time: _____
Temperature: ____° Wind Direction: ____
Humidity: _____

II. Hazards to be Evaluated

Y	N		Y	N		SPECIFIC HAZARDS Y	N	
☐	☐	Oxygen Deficient/Enriched	☐	☐	Ingestion / Skin Absorption	☐	☐	Crude Oil
☐	☐	Flammable Atmosphere	☐	☐	Frostbite	☐	☐	Other* ( )
		(Explosion Fire)	☐	☐	Chemical/MSDS # _____			
☐	☐	Toxic Atmosphere: _____			(Must be attached)			
☐	☐	Boat Operations	☐	☐	Physical Hazard _____			
☐	☐	Confined Space	☐	☐	Traffic _____			
			☐	☐	Vapor Cloud			

III. Testing & Monitoring (Check required items)

Tests are to be performed in the order listed.

Y	N		Continuous		Frequency
☐	☐	Oxygen Level	☐Y	☐N	_____ every ____
☐	☐	LEL	☐Y	☐N	_____ every ____
☐	☐	Hydrogen Sulfide	☐Y	☐N	_____ every ____
☐	☐	Benzene	☐Y	☐N	_____ every ____
☐	☐	Total Hydrocarbons	☐Y	☐N	_____ every ____
☐	☐	Other: _____	☐Y	☐N	_____ every ____

ACCEPTABLE ENTRY CONDITIONS

19.5 – 23.0% in air	< 19.5% or 23.0% in air	< 16.0 or ≥ 23.5% in air
< 10% in air	≥ 10.0 but < 20.0% in air	≥ 20.0% in air
< 10 ppm	≥ 10 but < 100 ppm	≥ 100 ppm
< 5 ppm	≥ 5 but < 10 ppm	≥ 10 ppm
< 300 ppm	≥ 300 but < 750 ppm	≥ 750 ppm

IV. Required Personal Protective Equipment (Check for required use)

General	Eye Prot.	Respiratory Prot.	Hearing Prot.	Gloves	Footwear	Clothing
☐ Hard Hat	☐ Safety Glasses	☐ SCBA/Air Line w/Escape	☐ Ear Plugs	☐ Leather	☐ Steel-toes	☐ FR Coveralls
☐ Safety Harness	☐ Goggles	☐ Air Line	☐ Ear Muffs	☐ Rubber	☐ Rubber	☐ Tyvek
☐ PFD	☐ Face-shield	☐ Air Purifying (Full Mask)	☐ Combination	☐ Nitrile	☐ Hip-boots	☐ Coated Tyvek
	☐ Tinted Lens	Cartridge Type: ☐ OV	☐ Hepa-OV	☐ PVC	☐ _____	☐ Saranyx
				☐ _____		☐ _____

Any other special PPE: _____

V. Emergency Information and Rescue Services

Emergency Contact Person: _____ Contact by: _____
Fire Department: _____ Contact by: _____
Ambulance: _____ Contact by: _____
Hospital: _____ Contact by: _____
Rescue Services: _____ Contact by: _____
(if not provided by above)

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VI. Required Safety & Rescue Equipment (on site)

☐ Lights	☐ Fall Protection	☐ First Aid Kit	☐ Drinking Water	☐ Fire Extinguisher	☐ Tripod	☐ Other:
☐ Ladder	☐ Retrieval Lines	☐ Resuscitator	☐ Communication Method			

VII. Comments or Special Work Procedures

VIII. Report All Injuries Immediately

IX. Control Measures

• Isolation & Lockout (identify items to be locked out)	• Ventilation ☐ Natural ☐ Mechanical
• Establish Work Zones when completed	Continuous ☐ No ☐ Yes
☐ Hot Zone = Red Ribbon	• Flagman / Watchman ☐
☐ Warm Zone = Yellow Ribbon	• Confined Space – Safety Watch ☐
☐ Cold Zone = Blue Ribbon	(See Exhibit "B" for Permit)
	• Evacuation Routes – (Identify on Map)
	☐ Air Horn – Emergency
	☐ Primary Route
	☐ Secondary Route

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X. Monitoring Results	Zone													
Oxygen	Time													
	Level													
	By													
LEL	Time													
	Level													
	By													
Hydrogen Sulfide	Time													
	Level													
	By													
Benzene	Time													
	Level													
	By													
VOC	Time													
	Level													
	By													
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	By													

Equipment: Type:_____ Mfger:_____ Calibration / Expiration: _____
Type: _____ Mfger:_____ Calibration / Expiration: _____

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG ICS 214-CG
3. Unit Name/Designations	4. Unit Leader (Name and ICS Position)	

5. Personnel Assigned

NAME	ICS POSITION	HOME BASE

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time

UNIT LOG ICS 214-CG (Rev 6/05)

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG (CONT.) ICS 214-CG

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time:

UNIT LOG ICS 214-CG (Rev 6/05)

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6.0 SPILL IMPACT CONSIDERATIONS

6.1 Critical Areas to Protect

6.2 Environmental/Socio-Economic Sensitivities

6.3 Fisheries and Wildlife Protection

6.4 Staging Areas

6.5 Containment and Recovery of Spilled Product

Figure 6.1 On-Water Response Flowchart

6.6 Vulnerability Analysis

6.7 Alternative Response Strategies

Figure 6.2 Environmental Sensitivity Maps

Figure 6.3 Endangered/Threatened Species Listing

Figure 6.4 Aquifers

Figure 6.5 Affected HCA/Environmental

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6.1 CRITICAL AREAS TO PROTECT

The critical areas to protect are classified as high, moderate, and low sensitivity to oil for non-coastal/inland environments. The Federal, Province/State, and Local authorities will further clarify these categories at the time of the response. The categories are defined as follows:

HIGH SENSITIVITY
• Areas which are high in productivity, abundant in many species, extremely sensitive, difficult to rehabilitate, or inhabited by threatened/endangered species. • Areas which consist of forested areas, brush/grassy areas, wooded lake areas, freshwater marshes, wildlife sanctuaries/refuges, and vegetated river/stream banks.

MODERATE SENSITIVITY
• Areas of moderate productivity, somewhat resistant to the effects of oiling. • Areas which consist of degraded marsh habitat, clay/silt banks with vegetated margins, and gravel/cobble beaches.

LOW SENSITIVITY
• Areas of low productivity, man-made structures, and/or high energy. • Areas which consist of gravel, sand, or clay material, barren/rocky riverbanks and lake edges, man-made structures, and concrete/compacted earthen drainage ditches.

6.2 ENVIRONMENTAL/SOCIO-ECONOMIC SENSITIVITIES

Environmental/Socio-economic sensitivities are of extreme importance when planning a response effort.The health and safety of the public and the environment, as well as the protection of the various socio-economic sensitivities, must be promptly addressed in order to mitigate the extent of damage and minimize the cost of the clean-up effort.

It is important to protect archeological sites and heritage resources (e.g. National Parks, National Marine Conservation Areas, and National Historic Sites). Impacted archeological sites or heritage resources of an area need to be identified and the likely impacts that result from the activities should be addressed. Specific consideration should be given to access to, and general use and disturbance of areas. The assessment should consider both direct and indirect impacts, cultural protocols and strategies for minimizing impacts. Consultation with local indigenous communities should occur as part of the planning process.

The Company will explore, where appropriate, equivalent environmental protection systems, methods, devices, or technologies that maintain or may be less damaging to the character of heritage resources or archeological sites. If a release from the pipeline impacts a heritage resource, the Company will respond as outlined in Section 3.0, report to the appropriate authority prescribed by law, cleanup and restore the area as required by regulation, and conduct such sampling, analyses, or associated monitoring during and after restoration.

All environmental/socio-economic sensitivities are worthy of protection, but must be prioritized

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during a response effort.When making decisions on which areas to designate as collection areas and which to protect, the following sources may be consulted:

- Canadian Wildlife Services, U.S. Fish and Wildlife Service and related province/ state agencies
- Applicable Area Contingency Plans
- Other industry and private experts

The environmental and socio-economic sensitivities in the vicinity of the Pipeline have been broken down into specific categories and identified in this Section. To further clarify the location of the sensitive areas of concern, references to published Area Contingency Plans and Environmental Sensitivity Maps are also provided in this section.

6.3 FISHERIES AND WILDLIFE PROTECTION

The Company will work with Federal, Province/State, and local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill, as necessary. Oversight of the Company's wildlife preservation activities and coordination with Federal, Province/State, and Local agencies during an oil spill is the responsibility of the Incident Commander.

Protecting fish habitat (e.g. spawning and rearing grounds) is important to both consumers and commercial fisheries. Beyond typical response strategies, other options could include moving floating facilities, temporarily sinking facilities using cages designed for this purpose, temporary suspension of water intakes, or closing sluice gates to isolate the facilities from contamination.

Special consideration should be given to the protection and rehabilitation of endangered species and other wildlife and their habitat in the event of an oil spill and subsequent response. Jurisdictional authorities should be notified and worked with closely on all response/clean-up actions related to wildlife protection and rehabilitation. Laws with significant penalties are in place to ensure appropriate protection of these species.

Wildlife Rescue

The Company will work with Federal, Province/State, and Local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate wildlife affected by an oil spill, as the situation demands.

The following are items which should be considered for wildlife rescue and rehabilitation during a spill response:

- Bird relocation can be accomplished using a variety of deterrents, encouraging birds to avoid areas of spilled oil. Bird relocation can be accomplished by utilizing deterrent methods including:
  - Use of visual stimuli, such as inflatable bodies, owls, stationary figures, or helium balloons, etc.
  - Use of auditory stimuli, such as propane cannons, recorded sounds, or shell crackers.
  - Use of herding with aircraft, boats, vehicles, or people (as appropriate).Use of capture and relocation.

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Search and Rescue - Points to consider

- **The Company's involvement should be limited to offering assistance as needed or requested by the agencies.**
- Prior to initiating any organized search and rescue plan, **authorization must be obtained from the appropriate Federal/State agency.**
- **Initial search and rescue efforts, if needed, should be left up to the appropriate agencies.** They have the personnel, equipment, and training to immediately begin capturing contaminated wildlife.
- With or without authorization, it must be anticipated that volunteer citizens will aid distressed/contaminated wildlife on their own. It is important to communicate that it may be illegal to handle wildlife without express authority from appropriate agencies. Provisions should be made to support an appropriate rehabilitator; however, **no support should be given to any unauthorized volunteer rescue efforts.**
- The regulatory agencies and response personnel should be provided the name and location of a qualified rehabilitator in the event contaminated wildlife is captured.
- Resources and contacts that can assist with wildlife rescue and rehabilitation are provided in Section 2.0. This list includes:
  - Outside rehabilitation organizations
  - Local regulatory agencies
  - Other resources

6.4 STAGING AREAS

When establishing personnel and equipment staging areas for a response to a Pipeline discharge, the following criteria should be evaluated:

- Access to waterborne equipment launching facilities and/or land equipment.
- Access to open space for staging/deployment of heavy equipment and personnel.
- Access to public services utilities (electricity, potable water, public phone, restroom and washroom facilities, etc.).
- Access to the environmental and socio-economically sensitive areas which are projected for impact.

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6.5 CONTAINMENT AND RECOVERY OF SPILLED PRODUCT

General descriptions of various specific response techniques that may be applied during a response effort are discussed below. Company responders are free to use all or any combination of these methods as incident conditions require, provided they meet the appropriate safety standards and other requirements relative to the situation encountered. Data was obtained from reports, manuals and pamphlets prepared by the American Petroleum Institute, Environmental Protection Agency, and the United States Coast Guard. The most effective cleanup of a product spill will result from an integrated combination of clean-up methods. Each operation should complement and assist related operations and not merely transfer spillage problems to areas where they could be more difficult to handle.

The spill should be assessed as soon as possible to determine the source, extent and location of travel. Terrain and other physical conditions downgradient of the spill site will determine the methods of control at a point in advance of the moving product. Often, the bulk of a spill can be contained at a single location or a few key locations in the immediate vicinity of the source point. When possible, the execution of this type of initial containment strategy helps confine a spill to a relatively limited area.

Spill on Land (Soil Surfaces)

- **Containment Methods**

  Product can be trapped in ditches and gullies by earth dams. Where excavating machinery is available, dams can be bulldozed to contain lakes of product. Dams, small and large, should be effectively employed to protect priority areas such as inlets to drains, sewers, ducts and watercourses. These can be constructed of earth, sandbags, absorbents, planks or any other effective method. If time does not permit a large dam, many small ones can be made, each one holding a portion of the spill as it advances. The terrain will dictate the placement of the dams. If the spill is minor, natural dams or earth absorption will usually stop the product before it advances a significant distance. Cleanup is the main concern in such situations.

  In situations where vapors from a spill present a clear and present danger to property or life (possible ignition because of passing automobiles, nearby houses, or work vehicles approaching the area), spraying the surface of the spill with dispersant will greatly reduce the release of additional vapors from the product. This method is especially adapted to gasoline spills on soil surfaces.

- **Removal Methods**

  The recovery and removal of free product from soil surfaces is a difficult job. The best approaches at present seem to be:

  - Removal with suction equipment to tank truck if concentrated in volumes large enough to be picked up. Channels can be formed to drain pools of product into storage pits. The suction equipment can then be used.
  - Small pockets may have to be dipped up by hand.
  - If practicable after removal of the bulk of the spill, controlled burning presents the possibility of a fast, simple, and inexpensive method of destruction of the remainder of the product. If all other options have been

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executed and the site is still unsafe for further activity because explosive vapors persist, the vapors may need to be intentionally ignited to prevent an accumulation sufficient to become an explosive mixture, provided the other requirements of these guidelines for controlled burning are met.

Intentional ignition to remove released product should be utilized only if all of the following conditions are met:

- Other steps and procedures have been executed and a determination has been made that this is the safest remaining method of control.
- Intentional burning will not unduly damage pipelines, adjacent property, or the environment.
- Controlled burning is permitted by government authorities. Local government authorities to be contacted may include city council, county board of commissioners, city or county fire chiefs, the county forestry commission or fire tower, and the local environmental protection agency. In seeking permission from these authorities, be prepared to convince them that adequate safety precautions have been and will be taken during the operation.
- Controlled burning is conducted with the consent of local land owners.
- Safety must always be a prime consideration when considering controlled burning of product. Sparks and heat radiation from large fires can start secondary fires and strong winds make fire control difficult. There must be no danger of the fire spreading beyond control limits. All persons must be at a safe distance from the edge of the inflammable area. Remember that all burning must be controlled burning.

Spill on Lake or Pond (Calm or Slow-Moving Water)

- **Containment Methods**

A lake or pond offers the best conditions for removal of product from water. Although the removal is no easy task, the lake or pond presents the favorable conditions of low or no current and low or no waves.

The movement of product on a lake or pond is influenced mainly by wind. The product will tend to concentrate on one shore, bank or inlet. Booms should be set up immediately to hold the product in the confined area in the event of a change in wind direction.

If the spill does not concentrate itself on or near a shore (no wind effect), then a sweeping action using boats and floating booms will be necessary.

The essential requirement for this operation is that it be done very slowly. The booms should be moved at not more than 40 feet per minute. Once the slick is moved to a more convenient location (near shore), the normal operations of removal should begin.

If the slick is small and thin (rainbow effect) and not near the shoreline, an absorbent boom instead of a regular boom should be used to sweep the area

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very slowly and absorb the slick. The product may not have to be moved to the shoreline. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

If the Containment slick is thick enough, regular suction equipment may be used first; however, in most instances, a floating skimmer should be used.

If the floating skimmer starts picking up excess water (slick becomes thin), drawing the boom closer to the bank as product is removed will also keep film of product thicker. However, when the slick becomes too thin, the skimmer should be stopped and an absorbent applied (with a boat if necessary) to remove the final amounts. The floating skimmer (if speed is a must) or hand skimmers (if water is shallow enough) or both can be used to pick up the product-soaked absorbent. Before pumping the product-soaked absorbent with a floating skimmer, ensure that the absorbent in question can be pumped and will not harm the pump. Several types are nonabrasive to pump internals. If the floating skimmer is used first, the product-soaked absorbent/water mixture should be pumped into a tank truck.

A better method of retrieving the product-soaked absorbent is to draw it in as close to the shore as possible with the booms used to confine the product initially. The absorbent can then be hand skimmed from the water surface and placed in drums, on plastic sheets or in lined roll-off boxes. It should then be disposed of by acceptable means.

The final rainbow on the surface can be removed with additions of more absorbent.

Spill on Small to Medium Size Streams (Fast-Flowing Creeks)

- **Containment Methods**

The techniques used for product containment on fast-flowing shallow streams are quite different from the ones used on lakes, ponds, or other still bodies of water. The containment and removal processes require a calm stretch of water to allow the product to separate onto the surface of the water. If a calm stretch of water does not exist naturally, a deep slow-moving area should be created by damming. The dam can be constructed by using sandbags, planks or earth. If a dam is required, it should be situated at an accessible point where the stream has high enough banks. The dam should be constructed soundly and reinforced to support the product and water pressure.

  - Underflow dam - The underflow dam is one method that can be used, especially on small creeks. The water is released at the bottom, of the dam using a pipe or pipes which are laid during construction of the dam. The flow rate through the pipe must be sufficient to keep the dam from overflowing. One method is to lay the pipe at an angle through the dam (while dam is being constructed) so that the height of the downstream end of the pipe will determine the height the water will rise behind the dam.

  - Overflow dam - Another method of containment is the overflow type dam. The dam is constructed so that water flows over the dam, but a deep

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pool is created which slows the surface velocity of the water. Therefore, the condition of a calm stretch of water is met. The overflow dam may be used where larger flow rates (medium size creeks) of water are involved

With this type dam, a separate barrier (floating or stationary boom) must be placed across the pool created by the dam. The separate barrier arrests the surface layer of product. At the same time, the water is flowing under the barrier and over the top of the dam. The barrier should be placed at an angle of 45 % across the pool to decrease the effective water velocity beneath it. Also, it helps to concentrate the product at the bank and not all along the barrier. A second barrier should be placed approximately 10 to 15 feet downstream of the first one as a secondary back-up.

The stationary boom type barrier should be made of wood planks or other suitable material. The stationary boom should be soundly constructed and sealed against the bank. The ends of the planks can be buried in the banks of the stream and timber stakes driven into the stream bed for support as needed. The necessary length of the boom will be approximately 1-1/2 times the width of the waterway.

The plank boom should extend six to eight inches deep into the water and about two inches or higher above the water level. If the increase in velocity under the stationary boom is causing release of trapped product, it should be moved upward slightly. At no time should barrier be immersed more than 20% of the depth of the pool at the barrier location; that is, if the pool created by damming is three feet deep, do not exceed an immersion depth of seven inches with the barrier at the position the barrier is installed.

Another method used with the underflow dam is having the pipe or pipes sized to carry only a portion of the flow needed. The pipe would be placed at the bottom of the dam and level with the creek bed. The remaining flow of the creek could be siphoned or preferably pumped around the dam from a point away from the dam and from the deepest portion of the pool. The pumping or siphoning can be controlled to maintain the desired water level at the dam. The key is the removal of water through or around the dam at the lowest point in the basin. This prevents the oil from escaping with the released water.

A floating boom can be used in place of the stationary type if the created pool?s size (bank to bank) and depth will permit. Since changing the depth and/or length of a standard floating boom in a small stream is difficult, the use of the separation of product and water. The advantages of using a floating boom are the speed of deployment and the fact that there is not need for additional support as with the stationary boom.

- Multiple Impoundments - Since emergency built dams (either underflow or overflow) are seldom perfect, a series of dams is usually required. The first one or two will trap the bulk and the ones that are downstream will trap the last traces of product. Precautions should be taken to ensure that the foundations of emergency dams are not washed away by the released water. If earth is used to construct an overflow dam, a layer of earth-filled bags should be placed on top of the dam so erosion will not

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take place. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

Once the containment dams are constructed, the problem or removal of the product from the water surface should be the prime consideration. The removal must be continuous or else build-up of product behind the dams or booms might lead to product escaping the traps.

The type of removal procedures used depends largely on the amount of product being trapped in a given span of time, if the amount of product moving down the stream is of sufficient quantity, the first dam or fixed boom would quite possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and possibly some water to a tank truck or other holding tank. Separated water may be released from the bottom of the tank truck if it becomes necessary. The absorbents could then be used at downstream dams or booms. It is inadvisable to place an absorbent in the stream prior to or at the first dam in anticipation of the arriving product. Let the product accumulate at the first dam and use the floating skimmer to recover the product.

Disposal of gross amount of product-soaked absorbent would not then be a problem. Follow directions on use of each absorbent. Some are designed to be placed on water before product arrives; others are intended only to be placed on the product after it accumulates on the water. Plastic sheets should be used to place the product- soaked absorbent on as it is hand skimmed from the water. Alternatively, the material may be placed in drums or lined roll-off boxes.

The containment and removal of spilled product on small to medium fast-flowing streams might require a combination of underflow or overflow dams, fixed booms, skimmers, and absorbents, to ensure a complete cleanup.

Spill on Large Streams and Rivers

- **Containment Methods**

The containment techniques differ considerably on large streams and rivers versus small streams. First, the smooth calm area of water necessary for product-water separation must be found along the stream or river rather than making one as with small streams. Floating booms (rather than fixed booms or dams) must be used to trap the surfaced product.

Local conditions of current and wind must be considered when selecting the site for the boom. A point with a low water velocity near the bank, sufficient depth to operate the product removal equipment, and good access are required. The fact that wind may tend to concentrate the product against one bank must be considered. A smooth, undisturbed area of water is required immediately upstream of the boom to ensure that the product has opportunity to separate out onto the surface. The boom should be positioned where the current is at a minimum. It is more effective to boom at a wide, slow position than on a narrow, fast stretch of water.

If the boom are positioned straight across a river or stream, at right angles to

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the flow, surface water tends to dive beneath the barrier (boom) when current velocities exceed about ½ knot (0.8 ft./sec.). However, if the current of the entire river is ½ knot or less, then a boom can be positioned straight across the river or large stream, but angled slightly in relation of the banks. By placing the boom at an angle to the banks, product on the surface is diverted along the boom to the side of the river.

The current velocity is usually much slower near the river bank than in the center and the product will move along the boom toward the bank for removal. A water-tight seal between the bank and the boom is essential. A secondary boom should be set up immediately downstream of the first one to capture the amounts that escape the upstream boom. A boom can be employed parallel to the river flow at the bank to form the seal with the booms used to trap the product.

Where the current velocity of the chosen site exceeds ½ knot, the boom should be positioned in two smooth curves from a point of maximum velocity (usually the center of the river) to both banks. However, this double-boom required product to be removed from both sides of the river. To determine the appropriate angle of boom placement and support (mooring) needed to hold the booms in position, the current velocity should be measured by timing a floating object which is 80% submerged over a distance of 100 feet. A time of 60 seconds over this distance indicates a water current of approximately 1 knot.

For currents from 1 to 2.5 knots (1.7 to 4.2 ft./sec.), the more the boom will have to be angled acute to the bank. The length of the boom will have to be such to reach the center of the river. For currents between ½ and 1 knot (0.8 and 1.7 ft./sec.), the angle of employment can be enlarged.

The major load on the boom is taken by the terminal moorings, particularly the one in the center of the river. However, intermediate moorings are also required both to maintain the smooth curve of the boom to prevent breaking of the boom and to assist with preventing skirt deflection. The intermediate moorings are preferably positioned every 25 feet and must be adjusted to avoid the formation of indentations in the boom profile. These trap product in pockets, prevent its deflection to the bank, and also encourage diving currents. The moorings? ropes should be five times the water depth.

In certain situations, it might be advantageous to position booms to deflect the approaching spilled product to a slower moving area. Naturally, additional booms would have to be positioned around this slower moving area prior to deflecting the product to the area. This approach has been used along river which has lagoons, etc., with a very low current action. The recovery would take place in the lagoons and not along the river bank. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

The product collected upstream of the floating booms in a large stream or river should be removed from the water surface as it accumulates. Regular suction equipment, a floating skimmer, and/or absorbents (including absorbent booms) should be used to remove the product as appropriate to the quantity being trapped in a given span of time. If the amount moving down the stream is of

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sufficient quantity, the primary floating boom would possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and some water to a tank truck or other holding tank.

The absorbents would then be used upstream of the secondary boom to absorb the underflow from the primary boom. An absorbent boom can also be placed between the primary and secondary booms to help the other absorbents control the underflow from the primary boom.

It is best to hand skim the saturated absorbents and place on plastic sheets. However, if the absorbent used can be pumped after product absorption and speed of removal is a necessity, the floating skimmer can be used to remove the product-soaked absorbent.

The disadvantage of pumping the product-soaked absorbent to a truck is the volume that will accumulate (skimmer will pump excess water) and the disposal problems associated with the large water/product-soaked absorbent mixture.

Spill on Stream which Flows into Lake or Pond

In certain locations where streams (small and large ones) flow into lakes or ponds at relatively short distances, it is conceivable that a spill could reach the lake before containment and recovery operations are set up. If time permits for containment operations to be set up on the stream in question, it then would be handled as described above depending upon the stream size involved.

However, if product in the stream is near the lake site or if product is flowing into the lake with a significant amount yet to arrive, a different containment should be employed.

- **Containment Methods**

Product on a stream flowing into a lake should be boomed as close to the entrance as possible. The boom should be positioned on the lake at an angle to the residential stream current so as to direct the surface water to a slower moving area. The area where the product is being deflected should be enclosed by booms to contain it. An additional boom for sweeping the product to the bank will be required. This area of containment should not have a current velocity of more than 1/2 knot (0.8 ft./sec.), preferably less. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

The removal of product from the lake or pond?s surface would be handled as described earlier.

For sizable releases, collected product will usually be pumped into tank trucks and transported to a storage facility. Tank trucks are available at several locations throughout.

Spill in Urban Areas

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Oil spills in urban areas can greatly impact recreational use, human health, wildlife habitat(s), and potential beach or park closures. Manmade structures along waterways require unique protection strategies. Manmade structures could include vertical shore protection structures such as seawalls, piers, and bulkheads, as well as riprap revetments and groins, breakwaters, and jetties. Vertical structures can be constructed of concrete, wood, and corrugated metal. They usually extend below the water surface, although seawalls can have beaches or riprap in front of them. These structures are very common along developed shores, particularly in harbors, marinas, and residential areas. The range in degree of exposure to waves and currents varies widely, from very low in dead-end canals, to very high on offshore breakwaters. Boat wakes can generate wave energy in otherwise sheltered areas. Maintaining shipping or other kinds of vessel traffic through navigation channels or waterways during a spill response is a difficult consideration because there is usually economic and political pressure to re-establish normal operations as soon as possible. This consideration extends to vehicular traffic through urban areas. Deploying booms and skimmers or constructing recovery sites can conflict with such traffic for several days. Also, passage of deep-draft vessels through the waterway can suddenly change water level and flow or create wakes, causing booms to fail. For these reasons, recovery efforts must be coordinated through the Unified Command to ensure the cooperation of all parties involved.

- **Containment Methods**

  Containment techniques in an urban area depend greatly on the ability to deploy equipment due to obstacles presented by the urban area. Most booming and containment techniques will work with slight modifications such as direct anchoring instead of the use of booming buoys. Often, debris and other obstacles cause gaps in containment or clog up the flow of oil in diversion booming. Vessel traffic can also cause containment to fail, due to splash over from vessel wakes.

- **Removal Methods**

  Normal recovery techniques work when recovering oil in an urban area. However, recovery can be hampered by several situations. Floating debris clogging skimming equipment is the main cause for low recovery rates. Another problem for recovery in an urban area is lack of storage space. Often traffic problems or lack of access prevent storage equipment such as frac tanks and vacuum trucks from approaching the recovery zone.

Spill Under Ice

- **Containment Methods**

  The traditional strategy for dealing with oil under the ice in a river or lake is to cut a slot to aid in recovery. Ice slots can be cut using chain saws, handsaws, ice augers or some form of trencher. Another effective variation of this technique is the diversionary plywood barrier method which is also discussed below. See Figure 6.1 for on-water decision tree.

- **Removal Methods**

  Ice slotting is a very basic technique used to gain access to oil trapped beneath

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the ice. In ice slotting, a J shaped outline is sketched into the ice at a 30 degree angle to the current. The slight J hook or curve is necessary at the upstream side to provide flow towards the recovery area. In general, the slot width should be 1.5 times the thickness of the ice. Remember, a block of ice is heavy and the width of the slot must be taken into consideration so it can be safely removed or pushed under if the water beneath the ice is sufficiently deep. The length of the slot will be determined by the width of the river and strategy.

This technique is a successful strategy to implement. However, there are a few pit falls to be aware off. First, responders will fatigue rapidly if required to cut the slot or slots by hand using a chain saw or hand held saw. This can present a problem if there are not a sufficient number of Hazmat technicians available. Secondly, when cutting with chain saws, large volumes of water are kicked up by the moving chain onto the responder. This is a safety problem when the responders get wet in extreme cold weather conditions. Wearing rain gear however can reduce this problem.

A second technique is to slot the ice and use plywood to help divert oil beneath the ice to a recovery area. This technique is called the diversionary plywood barrier method. In this technique, a narrow slot is made through the ice and 4' x 8' sheets of plywood or equivalent are dropped into the slot to create a barrier and force the oil to follow along it to the collection area. This is the same principal employed when using floating boom.

The slot can be cut or drilled depending on the equipment available at the time of the response. If drilling is required, a gas powered ice auger can be used. In this scenario a series of 8" or 10" holes are drilled next to each other in the J pattern.

A chain saw can be used to connect the holes if an ice bridge exists between two auger holes. After the ice auguring is complete, plywood can be dropped into the augured slot.

Again, river ice is dirty and chipper blades on the augers may only last long enough to complete a single auger hole. This technique requires a large inventory of chipper blades. Extra auger flights can be used, which reduces down time to change blades. A real plus to slotting the ice with an ice auger is the limited exposure of responders to water. The water is generally restricted to the area around the responder's feet.

If an ice auger is not available, a chain saw can be used to cut a narrow slot. After the slot has been cut and ice removed, plywood can be inserted. When using a chainsaw that makes a 3/8" cut, a 1/8"-1/4" plywood or outdoor siding can be inserted into the slot and effectively be used to create the barrier. Again, the down side when using a large chain saws is fatigue and splash from water being kicked up by the chain. However, this problem is not as bad as cutting large slots as described above. Since only a single slot is made, the number of responders can be reduced and extra personal protective equipment in the form of rain gear can be used to minimize the water splash.

Spill on Ice

When managing an oil spill on ice special consideration must be given to several safety factors. Thickness of the ice and general accessibility of equipment must be

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considered when planning for on- ice recovery. Ice that is too thin to safely traverse or broken ice may prevent active recovery.

- **Containment Methods**

  For ice-covered on-land or on- water spills, snow or earthen berms may be constructed to contain oil around the leak, if terrain permits. Dikes filled with sorbent materials may be used on spills in smaller streams to create a manmade dam to prevent the further migration of the oil.

  Oil may become encapsulated due to melting and refreezing of the ice. Oil may then be more difficult to access and remove. See Figure 6.1 for on-water recovery decision tree.

- **Removal Methods**

  Generally, on-ice recovery consists of the manual removal of the product from the spill site. If conditions permit, vacuum trucks or suction pumps may be used to remove pools of oil that may have collected. Often, product removal will be done by hand using brooms, shovels and rakes. Manually moving the oil/snow mixture into piles for collection where it is either vacuum or manually collected into storage containers.

Spill in Wetland Areas

Wetlands, which include upland and inland marshes, swamps and bogs, are highly sensitive to spills because they collect run-off from surrounding environments, and because they are home to many commercially and ecologically important species. Wetlands are very susceptible to damage and are a high priority to protect. Precautions should be taken so that the recovery effort does not cause more damage than that cause by the release.

- **Containment Methods**

  Containment booms can be strategically deployed to contain or divert the product into recovery areas where skimmers and vacuums can be used to remove the product. Berms can also be built to contain or divert the product. Consideration must be given to the damage that can be caused by holding the product in the wetland areas. Often, allowing the product to flow to natural collection areas and possibly assisting the flow by the use of high volume low pressure water pumps may be the best course of action.

- **Removal Methods**

  Skimmers and vacuums can be deployed to recover contained oil. Other acceptable response techniques might include bioremediation, sorbents and in-situ burning. The use of heavy equipment is often not practical because of the damage it can cause to plant and animal life. During recovery, specially designed flat bottom shallow draft vessels and the use of plywood or boards may be used to reduce the damage caused by recovery personnel. If the water table is high and the oil will not permeate the soil, shallow trenches may be dug to collect oil for removal.

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The Unified Command must balance the need to remove the product with the damage caused by active removal. Considerations for long term passive recovery should be considered.

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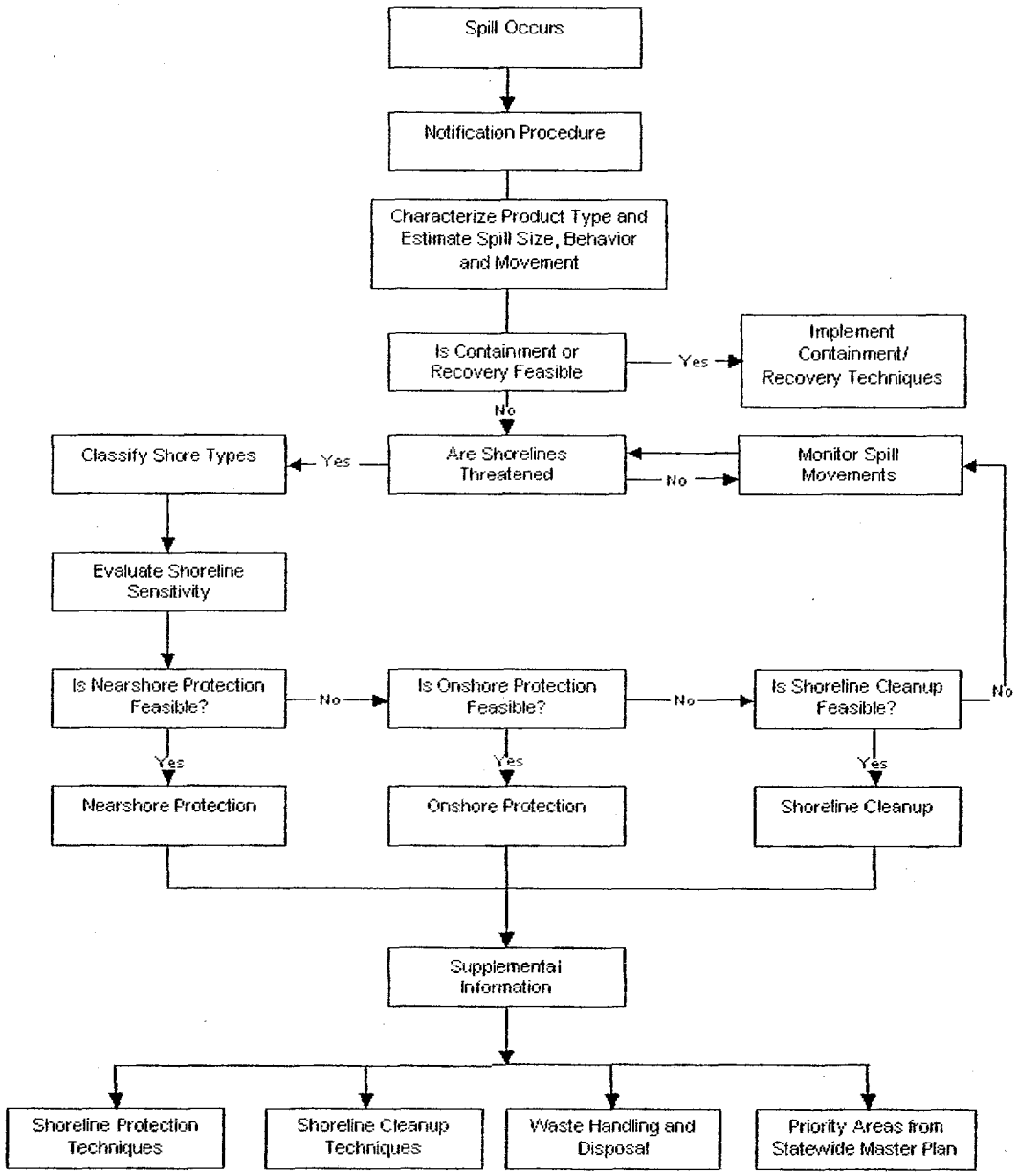
FIGURE 6.1
ON-WATER RESPONSE FLOWCHART



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6.6 VULNERABILITY ANALYSIS

The thorough examination of published Area Contingency Plans (ACPs) was conducted to identify sensitive areas in all the response zones.

The Environmental Sensitivity Maps located in Figure 6.2 identify sensitive areas along the Pipeline. The appropriate Area Contingency Plan maps are also included to provide more detailed information on sensitivities and possible potential response options.

6.7 ALTERNATIVE RESPONSE STRATEGIES

There are no pre-approved response options for inland spills within the United States. Any plans to use dispersants or in situ burn by the Company will be submitted to the Federal On-Scene Coordinator for Regional Response Team approval prior to such action being taken.

IN SITU BURNING

When considering the use of in situ burning the following considerations should be evaluated. In most cases, an agency application with further considerations will need to be completed before burning will be approved by the agency.

Size, Nature, and Product Spilled

- Flammability of the product. (Will the product burn?)
- Location of spill. (Distance and direction to nearest human use areas.)
- Volume of product released.
- Estimate of the surface area covered by the spill.
- How long has oil been exposed?
- Will burning cause more hazardous by-products?

Weather and Forecast

- Current weather conditions. (Rain / Heat)
- Wind speed and direction.
- 24 hour forecast.
- 48 hour forecast.

Evaluate the Response Operations

- Is there time enough to conduct burning?
- Is safety equipment available?
- Is adequate personnel available for monitoring / emergency response?
- Is mechanical recovery more intrusive than burning?

Habitats Impacted and Resources at Risk

- Have local agency / Officials been contacted.
  - Public Health
  - Land Owner / Manager
  - Local Fire Management (Fire Marshall)
  - Historic Property Specialist
  - Province / State Resource Agency
  - Aboriginal / Native American interests
- What is / will be the impact to surface water intakes and wells.

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- Are endangered habitats / endangered species present?
- Is area used by Migratory Animals?
- What wildlife is present?

Burn Plan

- How much of the oil is expected to burn?
- How long will it be expected to burn?
- How will burn be ignited?
- How will burn be extinguished?
- How will burned oil residue be collected?
- What are the monitoring protocols?

DISPERSANT USE

Dispersants are not commonly used on inland spills. Working closely with Federal, Province / State and local agencies will be necessary for gaining approval to use dispersants. Since dispersants do not eliminate the oil, only break up and spread the oil throughout the water column, it is important to look at the total effect the oil will have on the environment while considering the use of dispersants.

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FIGURE 6.2
ENVIRONMENTAL SENSITIVITY MAPS

Remember these maps are to be utilized as guidelines only. During a real response effort Federal, Province/State, and local agencies should be contacted to provide further assistance in the proper identification and protection of the various environmental and socio-economic sensitive areas

Canada ESM Map 1
Canada ESM Map 2
Canada ESM Map 3
Canada ESM Map 4
Canada ESM Map 5
Canada ESM Map 6
Canada ESM Map 7
Canada ESM Map 8
Canada ESM Map 9
Canada ESM Map 10
Canada ESM Map 11
Canada ESM Map 12
Canada ESM Map 13
Canada ESM Map 14
Canada ESM Map 15
Canada ESM Map 16
Canada ESM Map 17
Canada ESM Map 18
Canada ESM Map 19
Canada ESM Map 20
Canada ESM Map 21
Canada ESM Map 22
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Canada ESM Map 26
Canada ESM Map 27
Canada ESM Map 28
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US ESM Map 2
US ESM Map 3
US ESM Map 4
US ESM Map 5
US ESM Map 6
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US ESM Map 8
US ESM Map 9
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US ESM Map 17
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USL Map 12
USL Map 12A2
USL Map 12A3
USL Map 12C2
USL Map 12D2
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USL Map 19
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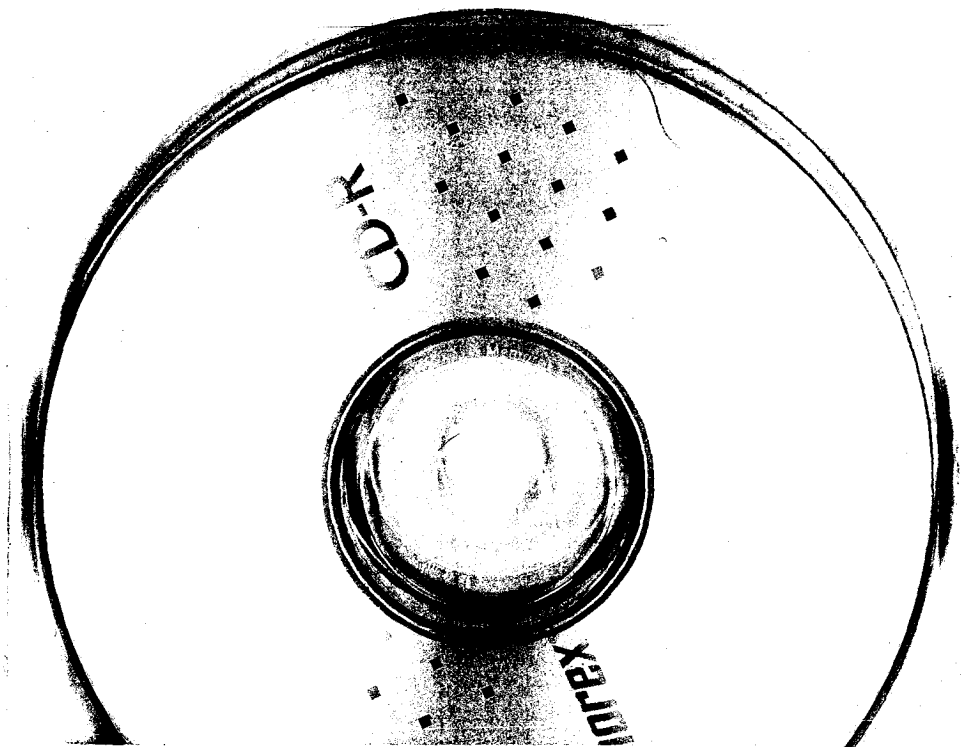

TransCanada Keystone Limited Partnership
TC Oil Pipeline Operations Inc.
Keystone Pipeline System
Emergency Response Plan
Environmental Sensitivity Maps
October 2008

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FIGURE 6.3

ENDANGERED/THREATENED SPECIES LISTING

Canada

Common Name	Scientific Name
Animals	
Burrowing Owl	*Athene cunicularia*
Olive-backed Pocket Mouse	*Perognathus fasciatus*
Long-billed Curlew	*Numenius americanus*
Short-eared Owl	*Asio flammeus*
Northern Leopard Frog	*Rana pipiens*
Sprague's Pipit	*Anthus spragueii*
Plants	
Bushy cinquefoil	*Potentilla paradoxa*
Chaffweed	*Anagallis minima*
Common tickseed	*Coreopsis tinctoria*
Dillen's wood sorrel	*Oxalis dillenii*
Endolepis	*Atriplex suckleyi*
Few-flowered aster	*Aster pauciflorus*
Few-flowered salt-meadow grass	*Torreyochloa pallida var pauciflora*
Lance-leaved loosestrife	*Lysimachia hybrida*
Little-seed rice grass	*Oryzopsis micrantha*
Low townsedia	*Townsendia exscapa*
Nevada rush	*Juncus nevadensis*
Pale blue-eyed grass	*Sisyrinchium septentrionale*
Rush-pink	*Stephanomeria runcinata*
Salt-marsh sand spurry	*Spergularia salina*
Short-stalk mouse-ear chickweed	*Cerastium brachypodum*
Shrubby evening-primrose	*Calylophus serrulatus*
American pellitory	*Parietaria pensylvanica*
American lopseed	*Phryma leptostachya*
Fox sedge	*Fox sedge*
Honewort	*Cryptotaenia canadensis*
Rice cutgrass	*Leersia oryzoides*
Yellow water crowfoot	*Ranunculus flabellaris*
Other	
None Listed	

Illinois

Common Name	Scientific Name
Animals	
Bald Eagle	*Haliaeetus leucocephalus*
Loggerhead Shrike	*Lanius ludovicianus*
Indiana Bat	*Myotis sodalis*
Black-crowned Night Heron	*Nycticorax nycticorax*
Eastern Massasauga	*Sistrurus catenatus catenatus*

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Western Sand Darter	*Ammocrypta clarum*
Kirtland's Snake	*Clonophis kirtlandi*
Least Bittern	*Lxobrychus exilis*
Greater Prairie Chicken	*Tympanuchus cupido*
Barn Owl	*Tyto alba*
Lake Sturgeon	*Acipenser fulvescens*
Timber Rattlesnake	*Crotalus horridus*
Little Blue Heron	*Egretta caerulea*
Butterfly	*Ellipsaria lineolata*
Peregrine Falcon	*Falco peregrinus*
Common Moorhen	*Gallinula chloropus*
Bigeye Shiner	*Notropis boops*
Yellow-crowned Night Heron	*Nyctanassa violacea*
Illinois Chorus Frog	*Pseudacris streckeri*
Pallid Sturgeon	*Scaphirhynchus albus*
Royal Catchfly	*Silene regia*
Lined Snake	*Tropidoclonion lineatum*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Henslow's SparrowAmmodramus henslowii	*Ammodramus henslowii*
Short-eared Owl	*Asio flammeus*
Upland Sandpiper	*Bartramia longicauda*
Northern Harrier	*Circus cyaneus*
King Rail	*Rallus elegans*
Barn Owl	*Tyto alba*
Plants	
Prairie Rose Gentian	*Sabatia campestris*
Ear-leafed Foxglove	*Tomanthera auriculata*
Sedge	*Carex bromoides*
Fibrous-rooted Sedge	*Carex communis*
Drooping Sedge	*Carex prasina*
Blazing Star	*Liatris scariosa var. nieuwlandii*
Prairie Rose Gentian	*Sabatia campestris*
Grass-leaved Lily	*Stenanthium gramineum*
Ear-leafed Foxglove	*Tomanthera auriculata*
Spring Ladies' Tresses	*Spiranthes vernalis*
Prairie Spiderwort	*Tradescantia bracteata*
Decurrent False Aster	*Boltonia decurrens*
Other	
None Listed	

Kansas

Common Name	Scientific Name
Animals	
American Burying Beetle	*Nicrophorus americanus*
Bald Eagle	*Haliaeetus leucocephalus*
Eastern Spotted Skunk	*Spilogale putorius*
Eskimo Curlew	*Numenius borealis*
Least Tern	*Sterna antillarum*

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Peregrine Falcon	*Falco peregrinus*
Piping Plover	*Charadrius melodus*
Snowy Plover	*Charadrius alexandrinus*
Western Silvery Minnow	*Hybognathus argyritis*
Chestnut Lamprey	*Ichthyomyzon castaneus*
Flathead Chub	*Platygobio gracilis*
Pallid Sturgeon	*Scaphirhynchus albus*
Sicklefin Chub	*Macrhybopsis meeki*
Silver Chub	*Macrhybopsis storeriana*
Silverband Shiner	*Notropis shumardi*
Smooth Earth Snake	*Virginia valeriae*
Sturgeon Chub	*Macrhybopsis gelida*
Topeka Shiner	*Notropis topeka*
Whooping Crane	*Grus americana*
Sharp Hornsnail	*Pleurocera acuta*
Arkansas Darter	*Etheostoma cragini*
Arkansas River Shiner	*Notropis girardi*
Arkansas River Speckled Chub	*Macrhybopsis tetranema*
Flutedshell Mussel	*Lasmigona costata*
Plants	
None Listed	
Other	
None Listed	

Missouri

Common Name	Scientific Name
Animals	
Indiana Bat	*Myotis sodalis*
Bald Eagle	*Haliaeetus leucocephalus*
Pallid Sturgeon	*Scaphirhynchus albus*
Interior Least Tern	*Sterna antillarum athalassos*
Eastern Massasauga	*Sistrurus catenatus catenatus*
Spectaclecase	*Cumberlandia monodonta*
Plants	
Running Buffalo Clover	*Trifolium stoloniferum*
Decurrent False Aster	*Boltonia decurrens*
Other	
None Listed	

North Dakota

Common Name	Scientific Name
Animals	
Horned Grebe	*Podiceps auritus*
American White Pelican	*Pelecanus erythrorhynchos*
American Bittern	*Botaurus lentiginosus*
Swainson's Hawk	*Buteo swainsoni*

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Ferruginous Hawk	*Buteo regalis*
Yellow Rail	*Coturnicops noveboracensis*
Willet	*Catoptrophorus semipalmatus*
Upland Sandpiper	*Bartramia longicauda*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Wilson's Phalarope	*Phalaropus tricolor*
Franklin's Gull	*Larus pipixcan*
Black Tern	*Chlidonias niger*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Sprague's Pipit	*Anthus spragueii*
Grasshopper Sparrow	*Ammodramus savannarum*
Baird's Sparrow	*Ammodramus bairdii*
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsonii*
Lark Bunting	*Calamospiza melanocorys*
Chestnut-collared Longspur	*Calcarius ornatus*
Canadian Toad	*Bufo hemiophrys*
Plains Spadefoot	*Spea bombifrons*
Smooth Green Snake	*Liochlorophis vernalis*
Western Hognose Snake	*Heterodon nasicus*
Black-tailed Prairie Dog	*Cynomys ludovicianus*
Sturgeon Chub	*Macrhybopsis gelida*
Sicklefin Chub	*Macrhybopsis meeki*
Pearl Dace	*Margariscus margarita*
Blue Sucker	*Cycleptus elongatus*
Northern Pintail	*Anas acuta*
Canvasback	*Aythya valisineria*
Redhead	*Aythya americana*
Northern Harrier	*Circus cyaneus*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Prairie Falcon	*Falco mexicanus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Greater Prairie Chicken	*Tympanuchus cupido*
Greater Sage-grouse	*Centrocercus urophasianus*
Piping Plover	*Charadrius melodus*
American Avocet	*Recurvirostra americana*
Least Tern	*Sterna antillarum*
Short-eared Owl	*Asio flammeus*
Burrowing Owl	*Athene cunicularia*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Loggerhead Shrike	*Lanius ludovicianus*
Sedge Wren	*Cistothorus platensis*
Dickcissel	*Spiza americana*
Le Conte's Sparrow	*Ammodramus leconteii*
Bobolink	*Dolichonyx oryzivorus*
Common Snapping Turtle	*Chelydra serpentina*
Short-horned Lizard	*Phrynosoma douglassi*
Northern Redbelly Snake	*Storeria occipitomaculata*
Pygmy Shrew	*Sorex hoyi*
Richardson's Ground Squirrel	*Spermophilus richardsonii*
Swift Fox	*Vulpes velox*

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River Otter	*Lutra canadensis*
Black-footed Ferret	*Mustela nigripes*
Paddlefish	*Polyodon spathula*
Pallid Sturgeon	*Scaphirhynchus albus*
Silver Chub	*Macrhybopsis storeriana*
Northern Redbelly Dace	*Phoxinus eos*
Flathead Chub	*Platygobio gracilis*
Trout-perch	*Percopsis omiscomaycus*
Threeridge	*Amblema plicata*
Wabash Pigtoe	*Fusconaia flava*
Mapleleaf	*Quadrula quadrula*
Black Sandshell	*Ligumia recta*
Creek Heelsplitter	*Lasmigona compressa*
Pink Heelsplitter	*Potamilus alatus*
Whooping Crane	*Grus americana*
Peregrine Falcon	*Falco peregrinus*
Brewer's Sparrow	*Spizella breweri*
McCown's Longspur	*Calcarius mccownii*
Smooth Softshell Turtle	*Apalone mutica*
False Map Turtle	*Graptemys pseudogeographica*
Northern Prairie Skink	*Eumeces septentrionalis*
Northern Sagebrush Lizard	*Sceloporus graciosus*
Arctic Shrew	*Sorex arcticus*
Western Small-footed Myotis	*Myotis ciliolabrum*
Long-eared Myotis	*Myotis evotis*
Long-legged Myotis	*Myotis volans*
Plains Pocket Mouse	*Perognathus flavescens*
Hispid Pocket Mouse	*Chaetodipus hispidus*
Sagebrush Vole	*Lemmiscus curtatus*
Eastern Spotted Skunk	*Spilogale putoris*
Gray Wolf	*Canis lupis*
Chestnut Lamprey	*Ichthyomyzon castaneus*
Silver Lamprey	*Ichthyomyzon unicuspis*
Central Stoneroller	*Campostoma anomalum*
Hornyhead Chub	*Nocomis biguttatus*
Pugnose Shiner	*Notropis anogenus*
Blacknose Shiner	*Notropis heterolepis*
Rosyface Shiner	*Notropis rubellus*
Finescale Dace	*Phoxinus neogaeus*
Yellow Bullhead	*Ameiurus natalis*
Flathead Catfish	*Pylodictis olivaris*
Logperch	*Percina caprodes*
River Darter	*Percina shumardi*
Pink Papershell	*Potamilus ohiensis*
Plants	
None Listed	
Other	
None Listed	

Nebraska

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Common Name	Scientific Name
Animals	
Eskimo Curlew	*Numenius borealis*
Whooping Crane	*Grus americana*
Interior Least Tern	*Sterna antillarum athalassos*
Bald Eagle	*Haliaeetus leucophalus*
Piping Plover	*Charadrius melodus*
Mountain Plover	*Charadrius montanus*
Black-footed Ferret	*Mustela nigripes*
Swift Fox	*Vulpes velox*
River Otter	*Lutra canadensis*
Southern Flying Squirrel	*Glaucomys volans*
Black-tailed Prairie Dog	*Cynomys ludovicianus*
Pallid Sturgeon	*Scaphirhyncus albus*
Topeka Shiner	*Notropis topeka*
Sturgeon chub	*Macrhybopsis gelida*
Blacknose shiner	*Notropis heteropis*
Lake sturgeon	*Acipenser fulvescens*
Northern Redbelly Dace	*Phoxinus eos*
Finescale Dace	*Phoxinus neogaeus*
American Burying Beetle	*Nicrophorus americanus*
Massasauga	*Sistrurs catenatus*
Scaleshell Mussel	*Leptodea leptodon*
Plants	
Hayden's (blowout) penstemon	*Penstemon haydenii*
Colorado Butterfly Plant	*Gaura neomexicana coloradensis*
Saltwort	*Salicornia rubra*
Western Prairie Fringed Orchid	*Platanthera praeclara*
Ute Lady's Tresses	*Spiranthes diluvialis*
Ginseng	*Panax quinquefolium*
Small White Lady's Slipper	*Cypripedium candidum*
Other	
None Listed	

South Dakota

Common Name	Scientific Name
Animals	
American Burying Beetle	*Nicrophorus americanus*
Scaleshell	*Leptodea leptodon*
Higgins Eye	*Lampsilis higginsii*
Dakota Skipper	*Hesperia dacotae*
Banded Killifish	*Fundulus diaphanus*
Blacknose Shiner	*Notropis heterolepis*
Finescale Dace	*Phoxinus neogaeus*
Longnose Sucker	*Catostomus catostomus*
Northern Redbelly Dace	*Phoxinus eos*
Pallid Sturgeon	*Scaphirhynchus albus*

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Pearl Dace	*Margariscus margarita*
Sicklefin Chub	*Macrhybopsis meeki*
Sturgeon Chub	*Macrhybopsis gelida*
Topeka Shiner	*Notropis topeka*
Eastern Hognose Snake	*Heterodon platirhinos*
False Map Turtle	*Graptemys pseudogeographica*
Lined Snake	*Tropidoclonion lineatum*
American Dipper	*Cinclus mexicanus*
Bald Eagle	*Haliaeetus leucocephalus*
Eskimo Curlew	*Numenius borealis*
Interior Least Tern	*Sterna antillarum athalassos*
Osprey	*Pandion haliaetus*
Peregrine Falcon	*Falco peregrinus*
Piping Plover	*Charadrius melodus*
Whooping Crane	*Grus americana*
Black-footed Ferret	*Mustela nigripes*
Gray Wolf	*Canis lupus*
River Otter	*Lontra canadensis*
Swift Fox	*Vulpes velox*
Western Prairie Fringed Orchid	*Platanthera praeclara*
Plants	
None Listed	
Other	
None Listed	

Note: Country and Province information is maintained separately from the plan for emergency responder use.

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FIGURE 6.4

AQUIFERS		
NAME	COUNTY/STATE	PROVINCE
Johsbourgh Valley & Empress	-----	SK
Buried Sand Gravel		
Swift Current Valley	-----	SK
Gravebourgh Valley	-----	SK
Neidpath Valley	-----	SK
Condie Moraine	-----	SK
Great Sand Hills	-----	SK
Upper Foral Formation Sands and Gravels	-----	SK
Empress Buried Valley Group	-----	SK
Aquifers and Interglacial Aquifers		SK
Judith River Formation		SK
Winkler	-----	MB
Pembina River	Cavalier & Pembina, ND	-----
Icelandic	Cavalier, Pembina, ND	-----
Pembina Delta	Cavalier, Pembina, ND	-----
Edinburgd	Pembina & Walsh, ND	-----
Eliot	Ransom, ND	-----
Englevale	Sargent, ND	-----
Spiritwood A.D. System	Sargent, ND	-----
Brampton	Sargent, ND	-----
High Plains	Nebraska	-----
Lower Cretaccous	Marshall, Kansas	-----
Ozark Plateaus	Missouri	-----
Missippian	Madison, Illinois	-----

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FIGURE 6.5

US ENVIRONMENTAL SENSITIVE AREAS			
USA ID	TYPE	ORGANIZATION	Ua Sheet
1	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
4	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
44	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
46	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
51	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
53	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
57	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
234	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
256	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
261	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
262	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
267	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
268	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
269	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
270	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
271	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
272	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
273	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
280	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
310	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
319	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
320	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
328	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
329	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
330	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
348	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
351	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
356	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
357	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
358	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
359	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
360	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
361	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
369	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
398	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
405	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
406	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 16
423	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
424	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
425	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
426	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
427	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
452	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
470	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
471	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
472	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
473	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
474	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
500	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
562	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 15

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564	ECO	South Dakota Natural Heritage Database	U.S. Map sheet 13
8	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
23	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
219	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
224	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
282	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
283	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
421	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
422	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
583	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 24
584	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 24
622	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
623	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
658	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
659	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
660	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
668	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
695	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
785	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
786	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
793	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
829	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
830	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
831	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
839	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 16
915	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 18
924	ECO	Nebraska Natural Heritage Program	U.S. Map sheet 19
569	ECO	North Dakota Natural Heritage Program	U.S. Map sheet 7
2	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
3	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
8	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
12	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
13	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
21	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
22	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
83	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 36
85	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
86	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
87	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
404	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
656	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
657	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
658	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
659	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
660	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
730	ECO	Missouri Natural Heritage Program	U.S. Map sheet 31
731	ECO	Missouri Natural Heritage Program	U.S. Map sheet 32
738	ECO	Missouri Natural Heritage Program	U.S. Map sheet 28
739	ECO	Missouri Natural Heritage Program	U.S. Map sheet 28
747	ECO	Missouri Natural Heritage Program	U.S. Map sheet 32
748	ECO	Missouri Natural Heritage Program	U.S. Map sheet 32
755	ECO	Missouri Natural Heritage Program	U.S. Map sheet 32

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768	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
778	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
779	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
781	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
782	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
786	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
787	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
791	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
908	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
910	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
913	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
917	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
923	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1060	ECO	Missouri Natural Heritage Program	U.S. Map sheet 32
1064	ECO	Missouri Natural Heritage Program	U.S. Map sheet 28
1178	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1180	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1181	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1183	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1184	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
1	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
2	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
4	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
7	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
164	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 24
187	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 24
194	ECO	Kansas Natural Heritage Inventory	U.S. Map sheet 27
265	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
266	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
268	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
269	ECO	Missouri Natural Heritage Program	U.S. Map sheet 27
32	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 36
43	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
44	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
49	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
162	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
171	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
172	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
173	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
174	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
175	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
198	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
210	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
232	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 35
240	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
241	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
242	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
243	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
311	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 38
461	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 38
464	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 38
506	ECO	Illinois Natural Heritage Database Program	U.S. Map sheet 38

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555	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
561	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
563	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
564	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
565	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36
566	ECO	Missouri Natural Heritage Program	U.S. Map sheet 36

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US HIGH POPULATED AREAS				
FEA ID	NAME	COUNTY NAME	STATE NAME	Map Sheet
737	St. Joseph, MO--KS	Buchanan	Missouri	U.S. Map Sheet 27
887	Alton, IL	Madison	Illinois	U.S. Map Sheet 36
888	St. Louis, MO--IL	Madison	Illinois	U.S. Map Sheet 36

US POPULATED AREAS				
FEA ID	NAME	COUNTY NAME	STATE NAME	Map Sheet
4048	Yankton	Yankton	South Dakota	U.S. Map Sheet 16
4150	Roswell	Miner	South Dakota	U.S. Map Sheet 13
4204	Iroquois	Kingsbury	South Dakota	U.S. Map Sheet 12
4220	Menno	Hutchinson	South Dakota	U.S. Map Sheet 15
4323	Raymond	Clark	South Dakota	U.S. Map Sheet 11
9956	Hoskins	Wayne	Nebraska	U.S. Map Sheet 18
9957	Sholes	Wayne	Nebraska	U.S. Map Sheet 17
10011	Seward	Seward	Nebraska	U.S. Map Sheet 21
10369	Leigh	Colfax	Nebraska	U.S. Map Sheet 19
10405	Randolph	Cedar	Nebraska	U.S. Map Sheet 17
10429	Garrison	Butler	Nebraska	U.S. Map Sheet 20
10526	Lankin	Walsh	North Dakota	U.S. Map Sheet 3
10639	Walhalla	Pembina	North Dakota	U.S. Map Sheet 1
12318	Renick	Randolph	Missouri	U.S. Map Sheet 32
12480	Middletown	Montgomery	Missouri	U.S. Map Sheet 34
12556	Cave	Lincoln	Missouri	U.S. Map Sheet 34
12560	Moscow Mills	Lincoln	Missouri	U.S. Map Sheet 35
12561	Old Monroe	Lincoln	Missouri	U.S. Map Sheet 35
12563	Troy	Lincoln	Missouri	U.S. Map Sheet 34
12832	Gower	Clinton	Missouri	U.S. Map Sheet 28
12836	Plattsburg	Clinton	Missouri	U.S. Map Sheet 28
12877	Brunswick	Chariton	Missouri	U.S. Map Sheet 30
12880	Keytesville	Chariton	Missouri	U.S. Map Sheet 31
12952	Cowgill	Caldwell	Missouri	U.S. Map Sheet 29
12955	Kingston	Caldwell	Missouri	U.S. Map Sheet 29
12961	Agency	Buchanan	Missouri	U.S. Map Sheet 27
12965	Gower	Buchanan	Missouri	U.S. Map Sheet 28
16649	Severance	Doniphan	Kansas	U.S. Map Sheet 26
16754	Robinson	Brown	Kansas	U.S. Map Sheet 26
17901	Vernon	Marion	Illinois	U.S. Map Sheet 38
18793	Keyesport	Bond	Illinois	U.S. Map Sheet 38
18797	Pierron	Bond	Illinois	U.S. Map Sheet 37
18798	Pocahontas	Bond	Illinois	U.S. Map Sheet 37

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US DAMS				
DAM NAME	COUNTY	RIVER	STATE	Map Sheet
UNNAMED	DONIPHAN	TR-MISSOURI RIVER	KS	U.S. Map Sheet 27
KSNONAME 4213	DONIPHAN	TR BRUSH CREEK	KS	U.S. Map Sheet 27
UPPER TURTLE R FLD RET #2	GRAND FORKS	SKUNK COULEE	ND	U.S. Map Sheet 3

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US LAKES		
NAME	ST	Map Sheet
Lake Ashtabula	ND	U.S. Map Sheet 5
Lone Tree Lake	ND	U.S. Map Sheet 7
Carlyle Lake	IL	U.S. Map Sheet 38

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US RIVERS & STREAMS			
FEATURE	NAME	STATE	Map Sheet
Stream	Pembina River	ND	U.S. Map Sheet 1
Stream	Tongue River	ND	U.S. Map Sheet 2
Stream	Carl Creek	ND	U.S. Map Sheet 2
Stream	North Branch Park River	ND	U.S. Map Sheet 2
Stream	Middle Branch Park River	ND	U.S. Map Sheet 2
Stream	South Branch Park River	ND	U.S. Map Sheet 2
Stream	North Branch Forest River	ND	U.S. Map Sheet 3
Stream		ND	U.S. Map Sheet 3
Stream	Middle Branch Forest River	ND	U.S. Map Sheet 3
Stream	South Branch Forest River	ND	U.S. Map Sheet 3
Stream Intermittent	Skunk Coulee	ND	U.S. Map Sheet 3
Stream Intermittent	North Branch Turtle River	ND	U.S. Map Sheet 3
Stream Intermittent	Goose Creek	ND	U.S. Map Sheet 4
Stream	Goose River	ND	U.S. Map Sheet 4
Stream	Sheyenne River	ND	U.S. Map Sheet 7
Stream Intermittent	Crow Creek	SD	U.S. Map Sheet 9
Stream Intermittent		SD	U.S. Map Sheet 9
Stream Intermittent	Antelope Creek	SD	U.S. Map Sheet 9
Stream Intermittent		SD	U.S. Map Sheet 10
Stream	Mud Creek	SD	U.S. Map Sheet 10
Stream Intermittent	Foster Creek	SD	U.S. Map Sheet 11
Stream Intermittent		SD	U.S. Map Sheet 11
Stream Intermittent	Pearl Creek	SD	U.S. Map Sheet 12
Stream Intermittent	South Pearl Creek	SD	U.S. Map Sheet 12
Stream Intermittent		SD	U.S. Map Sheet 12
Stream Intermittent	West Redstone Creek	SD	U.S. Map Sheet 12
Stream Intermittent	Redstone Creek	SD	U.S. Map Sheet 13
Stream Intermittent	Jim Creek	SD	U.S. Map Sheet 13
Stream Intermittent	Rock Creek	SD	U.S. Map Sheet 13
Stream Intermittent	Wolf Creek	SD	U.S. Map Sheet 14
Stream	James River	SD	U.S. Map Sheet 15
Stream Intermittent	Beaver Creek	SD	U.S. Map Sheet 16
Stream	James River	SD	U.S. Map Sheet 16
Stream	West Bow Creek	NE	U.S. Map Sheet 16
Stream	Bow Creek	NE	U.S. Map Sheet 17
Stream	Middle Logan Creek	NE	U.S. Map Sheet 17
Stream	Dog Creek	NE	U.S. Map Sheet 17
Stream	Elk Horn River	NE	U.S. Map Sheet 18
Stream	Elk Horn River	NE	U.S. Map Sheet 18
Stream	Union Creek	NE	U.S. Map Sheet 18
Stream	West Fork Maple Creek	NE	U.S. Map Sheet 19
Stream	Shell Creek	NE	U.S. Map Sheet 19
Stream	Lost Creek	NE	U.S. Map Sheet 19
Stream	North Branch Big Blue River	NE	U.S. Map Sheet 20
Stream	Big Blue River	NE	U.S. Map Sheet 20
Stream	Lincoln Creek	NE	U.S. Map Sheet 21
Stream	West Fork Big Blue River	NE	U.S. Map Sheet 21
Stream	Turkey Creek	NE	U.S. Map Sheet 21
Stream	Swan Creek	NE	U.S. Map Sheet 22
Stream Intermittent	Cub Creek	NE	U.S. Map Sheet 22
Stream Intermittent	Big Indian Creek	NE	U.S. Map Sheet 23
Stream	Big Indian Creek	NE	U.S. Map Sheet 23
Stream	Little Blue River	NE	U.S. Map Sheet 23
Stream	Little Blue River	KS	U.S. Map Sheet 23
Stream	Big Blue River	KS	U.S. Map Sheet 24
Stream	Horseshoe Creek	KS	U.S. Map Sheet 24
Stream	Walnut Creek	KS	U.S. Map Sheet 26

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Stream	Wolf River	KS	U.S. Map Sheet 26
Stream	Robidoux Creek	KS	U.S. Map Sheet 24
Stream	Delaware River	KS	U.S. Map Sheet 25
Stream Intermittent	Craig Creek	KS	U.S. Map Sheet 25
Stream	South Fork Big Nemaha River	KS	U.S. Map Sheet 25
Stream	Shoal Creek	MO	U.S. Map Sheet 29
Stream	Independence Creek	KS	U.S. Map Sheet 26
Stream	Shoal Creek	MO	U.S. Map Sheet 26
Stream	Castile Creek	MO	U.S. Map Sheet 28
Stream	Platte River	MO	U.S. Map Sheet 27
Stream	Mud Creek	MO	U.S. Map Sheet 29
Stream	Grand River	MO	U.S. Map Sheet 30
Stream	Big Creek	MO	U.S. Map Sheet 30
Stream	Grand River	MO	U.S. Map Sheet 30
Stream	Chariton River	MO	U.S. Map Sheet 31
Stream	Mussel Fork	MO	U.S. Map Sheet 31
Stream	Little Platte River	MO	U.S. Map Sheet 28
Stream	Chariton River	MO	U.S. Map Sheet 31
Stream	Turkey Creek	MO	U.S. Map Sheet 29
Stream	Coon Creek	MO	U.S. Map Sheet 32
Stream	Reese Fork	MO	U.S. Map Sheet 32
Stream	Middle Fork Little Chariton River	MO	U.S. Map Sheet 31
Stream	East Fork Little Chariton River	MO	U.S. Map Sheet 31
Stream	Old Channel Chariton River	MO	U.S. Map Sheet 31
Stream	Saling Creek	MO	U.S. Map Sheet 32
Stream	Youngs Creek	MO	U.S. Map Sheet 32
Stream	Long Branch	MO	U.S. Map Sheet 32
Stream	South Fork Salt River	MO	U.S. Map Sheet 33
Stream	Littleby Creek	MO	U.S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U.S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U.S. Map Sheet 34
Stream	West Fork Cuivre River	MO	U.S. Map Sheet 34
Stream	Cuivre Slough	MO	U.S. Map Sheet 35
Stream	Elkhorn Creek	MO	U.S. Map Sheet 34
Stream	Brick House Slough	MO	U.S. Map Sheet 36
Stream	Cuivre River	MO	U.S. Map Sheet 35
Stream	Cuivre River	MO	U.S. Map Sheet 35
Stream	Dardenne Creek	MO	U.S. Map Sheet 35
Dam	Lock and Dam Number 26	MO	U.S. Map Sheet 36
Stream		MO	U.S. Map Sheet 35
Stream	Cora Island Chute	MO	U.S. Map Sheet 36
Stream	Big Creek	MO	U.S. Map Sheet 35
Stream	Cahokia Creek	IL	U.S. Map Sheet 36
Stream	Indian Creek	IL	U.S. Map Sheet 36
Stream	Cahokia Creek	IL	U.S. Map Sheet 36
Stream	Peruque Creek	MO	U.S. Map Sheet 35
Dam	Dam Number 27	MO	U.S. Map Sheet 36
Stream	North Fork Kaskaskia Creek	IL	U.S. Map Sheet 36
Stream	Dardenne Creek	MO	U.S. Map Sheet 35
Stream	East Fork Silver Creek	IL	U.S. Map Sheet 37
Stream	Silver Creek	IL	U.S. Map Sheet 37
Stream	Beaver Creek	IL	U.S. Map Sheet 37
Stream	Shoal Creek	IL	U.S. Map Sheet 37
Stream	Sugar Creek	IL	U.S. Map Sheet 37

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ALBERTA, CANADA SENSITIVITY AREAS			
CE_DESIG_ID	SITE NAME	SIGNIFICANCE	Map Sheet
389	Silver Heights (wetlands only)	2	Ca. Map Sheet 2
395	Ribstone Creek - Nose Hill	3	Ca. Map Sheet 2
405	Neutral Hills	3	Ca. Map Sheet 2
413	Middle Lakes	2	Ca. Map Sheet 2
421	Gooseberry Lake	3	Ca. Map Sheet 3
433	Grassy Island Native Prairie	2	Ca. Map Sheet 3
440	Muddy Buttes	3	Ca. Map Sheet 3
449	Muddy Buttes Badlands	3	Ca. Map Sheet 3
450	Grassy Island Native Prairie	2	Ca. Map Sheet 3
460	Sounding Creek Native Prairie	3	Ca. Map Sheet 4
479	Alkali Creek Moraine	3	Ca. Map Sheet 5
493	Red Deer River - Alkali Creek/Dune Point	3	Ca. Map Sheet 5
501	Remount	2	Ca. Map Sheet 6
504	South Saskatchewan Canyon	2	Ca. Map Sheet 7

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CANADIAN WILDLIFE		
WOP ID	OBSERVATION	MapSheet
Alb06WOP1	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP3	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP5	Plains Spadefoot Toad & Great Plains To	Ca. Map Sheet 6
Alb06WOP12	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb06WOP13	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb07WOP3	Northern Leopard Frog (wetland)	Ca. Map Sheet 6
Alb07WOP4	Potential Amphian Breeding Wetland	Ca. Map Sheet 6
Alb07WOP6	Unidentified	Ca. Map Sheet 2
Alb07WOP7	Raptor sp.	Ca. Map Sheet 3
Alb07WOP9	Raptor sp.	Ca. Map Sheet 3
Alb07WOP10	Burrowing Owl	Ca. Map Sheet 6
Alb07WOP11	Sharp-tailed Grouse	Ca. Map Sheet 4
Man06WOP2	Northern Leopard Frog	Ca. Map Sheet 28
Man06WOP3	Northern Leopard Frog	Ca. Map Sheet 28

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CANADIAN POPULATED AREAS				
PLACE_ID	PROVIDENCE	GEONAME	CONCISE	Map Sheet
581	Manitoba	Reinland	Unincorporated area	Ca. Map Sheet 28
611	Manitoba	Brookdale	Unincorporated area	Ca. Map Sheet 23
1230	Saskatchewan	Caronport	Village	Ca. Map Sheet 13
2459	Manitoba	Miniota	Unincorporated area	Ca. Map Sheet 21

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CANADIAN MANUFACTURING WATERWELLS				
WELL ID	WELL OWNER	AQUIFER	WELL USE	Map Sheet
110879	G NEUFELD	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 26
120590	T BARBER	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 26
120592	UNKNOWN	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 26
120639	UNKNWON	SHALE	PRODUCTION	Ca. Map Sheet 26
120885	UNKNOWN	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 26
120887	S MOFFAT	LIMESTONE OR DOLOMITE	PRODUCTION	Ca. Map Sheet 26
160562	ROBINSON	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 27
160564	ROBINSON & MCCLOMNEL	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 27
181435	UNKNOWN	SHALE	PRODUCTION	Ca. Map Sheet 25
210553	J SWANTON	SAND AND GRAVEL	PRODUCTION	Ca. Map Sheet 27

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CANADIAN MUNICIPAL WELLS			
WATER USE	WELL USE	Basin ID	registered
Municipal	Water Test Hole	7403	Ca. Map Sheet 17
Municipal	Water Test Hole	26975	Ca. Map Sheet 13
Municipal	Withdrawal	28444	Ca. Map Sheet 10
Municipal	Water Test Hole	28445	Ca. Map Sheet 10
Municipal	Water Test Hole	28446	Ca. Map Sheet 10
Municipal	Water Test Hole	28447	Ca. Map Sheet 10
Municipal	Water Test Hole	28448	Ca. Map Sheet 10
Municipal	Withdrawal	28449	Ca. Map Sheet 10
Municipal	Water Test Hole	28450	Ca. Map Sheet 10
Municipal	Observation	28451	Ca. Map Sheet 10
Municipal	Water Test Hole	28452	Ca. Map Sheet 10
Municipal	Withdrawal	28453	Ca. Map Sheet 10
Municipal	Observation	28454	Ca. Map Sheet 10
Municipal	Water Test Hole	31129	Ca. Map Sheet 7
Municipal	Withdrawal	77323	Ca. Map Sheet 10

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CANADIAN LAKES		
Name	Lake ID	Map Sheet
Chaplin Lake	Chaplin Lake (ID956)	Ca. Map Sheet 12

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CANADIAN RIVERS & STREAMS	
NAME	MapSheet
Battle River	Ca. Map Sheet 1
Battle River	Ca. Map Sheet 1
Ribstone Creek	Ca. Map Sheet 2
Monitor Creek	Ca. Map Sheet 3
Sounding Creek	Ca. Map Sheet 4
Alkali Creek	Ca. Map Sheet 5
Alkali Creek	Ca. Map Sheet 5
Red Deer River	Ca. Map Sheet 6
South Saskatchewan River	Ca. Map Sheet 7
Miry Creek	Ca. Map Sheet 9
Thunder Creek	Ca. Map Sheet 13
9787107	Ca. Map Sheet 13
Thunder Creek	Ca. Map Sheet 13
Swift Current Creek	Ca. Map Sheet 11
Moose Jaw River	Ca. Map Sheet 14
Wascana Creek	Ca. Map Sheet 15
Thunder Creek	Ca. Map Sheet 13
10656107	Ca. Map Sheet 15
Pipestone Creek	Ca. Map Sheet 18
11701107	Ca. Map Sheet 20
Pipestone Creek	Ca. Map Sheet 18
11948107	Ca. Map Sheet 19
Arrow River	Ca. Map Sheet 21
12233107	Ca. Map Sheet 21
Assiniboine River	Ca. Map Sheet 21
Boggy Creek	Ca. Map Sheet 23
12527107	Ca. Map Sheet 21
Little Saskatchewan River	Ca. Map Sheet 22
12569107	Ca. Map Sheet 21
Oak River	Ca. Map Sheet 22
Whitemud River	Ca. Map Sheet 23
13019107	Ca. Map Sheet 24
13199107	Ca. Map Sheet 24
12959107	Ca. Map Sheet 22
Assiniboine River	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
13416107	Ca. Map Sheet 25
13333107	Ca. Map Sheet 24
13577107	Ca. Map Sheet 25
13379107	Ca. Map Sheet 23
13826107	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
14914107	Ca. Map Sheet 27
14990107	Ca. Map Sheet 27
15172107	Ca. Map Sheet 27
15266107	Ca. Map Sheet 27
15321107	Ca. Map Sheet 27

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15329107	Ca. Map Sheet 27
15606107	Ca. Map Sheet 28
15601107	Ca. Map Sheet 27
15776107	Ca. Map Sheet 28
15867107	Ca. Map Sheet 28
16006107	Ca. Map Sheet 28
16034107	Ca. Map Sheet 28

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APPENDIX A

RESPONSE EQUIPMENT/RESOURCES

A.1 Company Owned Response Equipment

A.2 Other Company Resources

A.3 Contract Resources

A.4 Cooperative/Mutual Aid Resources

A.5 Volunteers

A.6 Communications

Figure A.1 Company Owned Spill Response Equipment

Figure A.2 Response Resources

Figure A.3 USCG OSRO Classifications

Figure A.4 Coop Agreements/OSRO Contracts

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RESPONSE EQUIPMENT/RESOURCES

A.1 COMPANY OWNED RESPONSE EQUIPMENT

The Company owns and operates oil spill response equipment contained within response trailers staged throughout the pipeline system. This equipment is maintained according to manufacture's recommendations by Company and/or contracted personnel. An equipment summary detailing locations, type and amount stored in the response trailers is listed in Figure A.1. The Company also has contracts in place with Oil Spill Removal Organizations and other clean-up contractors that are capable of responding to all discharges along the Pipeline. Figure A.2 lists the contracted Oil Spill Removal Organizations.

The Qualified Individual has the authority to activate other private contractors, experts, and consultants as the situation demands.

All Pipeline personnel who might be involved in an oil spill have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water and that dispersants can only be used with the approval of the Canadian Regional Environmental Emergency Team (REET) or US Regional Response Team, the interagency group composed of Federal and State agency representatives that coordinates oil spill response.

A.2 OTHER COMPANY RESOURCES

Additional Company spill response equipment and manpower resources are not available to supplement the response operation; however, third party contractors will be activated on an as needed basis.

A.3 CONTRACT RESOURCES

The resources will be secured from a Company approved contractor. Management will typically handle notification/implementation of these resources. Figure A.2 provides a quick reference to the Oil Spill Removal Organizations and details their response capability and estimated response times. **Telephone reference is provided in Figure 2.5.** *(Note: The Company will ensure that each OSRO has a comprehensive maintenance program and applicable training / drills programs in place at contract renewal.)*

A.4 COOPERATIVE/MUTUAL AID RESOURCES

The Company is a member of the following Oil Spill Cooperatives or mutual aid groups:

- Western Canadian Spill Services Ltd.
- Alberta - Area U and S Oil Spill Cooperatives
- Saskatchewan - Area 3, 6, and 4 & 5 Oil Spill Cooperatives

A.5 VOLUNTEERS

Volunteers will not be utilized by the Company for the response operations. In the U.S., all volunteers will be referred to the Federal Regional Response Team.

A.6 COMMUNICATIONS

Effective and efficient communications systems are essential for emergency response at every level. The communications system will be utilized to gather information and current status reports as well as to provide coordination and direction to widely separated work groups involved in search, containment/diversion, repair, traffic control, public control or evacuation, and restoration.

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The Company's overall Emergency Notification Chart (Figure 2.2) indicates individuals within the Company and governmental agencies who must be contacted in the event of an emergency.

Notification information for the Qualified Individuals, Alternate Qualified Individuals, emergency response contractors, and governmental agencies is located in Section 2.0 and the Response Zone Annexes.

Lines of communication between the Incident Commander, local personnel, and contractors are demonstrated in the organization charts provided in Figures 4.1 and 4.2. Communication of the overall spill response operation between the Company and the responsible government agencies will occur between the Incident Commander and the Federal On-Scene Coordinator.

Central Communications System

Prearranged communication channels are of the utmost importance in dealing with Company emergencies. The notification procedures and telephone contacts documented in Section 2.0 will be reviewed in accordance with the earlier documented updating procedures. The predetermined communications channels include the following:

- A list of emergency telephone numbers for internal management and emergency response personnel (Figures 2.2 and 2.5).
- A list of emergency telephone numbers for various external resources such as the Fire Departments, Public Officials and local agencies is provided in the Annexes.
- A list of emergency telephone numbers for contract response resources (Figure 2.5).

Communications Equipment

Field communications during a spill response will be handled via radios, telephones, cellular phones, fax machines, and computers and will be maintained by Company personnel. In the event of a Worst Case Discharge, field communications will be enhanced with contract resources as the situation demands.

Communications Type

Voice communications may be conducted over the public telephone system or Company provided two-way radio equipment.

Radios - Hand-held and vehicle-mounted radio sets are the most effective means of communication for the field response operation. The units are battery operated, multi-channeled, and have a typical range that will cover the area of the response operation. Additional radio sets and battery packs/charges will be necessary in the event of a prolonged response operation.

Telephone (Conventional) - Conventional land line telephones are the most effective means of communication for regulatory and advisory notifications during a spill response operation. Additional telephone lines can be installed in the event of a prolonged response operation. All major facilities have access to standard telephone service.

Cellular - Cellular telephones are useful during spill events giving the user the ability to travel while using the communication system.

FAX Machines - FAX machines allow for a rapid transfer of information/documentation

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such as status reports/updates, written notifications, and purchase orders. All administrative office have facsimile machines.

Computers - Computers are commonly used in networks which allow access to various other locations and company personnel. Computers also speed the consolidation of information and preparation of a written report.

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FIGURE A.1

COMPANY OWNED SPILL RESPONSE EQUIPMENT

COMPANY OWNED RESPONSE EQUIPMENT	
SPILL RESPONSE TRAILERS (SRT) PER RESPONSE ZONE	
Description	Quantity
Response boat 18.5 foot work boat with a 90 HP "jet"	1
Jon boat 14 foot Safety boat with a 9.9 hp	1
34 ft Equipment trailer with 6 ft office includes equipment shelving, heat lights, power awning, rear ramp door and 1 side door. Roof rack for storage of the 14' boat and 500ft boom.	1
River Boom 6" x 6'River Boom 6" x 6'	500 ft
Portable dam 50 ft	1
Diesel /hydraulic Skimming System with diesel power transfer pump and hoses	1
Sorbent pads	5 bales
Sorbent boom	5 bales
500 gallon portable tank.	1
2,000 gallon portable tank	1
Winter equipment(e.g. Chain saws, chains, pry bars, ropes,ice,augers)	varies

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FIGURE A.2

RESPONSE RESOURCES

Zone : Hardisty Pump Station/ Regina Pump Station

COOPERATIVES
Western Canadian Spill Services Ltd.
Albert - Area U and S Oil Spill Cooperatives
Saskatchewan - Area 3 and 6 Oil Spill Cooperatives

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Zone : Regina Pump Station / Haskett Pump Station

COOPERATIVES
Western Canadian Spill Services Ltd.
Saskatchewan - Area 6 and 4 & 5 Oil Spill Cooperatives

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Zone : North Dakota, South Dakota, Nebraska

Area : North Dakota, South Dakota, Nebraska						
OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	WV1	WV2	WV3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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Zone : Kansas, Missouri, Illinois

Area : Kansas, Missouri, Illinois						
OSRO Name	Contact Number	Environment Type	Facility Classification Level			
			MW	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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FIGURE A.3

USCG OSRO CLASSIFICATIONS

The USCG has classified OSROs according to their response capabilities, within each Captain of the Port (COTP) zone, for vessels and for facilities in four types of environments. Response capabilities are rated MM, W1, W2, or W3 as described below

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION

Classification	Resource Quantity Guidelines	Maximum Facility Response Times	Maximum Vessel Response Times
	Rivers/Canals		
MM	Protective Boom: 4,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 25,000*ft EDRC:; 1,875 bbls TSC: 3,750 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC:; 3,750 bbls TSC: 7,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC:; 7,500 bbls TSC: 15,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
	Great Lakes		
MM	Protective Boom: 6,000*ft EDRC:; 1,250 bbls TSC: 2,500 bbls	All Ports: 6 hours	All Ports: 12 hours
W1	Protective Boom: 30,000*ft EDRC:; 6,250 bbls TSC: 12,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC:; 12,500 bbls TSC: 25,000 bbls	All Ports: 36 hours	All Ports: 42 hours
W3	Protective Boom: 30,000*ft EDRC:; 25,000 bbls TSC: 50,000 bbls	All Ports: 60 hours	All Ports: 66 hours

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION

Classification	Resource Quantity Guidelines	Maximum Facility Response Times	Maximum Vessel Response Times
	Inland		
MM	Protective Boom: 6,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC:; 50,500 bbls TSC: 100,500 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
	Great Lakes		
MM	Protective Boom: 8,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Location: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC:; 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC:; 25,500 bbls TSC: 50,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 30,000*ft EDRC:; 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Location: 60 hours (for open ocean, plus travel time from shore)	High Volume Ports: 60 hours Other Location: 72 hours (for open ocean, plus travel time from shore)

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATION

Classification	Resource Quantity Guidelines	Maximum Facility Response Times	Maximum Vessel Response Times
	Offshore		
MM	Protective Boom: 6,000*ft EDRC:; 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 15,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 24hours Other Ports: 48hours	High Volume Ports: 24 hours Other Ports: 48 hours
W2	Protective Boom: 15,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30hours Other Ports: 36hours	High Volume Ports: 36hours Other Ports: 48hours
W3	Protective Boom: 15,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54hours Other Ports: 60hours	High Volume Ports: 60hours Other Ports: 72hours
	Open Ocean		
MM	Protective Boom: 0*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6hours Other Ports: 12hours	High Volume Ports: 12hours Other Ports: 24hours
W1	Protective Boom: 0*ft EDRC: 12,500 bbls TSC: 25,000 bbls	High Volume Ports: 6hours Other Ports: 12hours	High Volume Ports: 12hours Other Ports: 24hours
W2	Protective Boom: 0*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30hours Other Ports: 36hours	High Volume Ports: 36hours Other Ports: 48hours
W3	Protective Boom: 0*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54hours Other Ports: 60hours	High Volume Ports: 60hours Other Ports: 72hours

1. Rivers/canals include bodies of water, including the Intracoastal Waterway and other bodies artificially created for navigation, confined within an inland area and having a project depth of 12 feet (3.66 meters).
2. EDRC stands for "effective daily recovery capacity," or the calculated recovery capacity of oil recovery devices determined by using a formula that takes into account limiting factors such as daylight, weather, sea state, and emulsified oil in the recovered material.
3. TSC stands for "temporary storage capacity," meaning sufficient storage capacity equal to twice the EDRC of an OSRO. Temporary storage may include inflatable bladders, rubber barges, certified barge capacity, or other temporary storage that can be utilized on scene at a spill response and which is designed and intended for the storage of flammable or combustible liquids. It does not include vessels or barges of opportunity for which no pre-arrangements have been made. Fixed shore-based storage capacity, ensured available by contract or other means, will be acceptable.

* In addition, 1,000 feet of containment boom plus 300 feet per skimming system.

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FIGURE A.4

AGREEMENTS/CONTRACTS

Click to view the file - NRC Packet_23_1_2009_14_31_34.pdf

Click to view the file - WCSS Packet_29_11_2008_10_23_9.pdf

Click to view the file - Alberta Area 2U Packet_29_11_2008_10_27_35.pdf

Click to view the file - Alberta Area 1S Packet_29_11_2008_10_28_3.pdf

Click to view the file - Sask Area 3 Packet_29_11_2008_10_28_27.pdf

Click to view the file - Sask Area 6 Packet_29_11_2008_10_29_12.pdf

Click to view the file - Sask Area 4and5 Packet_29_11_2008_10_29_50.pdf

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Decision Summary (DS-244)

TransCanada
In business to deliver

To:	Richard Prior	**Date:**	October 14, 2008
From:	John Hayes	**Location:**	Calgary, Alberta
Subject:	NRC OSRO Resource Retainer		

Decision Proposed ($125,000 per Annum(U.S. Currency) for 3 years)

Your approval is requested for funds related to emergency response planning and preparedness. As a matter of risk mitigation and regulatory compliance, it is proposed to enter into a contractual retainer to address a number of emergency response functions during operations. This amount falls within the existing capital expenditures for emergency response for 2009.

Background

National Response Corporation (NRC) will provide Keystone with Oil Spill Response Organization (OSRO) resources. Specifically, NRC will be the overall coordinating company that has the ability to safely respond to spill related incidents along the pipeline. NRC ensures spill readiness which included supplier subcontracts, training, workshops and overall spill site coordination. NRC has the proven ability to handle spills of all sizes and is approved by the United States Coastguard.

NRC has its own equipment, spill managers and a network of related industries to ensure Keystone is prepared to respond efficiently and effectively. The retention of a contractor is mandatory for Keystone to meet regulatory requirements. Having a retainer guarantees Keystone the resources when most needed.

The contract should start on January 1, 2009 and will form part of the existing Emergency Response Plan for 2009. This type of contract was not contemplated in the original Emergency Response budget of 3MM, but is part of the overall plan. The first year will be absorbed by the existing budget and for future years, these costs should be part of a field operations budget.

Requested by:

John Hayes – Operations Manager Keystone Pipeline	14 October 2008 Date

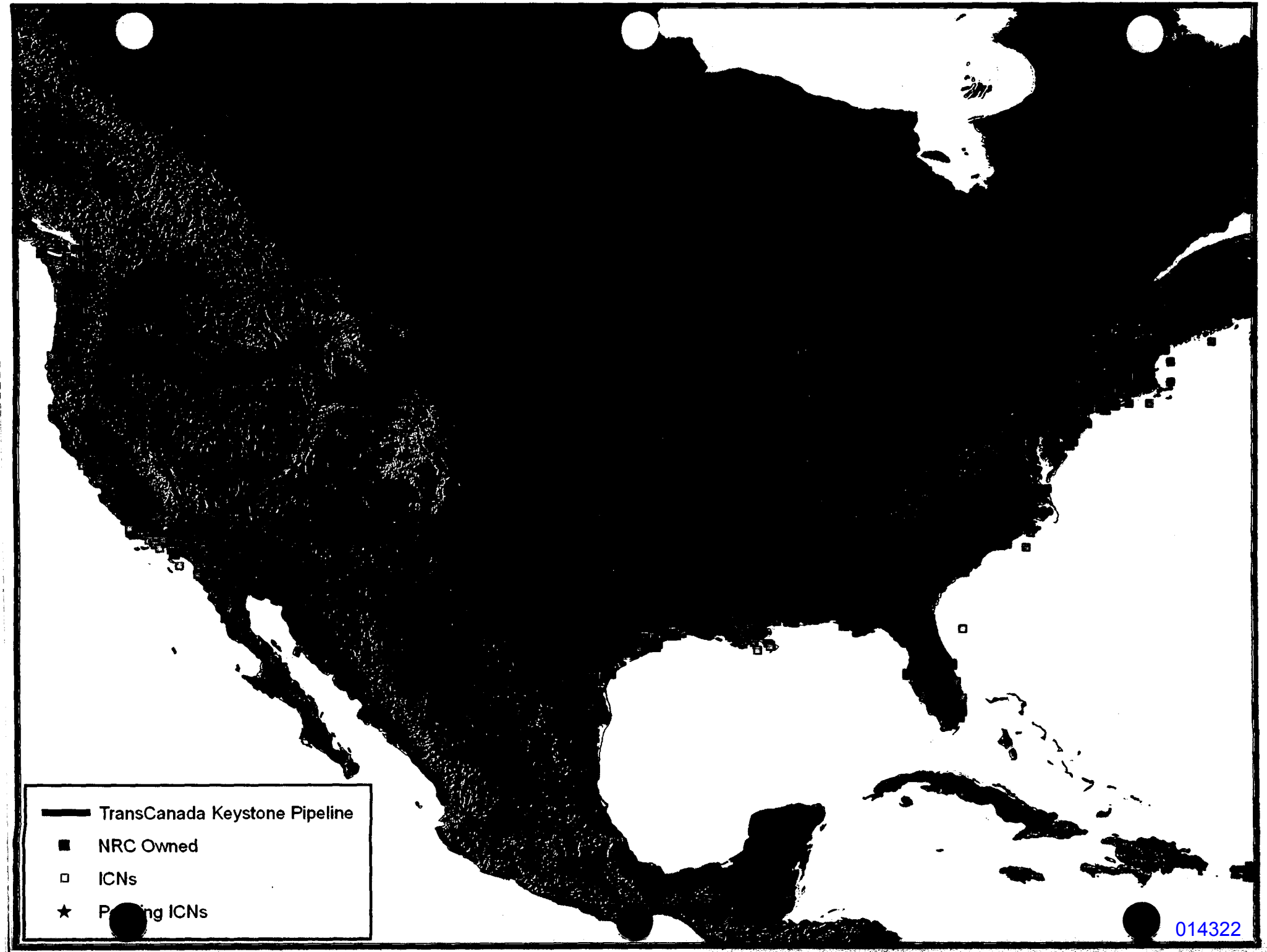
Approved by:

Rob Sillner Integration Manager, Keystone Pipeline	14 October 2008 Date

National Response Corporation, Inc.

National Response Corporation, Inc. is an Oil Spill Response Organization contracted to conduct oil recovery for TransCanada Keystone Limited Partnership and TC Oil Pipeline Operations, Inc. National Response Corporation uses a network of associated cleanup contractors throughout North America and the world. National Response Corporation has been certified by the United States Coast Guard, as described in the Emergency Response Manual, to respond to releases along the length of the Pipeline.

For further information about National Response Corporation and a list of response equipment you can visit their website at http://www.nrcc.com.


TransCanada Keystone Pipeline
NRC Owned
ICNs
ng ICNs
014322

Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

Western Canadian Spill Services Ltd

Western Canadian Spill Services Ltd. is the spill preparedness organization of the upstream petroleum industry in North East British Columbia, Alberta and Cooperative VR1 that extends into Saskatchewan. The purpose of Western Canadian Spill Services is to maintain an effective spill response capability for the upstream petroleum industry in Western Canada and to provide information and education on spill issues including spill prevention.

Through an agreement between Western Canadian Spill Services and the Canadian Petroleum Products Institute the members of the Western Canadian Spill Services in good standing can have access to the equipment owned by Canadian Petroleum Products Institute.

In Manitoba, the Western Canadian Spill Services contracts with Euroway Industrial Service Company Ltd, to store and maintain response equipment available for use by members of the Western Canadian Spill Services. Euroway is located in Winnipeg, Manitoba.

For further information about Western Canadian Spill Services and a list of response equipment you can visit their website at http://www.wcss.ab.ca. Information on the Canadian Petroleum Products Institute can be found at their website www.cppi.ca.

CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

Alberta	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Athabasca	Basic	Volunteer Fire Dept. (Town)	Fire Chief Denis Mathieu	4707-50 Street T9S 3A3	780 675-2200 (emerg.) 780 675-2569 (fire hall)	780 675-2200 (emerg.) 780 689-9024 (DM cell)	780 675-2569 (fax) 780 675-6350 (DM workP)	
Banff	Basic	Fire Department	Deputy Jim Watt	201 Beaver Street PO Box 1260 T0L 0C0	403 760-5955 (onduty cell) 403 762-1250 (JW)	911 (fire dept.)	403 762-1261	jim.watt@banff.ca
Calgary	Basic	ECL Transportation	Bruce Thomson & Gail Sharko	7100 44 St SE T2C 2V7 (Gail) 5366-55 Street SE T2C 3G9 (trailer)	403 720-1000	403 720-1000	403 720-5060	gsharko@eclgroup.com bthomson@eclgroup.com
Edmonton	Basic	ECL Transportation	Randy Johnston & Gail Sharko (Calgary)	1810 66 Ave T6P 1M4	780 464-3200	780 464-3200	780 463-1133	gsharko@eclgroup.com rjohnston@eclgroup.com
Edson	Basic	Fire Department	Chief Allan Schram	6 Avenue & 49 Street Box 6300 T7E 1T7	780 723-3178 780 723-4401 (AS)	780 723 3137 (emerg.)	403 723-3508	alans@townofedson.ca civiccentre@townofedson.ca
Ft. McMurray	CPPI Basic WCSS Equip. OSCAR, Skid Unit, Work Boat, Boom Vane	Eveready Industrial (TriVax Enterprises)	Brent Bakke	230A MacKay Crescent T9H 5C6	780 743-0222 780 598-3427 (BB)	780 743-0222 780 598-3427 (BB)	780 791-3242	bbakke@evereadyindustrial.com
Grande Prairie	Basic	Fire Department (cheque NOT to City)	Deputy Chief Harvey Pearson Dennis Driver, Stn. Captain	8111 Resources Road T8V 7Y2	780 538-0393 780 538-0381 (HP)	780 538-0393 (fire dept.)	780 538-0395	hpearson@cityofgp.com ddriver@cityofgp.com
Hanna	Basic	Volunteer Fire Dept.	Chief David Mohl	201 1 Ave East Box 430 T0J 1P0	403 854-4433 (town)	403 854-9090 (fire dept.)	403 854-2772	hannfire@telus.net
High Level	Basic	Fire Department	Chief Rod Schmidt	10201-100 Ave T0H 1Z0 (FD) 9813 102 St T0H 1Z0 (town)	780 926-3141 (24 hrs.) 780 926-3192	780 926-3141 (24 hr. emerg.)	780 926-2058 780 926-7609 780 926-2033	rschmidt@highlevel.ca
Lethbridge	WCSS Equip. Muskrat, mini OSCAR, work boat	Mid-West Pump (90) Ltd.	Gerry Colburn Ed Carpenter	311 33 St N T1H 3Z6	403 329-0427 (24 hrs.)	403 329-0427 (24 hrs.)	403 327-4660	gcolburn@mid-westgroup.com
Medicine Hat	Basic	Fire Department	Chief Garry Mauch Deputy Allan Guest Randy Stotz	440 Maple Ave SE T1A 7S3	403 529-8282	403 529-8282	403 526-1352	allgue@medicinehat.ca ransto@medicinehat.ca
Viking	Basic	Fire Department	Chief Ken Ruzicka	4920-53 Avenue T0B 4N0	780 336-5406 (cell)	780 336-5406 (24 hrs. - cell)	780 336-2669	vikfire@telusplanet.net

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

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CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

[redacted]	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Burns Lake	Basic	Lyle Sande Agencies (Chevron)	Lyle Sande Kristi McCrindle	65 Railway Ave. PO Box 619 V0J 1E0	250 692-3511	250 692-5721 (KM)	250 692-3702	burns_lake_agency@telus.net
Campbell River	Basic	K&S Petroleum Ltd. (Chevron)	Kerry Coulson	4700 Orange Point Road PO Box 968 V9W 6Y4	250 286-1136	250 729-5533 (KC-cell)	250 286-1335	campbell_river_agency@telus.net
Castlegar	Basic	Fire Department	Chief Gerry Rempel & Ast Chief Tony Cooper	2161 6 Ave V1N 3B2	250 365-3355 250 365-3266 (GR)	250 365-3355 (emerg.)	250 365-4810	grempel@castlegar.ca
Cranbrook	Basic	Jepson Petroleum Ltd (Petro-Canada)	Mgr. Chris Jepson & Dave Schmideder	1814 Theatre Road V1C 7G1	250 426-6669	250 426-2551	250 426-4064	sandra@jepsonpetro.com
Creston	Basic	R A Glennon Petroleum (Shell)	Robert Smith Randy Glennon Stacey Ostendorf	1411 Northwest Blvd RR 6 V0B 1G6	250 428-7131	250 428-4553 (RS) 250 866-5782 (SO)	250 428-7133	stacey.ostendorf@bluewaveenergy.ca
Ft. Nelson	Basic	Fire Department	Chief Dennis Muise Asst. Chief James Childs	5404 48 Ave Bag 399 V0C 1R0	250 774-3955	250 774-3955 (24 hr. emerg.)	250 774-2845	dmuise@northernrockies.org jchilds@northernrockies.org
Ft. St. John	Basic	Fire Department	Dep Chief Fred Burrows Chief Jeff Lambert Doreen Holmes	9407-100 Avenue V1J 6W1 10631-100 Street V1J 3Z5 (Town Office)	250 785-4333	250 261-6417 (emerg.)	250 785-0080	fburrows@fortstjohn.ca jlambert@fortstjohn.ca
Golden	Basic	Fire Department	Chief Shawn Tomash	1107-11 Avenue S. P.O. Box 350 V0A 1H0	250 344-6401	250 832-3132 250 344-8264 (ST cell)	250 344-5761	goldfire@town.golden.bc.ca
Kamloops	Basic	Petro-Canada Terminal	Stephen Demianiuk Rick Geier	2955 Tranquille Rd V2B 7W2	250 376-3334	250 376-3334 (answer service)	250 376-5522	sdemiani@petro-canada.ca geier@petro-canada.ca
Kelowna	Basic	Fire Department	Eileen Davies	2255 Enterprise Way V1Y 8B8	250 860-6419	250 860-6419	250 862-3571	edavies@kelowna.ca
Nanaimo	Basic	Nanaimo Fire Rescue	Deputy Chief Bob Simpson	**Trailer: Fire Stn #2** **2499 Dorman Road** **V9S 5T3** / 200, 575 Fitzwilliam St V9R 3B2 (BS)	250 755-4569 (24 hr.) 250 755-4556 (BS)	250 755-4569 (24 hr.)	250 753-5480	bob.simpson@nanaimo.ca
Prince George	Basic	Husky Energy Refinery	Greg Primus Bill Fraser	2542 Pulp Mill Rd PO Box 1390 V2L 4V4	250 960-2500 250 960-2523 (BF)	250 960-2500 (switchboard)	250 562-5725	greg.primus@huskyenergy.ca bill.fraser@huskyenergy.ca
Revelstoke	Basic	Big Eddy Fuel (Shell)	Peter Humphries	733 South Highway 23 Box 1740 V0E 2S0	250 837-3214	250 837-5223 (PH res.)	250 837-7082	hwy23@telus.net P06049a@mktng.ca
Surrey (Cloverdale)	Basic	D.W.P. Distributors Limited (Chevron)	Bill Poppy	5504 176 Street Surrey, BC V3S 4C3	604 576-2961	604 856-7879 (BP)	604 576-9317	cloverdale_agency@telus.net
Terrace	Basic	Fire Department	Chief Peter Weeber	3, 3215 Eby Street V8G 2X8	250 638-4734 (24hr.) 250 638-4742 (PW)	250 638-4734 or 250 638-8121 (24 hr.) 250 615-9112 (PW cell)	250 635-4933	pweeber@terrace.ca

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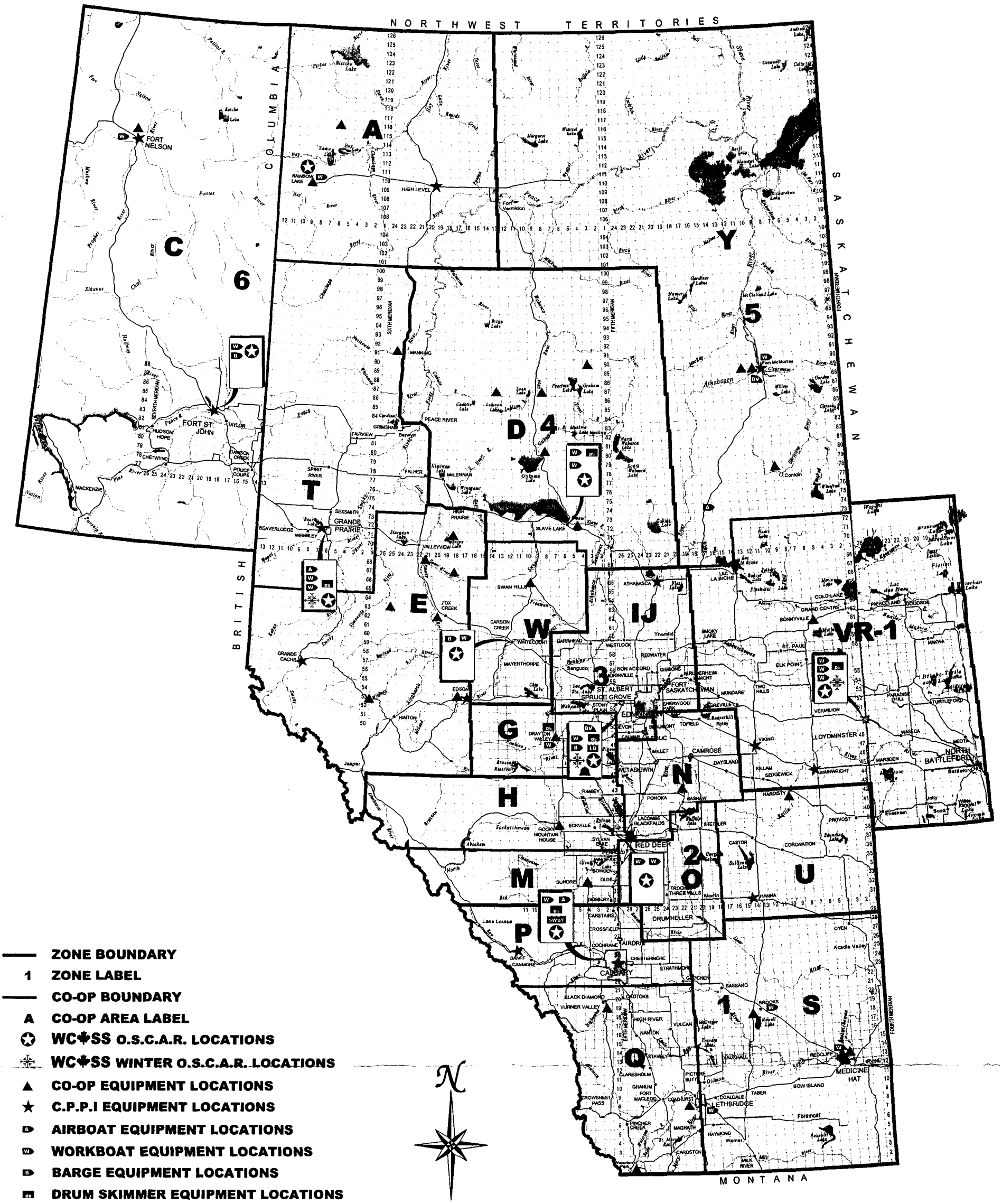
(see www.wcss.ab.ca for additional locations of WCSS equipment)

WC✱SS OIL SPILL
COOPERATIVE BOUNDARIES
2008



——	ZONE BOUNDARY
1	ZONE LABEL
——	CO-OP BOUNDARY
A	CO-OP AREA LABEL
✪	WC✱SS O.S.C.A.R. LOCATIONS
✱	WC✱SS WINTER O.S.C.A.R. LOCATIONS
▲	CO-OP EQUIPMENT LOCATIONS
★	C.P.P.I EQUIPMENT LOCATIONS
AB	AIRBOAT EQUIPMENT LOCATIONS
WB	WORKBOAT EQUIPMENT LOCATIONS
B	BARGE EQUIPMENT LOCATIONS
DS	DRUM SKIMMER EQUIPMENT LOCATIONS
BV	BOOM VANE EQUIPMENT LOCATIONS
SWBT	SHALLOW WATER BOOM TRAILER LOCATIONS
LB	LAKE BOOM EQUIPMENT LOCATIONS
	INCINERATOR EQUIPMENT LOCATIONS

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SCALE

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0 20 40 60 80 120 160 200 miles

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CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

Alberta	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Athabasca	Basic	Volunteer Fire Dept. (Town)	Fire Chief Denis Mathieu	4707-50 Street T9S 3A3	780 675-2200 (emerg.) 780 675-2569 (fire hall)	780 675-2200 (emerg.) 780 689-9024 (DM cell)	780 675-2569 (fax) 780 675-6350 (DM workP)	
Banff	Basic	Fire Department	Deputy Jim Watt	201 Beaver Street PO Box 1260 T0L 0C0	403 760-5955 (onduty cell) 403 762-1250 (JW)	911 (fire dept.)	403 762-1261	jim.watt@banff.ca
Calgary	Basic	ECL Transportation	Bruce Thomson & Gail Sharko	7100 44 St SE T2C 2V7 (Gail) 5366-55 Street SE T2C 3G9 (trailer)	403 720-1000	403 720-1000	403 720-5060	gsharko@eclgroup.com bthomson@eclgroup.com
Edmonton	Basic	ECL Transportation	Randy Johnston & Gail Sharko (Calgary)	1810 66 Ave T6P 1M4	780 464-3200	780 464-3200	780 463-1133	gsharko@eclgroup.com rjohnston@eclgroup.com
Edson	Basic	Fire Department	Chief Alan Schram	6 Avenue & 49 Street Box 6300 T7E 1T7	780 723-3178 780 723-4401 (AS)	780 723 3137 (emerg.)	403 723-3508	alans@townofedson.ca civiccentre@townofedson.ca
Ft. McMurray	CPPI Basic. WCSS Equip. OSCAR, Rapid Unit, Work Boat, Boom Trailer	Eveready Industrial (TriVax Enterprises)	Brent Bakke	230A MacKay Crescent T9H 5C6	780 743-0222 780 598-3427 (BB)	780 743-0222 780 598-3427 (BB)	780 791-3242	bbakke@evereadyindustrial.com
Grande Prairie	Basic	Fire Department (cheque NOT to City)	Deputy Chief Harvey Pearson Dennis Driver, Stn. Captain	8111 Resources Road T8V 7Y2	780 538-0393 780 538-0381 (HP)	780 538-0393 (fire dept.)	780 538-0395	hpearson@cityofgp.com ddriver@cityofgp.com
Hanna	Basic	Volunteer Fire Dept.	Chief David Mohl	201 1 Ave East Box 430 T0J 1P0	403 854-4433 (town)	403 854-9090 (fire dept.)	403 854-2772	hannfire@telus.net
High Level	Basic	Fire Department	Chief Rod Schmidt	10201-100 Ave T0H 1Z0 (FD) 9813 102 St T0H 1Z0 (town)	780 926-3141 (24 hrs.) 780 926-3192	780 926-3141 (24 hr. emerg.)	780 926-2058 780 926-7609 780 926-2033	rschmidt@highlevel.ca
Lethbridge	WCSS Equip. Muskrat, mini OSCAR, work boat	Mid-West Pump (90) Ltd.	Gerry Colburn Ed Carpenter	311 33 St N T1H 3Z6	403 329-0427 (24 hrs.)	403 329-0427 (24 hrs.)	403 327-4660	gcolburn@mid-westgroup.com
Medicine Hat	Basic	Fire Department	Chief Garry Mauch Deputy Allan Guest Randy Stotz	440 Maple Ave SE T1A 7S3	403 529-8282	403 529-8282	403 526-1352	allgue@medicinehat.ca ransto@medicinehat.ca
Vikeng	Basic	Fire Department	Chief Ken Ruzicka	4920-53 Avenue T0B 4N0	780 336-5406 (cell)	780 336-5406 (24 hrs. - cell)	780 336-2669	vikfire@telusplanet.net

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

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CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

[redacted]	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	Email
Burns Lake	Basic	Lyle Sande Agencies (Chevron)	Lyle Sande Kristi McCrindle	65 Railway Ave. PO Box 619 V0J 1E0	250 692-3511	250 692-5721 (KM)	250 692-3702	burns_lake_agency@telus.net
Campbell River	Basic	K&S Petroleum Ltd. (Chevron)	Kerry Coulson	4700 Orange Point Road PO Box 968 V9W 6Y4	250 286-1136	250 729-5533 (KC-cell)	250 286-1335	campbell_river_agency@telus.net
Castlegar	Basic	Fire Department	Chief Gerry Rempel & Ast Chief Tony Cooper	2161 6 Ave V1N 3B2	250 365-3355 250 365-3266 (GR)	250 365-3355 (emerg.)	250 365-4810	grempel@castlegar.ca
Cranbrook	Basic	Jepson Petroleum Ltd (Petro-Canada)	Mgr. Chris Jepson & Dave Schmideder	1814 Theatre Road V1C 7G1	250 426-6669	250 426-2551	250 426-4064	sandra@jepsonpetro.com
Creston	Basic	R A Glennon Petroleum (Shell)	Robert Smith Randy Glennon Stacey Ostendorf	1411 Northwest Blvd RR 6 V0B 1G6	250 428-7131	250 428-4553 (RS) 250 866-5782 (SO)	250 428-7133	stacey.ostendorf@bluewaveenergy.ca
Ft. Nelson	Basic	Fire Department	Chief Dennis Muise Asst. Chief James Childs	5404 48 Ave Bag 399 V0C 1R0	250 774-3955	250 774-3955 (24 hr. emerg.)	250 774-2845	dmuise@northernrockies.org jchilds@northernrockies.org
Ft. St. John	Basic	Fire Department	Dep Chief Fred Burrows Chief Jeff Lambert Doreen Holmes	9407-100 Avenue V1J 6W1 10631-100 Street V1J 3Z5 (Town Office)	250 785-4333	250 261-6417 (emerg.)	250 785-0080	fburrows@fortstjohn.ca jlambert@fortstjohn.ca
Golden	Basic	Fire Department	Chief Shawn Tomash	1107-11 Avenue S. P.O. Box 350 V0A 1H0	250 344-6401	250 832-3132 250 344-8264 (ST cell)	250 344-5761	goldfire@town.golden.bc.ca
Kamloops	Basic	Petro-Canada Terminal	Stephen Demianiuk Rick Geier	2955 Tranquille Rd V2B 7W2	250 376-3334	250 376-3334 (answer service)	250 376-5522	sdemiani@petro-canada.ca geier@petro-canada.ca
Kelowna	Basic	Fire Department	Eileen Davies	2255 Enterprise Way V1Y 8B8	250 860-6419	250 860-6419	250 862-3571	edavies@kelowna.ca
Nanaimo	Basic	Nanaimo Fire Rescue	Deputy Chief Bob Simpson	**Trailer: Fire Stn #2** **2499 Dorman Road** **V9S 5T3** / 200, 575 Fitzwilliam St V9R 3B2 (BS)	250 755-4569 (24 hr.) 250 755-4556 (BS)	250 755-4569 (24 hr.)	250 753-5480	bob.simpson@nanaimo.ca
Prince George	Basic	Husky Energy Refinery	Greg Primus Bill Fraser	2542 Pulp Mill Rd PO Box 1390 V2L 4V4	250 960-2500 250 960-2523 (BF)	250 960-2500 (switchboard)	250 562-5725	greg.primus@huskyenergy.ca bill.fraser@huskyenergy.ca
Revelstoke	Basic	Big Eddy Fuel (Shell)	Peter Humphries	733 South Highway 23 Box 1740 V0E 2S0	250 837-3214	250 837-5223 (PH res.)	250 837-7082	hwy23@telus.net P06049a@mktng.ca
Surrey (Cloverdale)	Basic	D.W.P. Distributors Limited (Chevron)	Bill Poppy	5504 176 Street Surrey, BC V3S 4C3	604 576-2961	604 856-7879 (BP)	604 576-9317	cloverdale_agency@telus.net
Terrace	Basic	Fire Department	Chief Peter Weeber	3, 3215 Eby Street V8G 2X8	250 638-4734 (24hr.) 250 638-4742 (PW)	250 638-4734 or 250 638-8121 (24 hr.) 250 615-9112 (PW cell)	250 635-4933	pweeber@terrace.ca

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

BC	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Valemount	Basic	Fire Department	Chief Rick LaLonde, Hugh Miller, Dep. & Donovan Gee, Dep.	1380 5 Avenue Box 727 V0E 2Z0	250 566-9800 Firehall 250 566-9131 250 566-4435 Village Office	250 566-9847 (RL res.) 250 566-4855 (HM res.) 250 566-4590 (DG res.)	250 566-9890 Village Office 250 566-9132	rickvvld@telus.net
Williams Lake	Basic	TaGerra Holdings Ltd. (Chevron)	Tammi Caferra Linda Dudoski	101 25 Hodgson Road V2G 3P5	250 392-4224	250 398-5463 250 305-8673 (cell-TC) 250 398-7401 (LD)	250 392-6525	wlliams_lake_agency@telus.net

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

Manitoba	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Brandon	Basic	Fire Department	A/Lt. Donald Matthews	**Trailer @ Fire Stn #2** 637 Princess Avenue R7A 0P2 (DM)	204 729-2420 204 729-2400 (DM)	204 729-2400	204 729-8970	d.matthews@brandon.ca
Dauphin	Basic	Brendonn Holdings Ltd. (Petro-Canada)	Mike Gawaziuk	Hwy. 5A West PO Box 607 R7N 2V4	204 638-4401	204 672-0093 (MG cell)	204 638-4350	brendond@mts.net
Swan River	Basic	Doak's Fuel Service (Imperial Oil)	Dale Macooh Troy Carter	PO Box 695 523-3 Avenue S R0L 1Z0	204 734-9364	204 281-1091 (TC cell)	204 734-2272	doakssr@mts.net
The Pas (Town)	Basic	Fire Department	Deputy Chief Richard Paetzold Chief Ron Bourquin	81 Edwards Ave PO Box 870 R9A 1K8	204 627-1122 204 627-1121 (RP)	204 623-3100 (emerg.) 204 623-0585 (cell) 204 623-0720 (RP)	204 623-5506	richardp@townofthepas.ca (RP)
Thompson	Basic	Doak's Fuel Service (Imperial Oil)	Rob Bilawka	CN Grounds-Station Rd PO Box 309 R8N 1N1	204 677-2150	204 677-2150	204 778-4474	doaks3@mts.net
Winnipeg	CPPI Basic . WCSS Equip. OSCAR, 2 Jet Boats	Euroway Industrial Service Co. Ltd.	Gary Mittermayr	245 Transport Road Box 4, Group 582, RR 5 R2C 2Z2	204 661-0500	204 661-0500	204 661-3933	info@eurowayindustrial.com

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(see www.wcss.ab.ca for additional locations of WCSS equipment)

CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

Saskatch	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
La Ronge	Basic	Fire Department	Chief Ron Pratt	1222 Hildebrand Drive PO Box 5680 S0J 1L0	306 425-3230	306 425-3111 (emerg.)	306 425-3883	laronge.fire@sasktel.net
North Battleford	Basic	Fire Department	Chief Mike Saunders Deputy Bryan Beach	902 104 Street PO Box 460 S9A 2Y6	306 445-1770 306 445-1779 (MS) 306 445-1778 (BB)	306 445-1770 (24 hr phone)	306 445-1785	msaunders@cityofnb.ca bbeach@cityofnb.ca
Prince Albert	Basic	Marsollier Petroleum Ltd. (Esso)	Kelly Bartel & Curtis Parent	1100 6 Ave E S6V 2J9	306 764-4228	306 763-1773 (KB) 306 922-4294 (CP)	306 764-4003	marsollier.pa@sasktel.net
Regina	Basic	Envirotec Services Inc.	Lyle Clouatre (Daniel Guskjolen looks after trailer - 99 Andre Ave, Regina S4T 7N1)	804-46 Street East Saskatoon S7K 3V7 **Trailer: 1910 Winnipeg Street N., Regina**	1-877-244-9500 (24 hr.) 306 721-9500 (SB)	1-877-244-9500 (24 hr.) 306 533-0336 (DG cell)	306 244-9501 (LC) 306 543-2984 (DG)	lclouatre@envirotec.ca dguskjolen@envirotec.ca
Saskatoon	Basic	Fire Department	Chief Gary Kobussen (admin office) Jim Wood (AO) (Captain Jerry Unser looks after trailer)	125 Idylwyld Dr S S7M 1L4 (admin offices) **Trailer: Fire Hall 7** **3550 Wanuskewin Road** **Saskatoon**	306 975-2520	306 975-2528 (GK) 306 220-2776 (JW) 306 975-2520 (JU)	306 975-2589	gary.kobussen@saskatoon.ca jerry.unser@saskatoon.ca
Swift Current	Basic	Fire Department	Chief Bob Rindahl Cathie Werbowetsky	236 Chaplin Street E S9H 5B2	306 778-2760 306 778-2795 (BR) 306 778-2760 (CW)	306 778-2761 (BR)	306 778-9191	b.rindahl@swiftcurrent.ca c.werbowetsky@swiftcurrent.ca
Weyburn	Basic	Fire Department	Chief Denis Pilon & Asst Murray Sabados	55-16 Street NE PO Box 370 S4H 2K6	306 848-3240	306 848-3240	306 842-2001	dpilon@weyburn.ca
Yorkton	Basic	Brendonn Holdings Ltd. (Petro-Canada)	Tony Ripa & R Kuschak	24 Broadway Street W S3N 0L4	306 783-4567	306 783-2396	306 783-5700	brendonn.tony@sasktel.net

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

CPPI/WCSS* Environmental Protection Unit (EPU) Custodian Information

NWT	CPPI Equip.	Custodian	Contact	Address	Phone	Night Phone	Fax	E-mail
Hay River	Basic	Matonabee Petroleum Ltd. (Petro-Canada)	Bill Wright	43064 MacKenzie Highway X0E 0R9	867 874-2215 867 874-2594	867 874-2215 (emerg.)	867 874-3346	bill@ssimicro.com
Yellowknife	Basic	Matonabee Petroleum Ltd. (Petro-Canada)	Shawn Delaney Dalyn Chan	117 Kamlake Road Box 2697 X1A 2R1	867 873-4001	867 873-4001	867 873-9460	shawn@matonabee.com
Yukon	**CPPI Equip.**	**Custodian**	**Contact**	**Address**	**Phone**	**Night Phone**	**Fax**	**E-mail**
Whitehorse	Basic	Dall Contracting Ltd. (Petro-Canada)	Mike Baldwin	110 Galena Rd Y1A 2W6	867 667-6431	867 667-6431 (answer service)	867 667-6704	mike.baldwin@northwestel.net

* WCSS - Western Canadian Spill Services
(see www.wcss.ab.ca for additional locations of WCSS equipment)

Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

Albert Area 2U Oil Spill Cooperative

The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 2U means area U of zone 2. The TransCanada Keystone Pipeline system begins and travels south through this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.

Zone 2 - Coop Area U

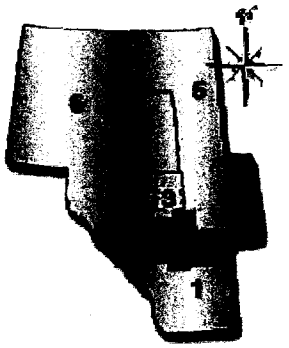
COOP Custodian

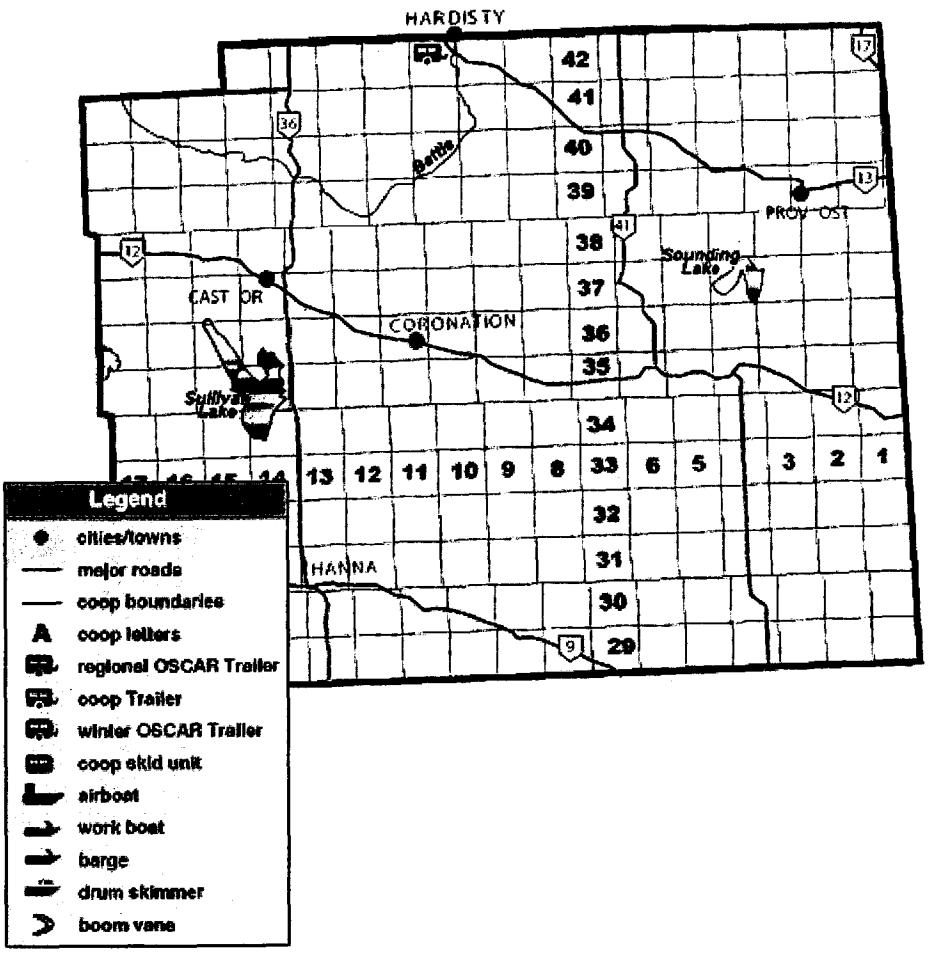
Greg Schmidt/Trevor Bitzer
Greg's Contracting Services Ltd.
Ph : (780) 888-3845
After Hours: Max Devey
(780) 209-7363

Equipment Location
Greg's Contracting Services Ltd. Box 29 4616A 47 Street
Hardisty, AB T0B 1V0

Equipment Summary

- OSCAR Trailer





Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

Albert Area 1S Oil Spill Cooperative

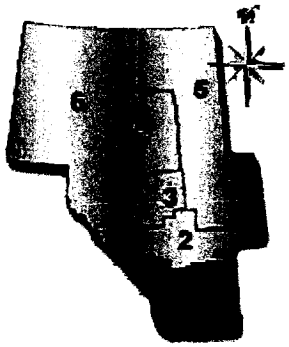
The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 1S means area S of zone 1. The TransCanada Keystone Pipeline system traverses the north east corner of this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.

Zone 1 - Coop Area S

Regional Custodian



Adrian Schuurman
Mid-West Pumps (90) Ltd.
Ph: (403) 329-0427
24-HR:(403) 329-0427
Fax: (403) 327-4660

Ed Carpenter

Equipment Location
Lethbridge

Equipment Summary

- Mini-OSCAR (3/4-ton truck with 2 5/16" ball hitch)
- Muskrat (1/2-ton truck with 2" ball hitch)
- Marathon Workboat (1/2-tin with 2" ball hitch)

Coop Custodian

Equipment Location
NE 34-18-15 W4M Brooks, AB

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Summary

- 45' Trailer (Tractor Truck)
- Muskrat Workboat (1/2-ton with 2" ball hitch)

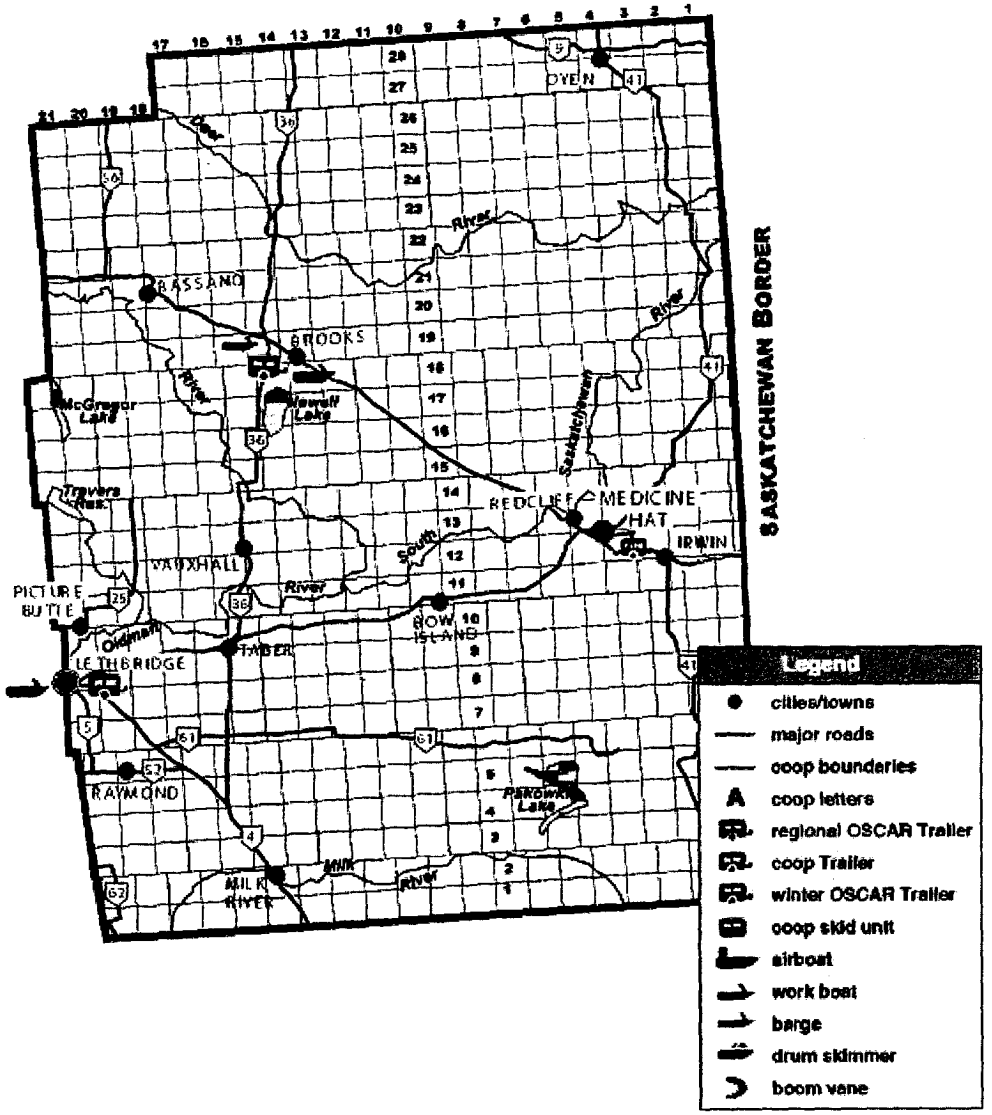
Directions
From Brooks, take Castle Road heading west towards Hwy 36 for 5 kms. Yard is located on south side of road, or Junction of Hwy 1 and Hwy 36. Head south of Hwy 36 until you reach Castle Road , yard is located on south side.

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Location
15-7-13-5-W4 Enerplus site North of Medicine Hat, AB

Equipment Summary

- C-Can Skid Unit (Bed Truck)


SASKATCHEWAN BORDER
OYEN
BASSANO
BROOKS
Newell Lake
McGregor Lake
Travers Reservoir
REDCLIFF
MEDICINE HAT
IRWIN
VAUXHALL
PICTURE BUTTE
LETHBRIDGE
TABER
ROW ISLAND
RAYMOND
MILK RIVER
Pakowki Lake
Legend
cities/towns
major roads
coop bounderies
coop letters
regional OSCAR Trailer
coop Trailer
winter OSCAR Trailer
coop skid unit
airboat
work boat
barge
drum skimmer
boom vane

Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

Saskatchewan Area 3 Oil Spill Cooperative

The Province of Saskatchewan is divided into 5 oil spill cooperative areas. The TransCanada Keystone Pipeline travels from west to east through area 3. The cooperative is run by a steering committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.

AREA 3 Emercency Response Unit

Trailer Location:

06-08-011-18w3 Bench Oil Battery – Husky Energy Inc.

Steering Committee:

Title	Name	Office	Phone
CHAIRMAN:	Gilbert Cadrain	Husky Energy Inc.	773-0234 741-8922
SECRETARY:	Gary Hammer	Plains Marketing	773-9381
TREASURER:	Garry Zinger	Focus Energy	741-6778
COMMITTEE:	Ron Dolker	S.I.R	778-8252
	Darcy Thoreson	Equipment Custodian	672-3723
	Dave Knipfel	Huskey Energy	741-2772
	Jeff Seffern	Talisman Energy Inc.	297-2601
	Rob Forester	Crescent Point	626-3557
	Tim Stevenson	Penn West	672-3875
	Blake Barsness	Acclaim Energy	

Boundry Map:

AREA III ENVIRONMENTAL RESPONSE TRAILER UNIT

'owing equipment is stored in a 8' x 28' tandem axle
y pindle hitch.

EMERGENCY RESPONSE TELEPHONE NUMBERS

EMERGENCY 911

COMPANY	CONTACT	PHONE
Ambulance (non-emergency)	Swift Current	(306)773-2666
	Cabri	(306)587-2552
	Gull Lake	(306)672-4704
	Shaunavon	(306)297-2644
Air Ambulance		1-888-782-8247
	Saskatoon (Information)	(306)933-5255
Fire Department (non-emergency)	Swift Current	(306)778-2760
	Cabri	(306)587-2200
	Shaunavon (Kevin)	(306)297-2424 (306)297-3870 hor
	Gull Lake	(306)672-3200
Hospitals		
Cabri Health Centre	Cabri	(306)587-2623
Gull Lake Health Centre	Gull Lake	(306)672-4700
S. C. Union Hospital	Swift Current	(306)778-9400
Shaunavon Union Hospital	Shaunavon	(306)297-2644
Royal Canadian Mounted Police	Swift Current	(306)778-5550
	Gull Lake	(306)672-3140
	Shaunavon	(306)297-5550
	Cabri	(306)587-2667
Saskatchewan Pow Corporation Elec. Swift Current	Emergencies 24 Hour	310-2220 1-888-757-6937
Gas		
Swift Current	24 Hour	(306)773-9098
Shaunavon	24 Hour	1-888-757-6937
Cabri	24 Hour	1-888-757-6937

Website Address for Spill Cooperatives:

www.area3eru.com
http://areatwo.sasktelhosting.net
/
http://www.saskoilspill.com/
http://www.saskoilspill.com/main.htm
http://www.area6sask.com/

INITIAL SPILL REPONSE FLOW CHART

SPILL OBSERVED ? RESPONSE

1. ASSESS THE SPILL OCCURRENCE:

- ASSESS IMMEDIATE HAZARDS TO:
  - PERSONAL SAFETY
  - PUBLIC SAFETY
  - PROPERTY
  - ENVIRONMENTAL

2. ASSESS THE SPILL OCCURRENCE:

- ASSESS AND REPORT SOURCE
- ASSESS AND REPORT SPILL TYPE
  - OIL
  - SALT WATER
  - CHEMICAL
- ASSESS AND REPORT SPILL SIZE
- ASSESS SPILL AND REPORT FLOW DIRECTION AND FURTHER CONTAMINATION

3. NOTIFY IMMEDIATE SUPERVISOR:

- IDENTIFY LOCATION OF SPILL
- NOTE TIME SPILL DISCOVERED
- NOTE ADVERSE WEATHER CONDITIONS
  - WEATHER
  - TERRAIN
  - DOWNSTREAM WATER USERS
- POTENTIAL TO STOP FLOW FROM SOURCE
- POTENTIAL TO CONTAIN SPILL FLOW
- COMMUNICATE ON SITE RESPONSE ACTION PLAN

SPILL REPORTED ? IMMEDIATE SUPERVISOR IS NOW THE INTERIM ON-SCENE COMMANDER.

1. ACTIVATE OIL SPILL CONTINGENCY PLAN

- SET THE RESPONSE UNIT INTO MOTION
- ESTABLISH THE ON-SCENE COMMANDER

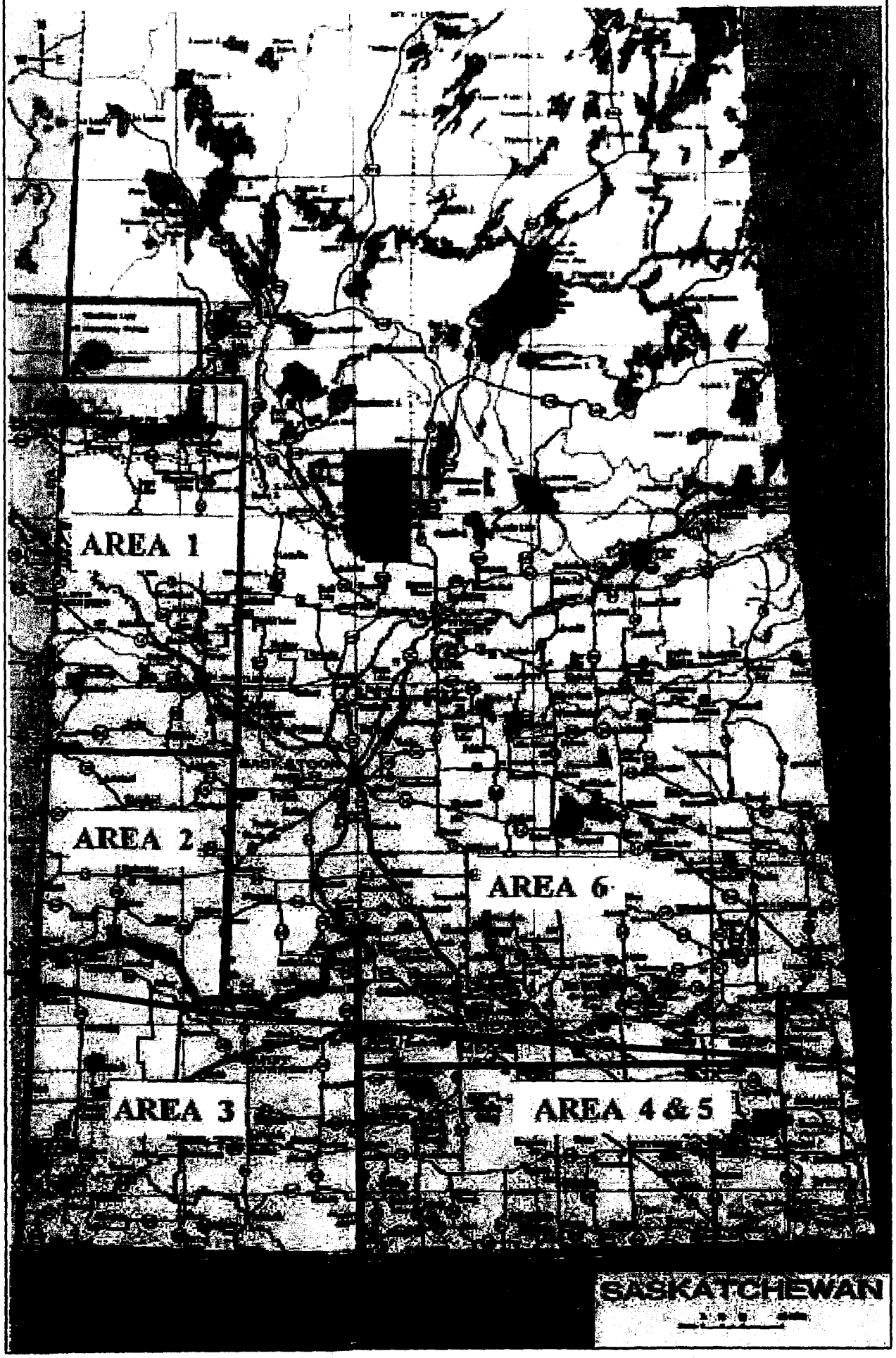
AREA III MOBILIZATION TO SPILL SITE ? ON-SCENE COMMANDER

1. ESTABLISH AND MAINTAIN COMPLETE CONTROL OF THE OPERATION:

- SET UP A COMMAND POST FOR OPERATIONS
- DISPATCH FIELD STAFF TO SPILL SITE TO VERIFY THE SPILL LOCATION, THE EXTENT OF THE SPILL AND PROCEED WITH SHUT-IN PROCEDURES
- MOBILIZE THE AREA III EQUIPMENT ?(COMBINATION #1, 2, 3, 4.)
- CALL KEY PERSONNEL AND REGULATORY AGENCIES
- ORGANIZE AND ACTIVATE CONTINGENCY PLAN AS PER AREA III SPILL CONTINGENCY MANUAL FOR CONTAINMENT AND CLEANUP OF SPILL.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

Saskatchewan Area 4&5 Oil Spill Cooperative

The Province of Saskatchewan is divided into 5 oil spill cooperative areas. The TransCanada Keystone Pipeline travels from west to east through a small area in the north-east corner of area 4&5. The cooperative is run by a steering committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment location, contact information and Saskatchewan area map are included in this document.

EQUIPMENT LOCATION	DATE LAST REVISED: 08-Feb-26
OIL SPILL CONTINGENCY AREA 4&5 FIRST RESPONSE FOR EQUIPMENT/TRAILER AND LOCATION	

OIL SPILL FIRST RESPONSE

Phone: **(306) 634-6277** to notify the Oil Spill Contingency that you will need the trailer and to make arrangements to pick up the trailer.

EQUIPMENT LOCATION

Oil spill equipment is stored in a 32 foot trailer.

TRAILER LOCATION

Redigo Construction Company Limited
44 Hwy 39 East
Estevan, Saskatchewan

DRIVER QUALIFICATION AND VEHICLE RATING REQUIREMENTS

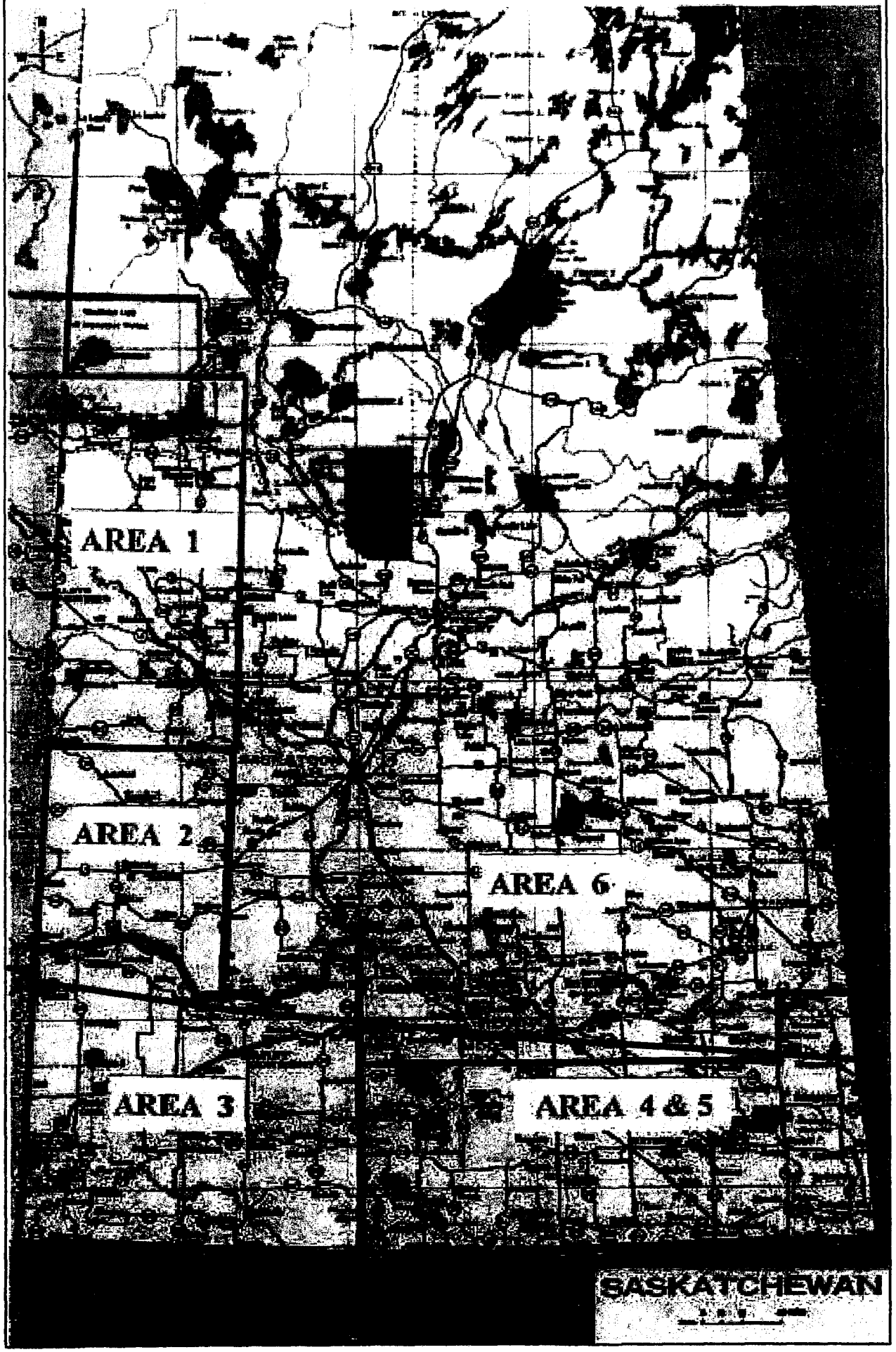
As the trailer is greater than 10,000 lb (actual weight approx. 13,000 lb), drivers must possess a minimum of a Class 1G license, as per SGI requirements. Also, vehicles must be rated accordingly. Below is a list of contractors with qualified drivers and vehicles. Any other contractors with qualified drivers and vehicles may also be used to mobilize and de-mobilize the trailer.

Murray Towing and Boosting Service, Estevan 306-637-2007
Carson Welding & Maintenance , Lampman -306-487-2281
Jerry Mainil Limited, Weyburn- 306-842-5412

The ball for the hitch is located just inside the side door.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



Oil Spill Cooperative Agreement

TransCanada Keystone Limited Partnership has agreed and intends to join the Oil Spill Cooperative organizations in all areas which its pipeline crosses. Currently, the pipeline is not in operation, therefore the contracts / agreements are not in place. When contracts / agreements are completed they will replace this page of this document and will be made available for inspection.

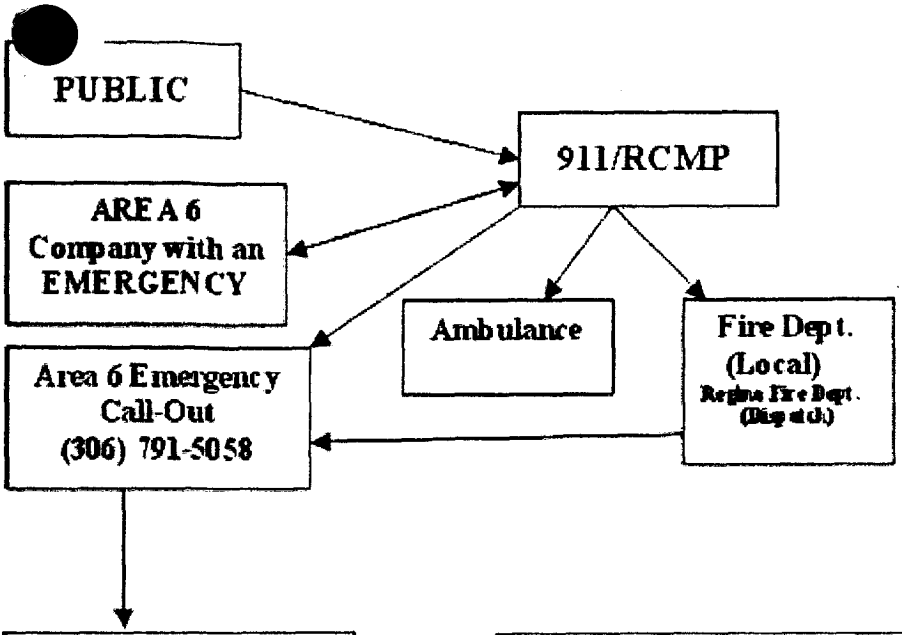
Saskatchewan Area 6 Oil Spill Cooperative

The Province of Saskatchewan is divided into 5 oil spill cooperative areas. The TransCanada Keystone Pipeline travels from west to east through the southernmost part of area 6. The cooperative is comprised of several oil companies in the area who designate their company owned response equipment to be available to other members of the area cooperative for use during an incident.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

Contact information and Saskatchewan area map are included in this document.

AREA 6 EMERGENCY RESPONSE CO-OP
CALL-OUT CHART & INSTRUCTIONS (May 2008)



Alliance Pipeline
1-800-884 8811
Kinder Morgan (Cochin)
1-800-265 6000
Co-op Refineries
721 5372
ra Energy
1-403-838-3764
Imperial Oil
(24/7) (306) 757 4342

Enbridge Pipelines
1-877-420 8800
Moose Jaw Asphalt
1-306-691 7800 (ext. 0)
Petro Canada
(Saskatoon)
1-306-382 1455 (ext. 0)
Plains Midstream
1-866-875 2554
SaskEnergy/TransGas
(306) 777 9800

MEMBER INSTRUCTIONS

*** THE "FIRST" COMPANY TO RECEIVE A CALL or have a PIPELINE EMERGENCY shall contact the AREA 6 EMERGENCY CALL-OUT and announce the following summary message:

"(your company) is calling on behalf of the Area 6 Emergency Response Co-op.

There is a "pipeline emergency" at the following (location).

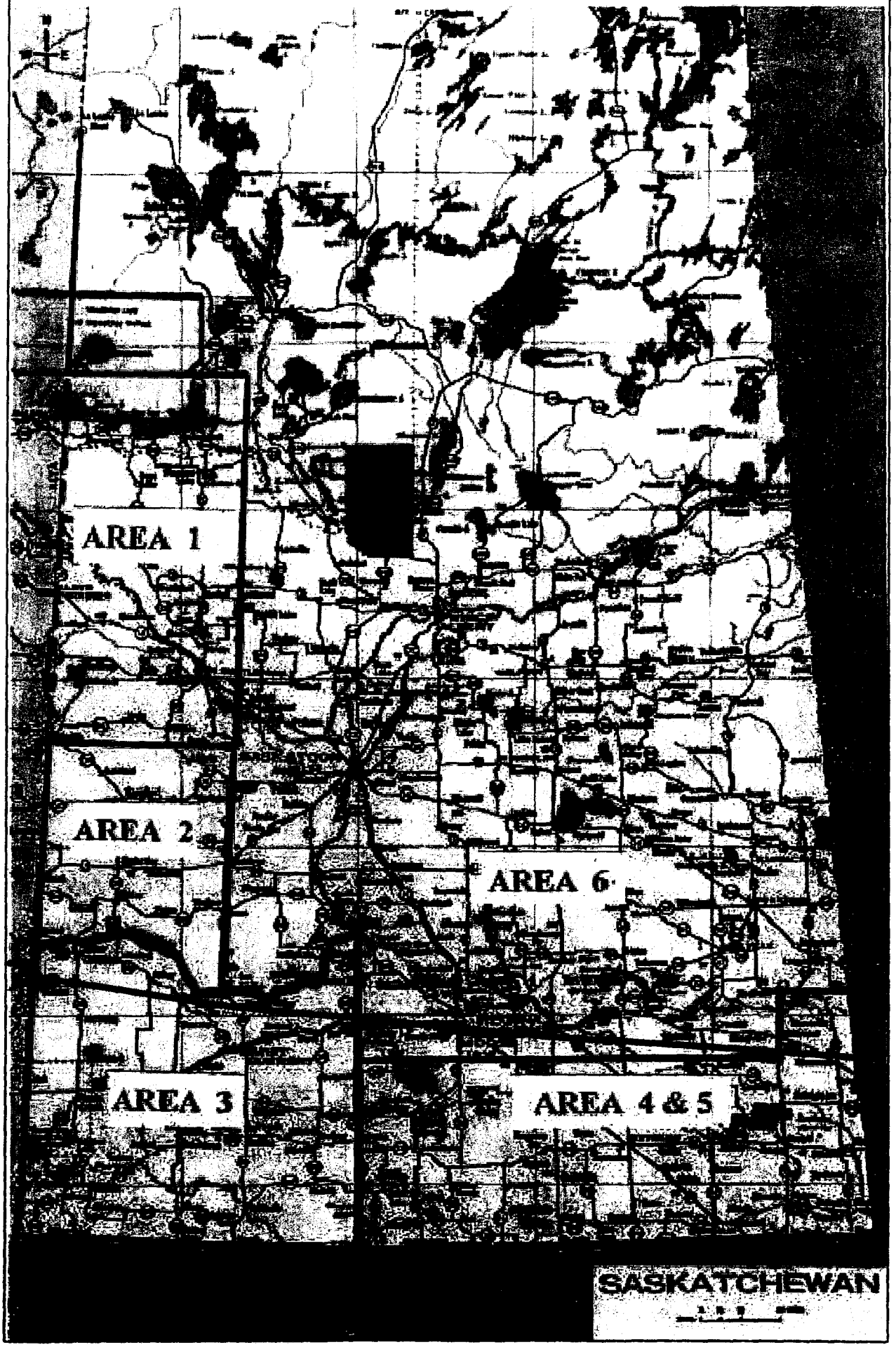
The company involved is (state name if known) or (state unknown).

Please "ACTIVATE" the Area 6 Emergency Response Co-op's "Call-Down Procedure".

SPECIAL INSTRUCTIONS: Please state if you are requesting assistance or this is for notification purposes only. Also if you require equipment, manpower or any special requests or instructions.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



APPENDIX B

WORST CASE DISCHARGE ANALYSIS AND SCENARIOS

Introduction

Hardisty Pump Station/ Regina Pump Station

- Worst Case Discharge
- Planning Volume Calculations

Regina Pump Station / Haskett Pump Station

- Worst Case Discharge
- Planning Volume Calculations

North Dakota, South Dakota, Nebraska

- Worst Case Discharge
- Planning Volume Calculations

Kansas, Missouri, Illinois

- Worst Case Discharge
- Planning Volume Calculations

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INTRODUCTION

This Appendix identifies potential causes for oil discharges and discusses the response efforts that are necessary for successful mitigation. Included in this Appendix are hypothetical scenarios for various types of spills that have the potential to occur along the system. It is anticipated that the Company will respond to spills in a consistent manner regardless of the location. Therefore, the guidelines discussed in this appendix will apply to all spills whenever possible.

United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Discharge Volume Calculation

- **Worst Case Discharge**

  The largest volume (Bbls) of the following:

  - *Pipeline's maximum release time (hrs), plus the maximum shutdown response time (hrs), multiplied by the maximum flow rate (bph), plus the largest line drainage volume after shutdown of the line section.*

  --OR--

  - *Largest foreseeable discharge for the line section is based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective action or preventive action taken.*

  --OR--

  - *Capacity of the single largest breakout tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system.*

Scenario Types

The occurrence of a Worst Case Discharge (WCD) could be the result of any number of scenarios along the pipeline system including:

- Piping rupture.
- Piping leak, under pressure and not under pressure.
- Explosion or fire.
- Equipment failure (e.g. pumping system failure, relief valve failure, or other general equipment relevant to operational activities associated with internal or external facility transfers).

The response actions to each of these scenarios are outlined in Section 3.1 and Figure 3.1. The response resources are identified in a quick reference format in Figure 2.5. Pipeline response personnel list/telephone numbers and other internal/external resources telephone numbers are detailed in Figures 2.2 and 2.5.

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RESPONSE CAPABILITY SCENARIOS

Hardisty Pump Station/ Regina Pump Station

Pipeline Worst Case Discharge = 41,504 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 9,300 feet upstream of Valve KP 641.1.

Volume

Worst Case = (Initial Line Fill Volume - Pumping Rate Volume) x 0.60 = Barrels
= (63346.00 - 8740.00) x 0.60 = 32763.6 Bbls
= Adjusted Line Volume + Pumping Rate Volume
= 32763.6 + 8740.00 = 41,504 Bbls

The Worst Case Discharge for this response zone was calculated electronically using elevation data, pipeline statistics, and designed operational levels. The first calculation completed was the volume released prior to the shutdown of the pipeline system. This volume is noted as "Pumping Rate Volume" and is equal to 8,740 barrels. Using the designed operational levels, the pumping rate volume is calculated by taking the pumping rate of 662,400 barrels per day and multiplying by the shutdown time of 19 minutes. The 19 minutes of shutdown time consists of 10 minutes of evaluation time, where the controllers decide that there is a problem and the line needs to be shut down, 9 minutes of pump station shutdown, which must be completed in a certain order to prevent damage to the system. To ensure that the volume is not underestimated, the 19 minutes of shutdown time is multiplied by the full pumping rate, 460 barrels per minute, even though, as pump stations are shut down the rate will decrease throughout the 9 minutes of shutdown.

The second calculated number is the amount of drain down. These calculations were done at 100 foot increments throughout the length of the pipeline. This drain down volume is calculated using electronic elevation data and assumes a complete break in the pipeline. The computer program used develops elevation profiles of the pipeline and provides the volume of a release at each 100 foot point taking into account the large elevation changes in the pipeline. The combination of the pumping rate volume and the drain down volume provides the "Initial Line Fill Volume".

In the Initial Line Fill Volume calculation the program only accounts for large elevation changes. In such, long flat portions that have smaller hills and valleys are calculated as draining fully, when common sense and subject matter studies, such as the California State Fire Marshall report of March 1993, have proven that these smaller elevation changes will prevent much of these areas from draining. Therefore, the worst case discharge has been calculated above reducing the line drainage component to 60% of the computer generated amount.

Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

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- Resources capable of arriving at the staging area within the applicable response tier requirements for non-high volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tanks

There are no breakout tanks in the Response Zone.

Volume

If the Response Zone had breakout tank(s), a worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system.

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Hardisty Pump Station/ Regina Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			41,504
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			41,504
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			20,752
Shoreline Recovery Volume (bbls)			20,752
Shoreline Cleanup Volume (bbls)			41,504
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	[illegible]	[illegible]	[illegible]
Shallow Water Resp Cpblty (bbls/day)	[illegible]	[illegible]	[illegible]
Storage Capacity (bbls/day)	[illegible]	[illegible]	[illegible]
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Regina Pump Station / Haskett Pump Station

Pipeline Worst Case Discharge = 51,413 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 2,000 feet downstream of Valve KP 1138.1.

Volume

Worst Case = (Initial Line Fill Volume - Pumping Rate Volume) x 0.60 = Barrels
= (79861.00 - 8740.00) x 0.60 = 42672.6 Bbls
= Adjusted Line Volume + Pumping Rate Volume
= 42672.6 + 8740.00 = 51,413 Bbls

The Worst Case Discharge for this response zone was calculated electronically using elevation data, pipeline statistics, and designed operational levels. The first calculation completed was the volume released prior to the shutdown of the pipeline system. This volume is noted as "Pumping Rate Volume" and is equal to 8,740 barrels. Using the designed operational levels, the pumping rate volume is calculated by taking the pumping rate of 662,400 barrels per day and multiplying by the shutdown time of 19 minutes. The 19 minutes of shutdown time consists of 10 minutes of evaluation time, where the controllers decide that there is a problem and the line needs to be shut down, 9 minutes of pump station shutdown, which must be completed in a certain order to prevent damage to the system. To ensure that the volume is not underestimated, the 19 minutes of shutdown time is multiplied by the full pumping rate, 460 barrels per minute, even though, as pump stations are shut down the rate will decrease throughout the 9 minutes of shutdown.

The second calculated number is the amount of drain down. These calculations were done at 100 foot increments throughout the length of the pipeline. This drain down volume is calculated using electronic elevation data and assumes a complete break in the pipeline. The computer program used develops elevation profiles of the pipeline and provides the volume of a release at each 100 foot point taking into account the large elevation changes in the pipeline. The combination of the pumping rate volume and the drain down volume provides the "Initial Line Fill Volume".

In the Initial Line Fill Volume calculation the program only accounts for large elevation changes. In such, long flat portions that have smaller hills and valleys are calculated as draining fully, when common sense and subject matter studies, such as the California State Fire Marshall report of March 1993, have proven that these smaller elevation changes will prevent much of these areas from draining. Therefore, the worst case discharge has been calculated above reducing the line drainage component to 60% of the computer generated amount.

Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

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- Resources capable of arriving at the staging area within the applicable response tier requirements for non-high volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tanks

There are no breakout tanks in the Response Zone.

Volume

If the Response Zone had breakout tank(s), a worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system.

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Regina Pump Station / Haskett Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			51,413
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			51,413
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			25,706
Shoreline Recovery Volume (bbls)			25,706
Shoreline Cleanup Volume (bbls)			51,412
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	[illegible]	[illegible]	[illegible]
Shallow Water Resp Cpblty (bbls/day)	[illegible]	[illegible]	[illegible]
Storage Capacity (bbls/day)	[illegible]	[illegible]	[illegible]
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

North Dakota, South Dakota, Nebraska

Pipeline Worst Case Discharge = 27,329 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 29,400 feet downstream of Valve MP 432.4.

Volume

Worst Case = (Initial Line Fill Volume - Pumping Rate Volume) x 0.60 = Barrels
= (39722.00 - 8740.00) x 0.60 = 18589.2 Bbls
= Adjusted Line Volume + Pumping Rate Volume
= 18589.2 + 8740.00 = 27,329 Bbls

The Worst Case Discharge for this response zone was calculated electronically using elevation data, pipeline statistics, and designed operational levels. The first calculation completed was the volume released prior to the shutdown of the pipeline system. This volume is noted as "Pumping Rate Volume" and is equal to 8,740 barrels. Using the designed operational levels, the pumping rate volume is calculated by taking the pumping rate of 662,400 barrels per day and multiplying by the shutdown time of 19 minutes. The 19 minutes of shutdown time consists of 10 minutes of evaluation time, where the controllers decide that there is a problem and the line needs to be shut down, 9 minutes of pump station shutdown, which must be completed in a certain order to prevent damage to the system. To ensure that the volume is not underestimated, the 19 minutes of shutdown time is multiplied by the full pumping rate, 460 barrels per minute, even though, as pump stations are shut down the rate will decrease throughout the 9 minutes of shutdown.

The second calculated number is the amount of drain down. These calculations were done at 100 foot increments throughout the length of the pipeline. This drain down volume is calculated using electronic elevation data and assumes a complete break in the pipeline. The computer program used develops elevation profiles of the pipeline and provides the volume of a release at each 100 foot point taking into account the large elevation changes in the pipeline. The combination of the pumping rate volume and the drain down volume provides the "Initial Line Fill Volume".

In the Initial Line Fill Volume calculation the program only accounts for large elevation changes. In such, long flat portions that have smaller hills and valleys are calculated as draining fully, when common sense and subject matter studies, such as the California State Fire Marshall report of March 1993, have proven that these smaller elevation changes will prevent much of these areas from draining. Therefore, the worst case discharge has been calculated above reducing the line drainage component to 60% of the computer generated amount.

Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

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- Resources capable of arriving at the staging area within the applicable response tier requirements for non-high volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tanks

There are no breakout tanks in the Response Zone.

Volume

If the Response Zone had breakout tank(s), a worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system.

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North Dakota, South Dakota, Nebraska

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
			-
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			27,329
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			27,329
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculations			
On-Water Recovery Volume (bbls)			13,665
Shoreline Recovery Volume (bbls)			13,665
Shoreline Cleanup Volume (bbls)			27,330
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	12,000	6,832	13,664
Shallow Water Resp Cpblty (bbls/day)	820	3,416	2,416
Storage Capacity (bbls/day)	2,198	2,964	2,964
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Kansas, Missouri, Illinois

Pipeline Worst Case Discharge = 24,069 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 35,100 feet upstream of Valve MP 1003.3.

Volume

Worst Case = (Initial Line Fill Volume - Pumping Rate Volume) x 0.60 = Barrels
= (34289.00 - 8740.00) x 0.60 = 15329.4 Bbls
= Adjusted Line Volume + Pumping Rate Volume
= 15329.4 + 8740.00 = 24,069 Bbls

The Worst Case Discharge for this response zone was calculated electronically using elevation data, pipeline statistics, and designed operational levels. The first calculation completed was the volume released prior to the shutdown of the pipeline system. This volume is noted as "Pumping Rate Volume" and is equal to 8,740 barrels. Using the designed operational levels, the pumping rate volume is calculated by taking the pumping rate of 662,400 barrels per day and multiplying by the shutdown time of 19 minutes. The 19 minutes of shutdown time consists of 10 minutes of evaluation time, where the controllers decide that there is a problem and the line needs to be shut down, 9 minutes of pump station shutdown, which must be completed in a certain order to prevent damage to the system. To ensure that the volume is not underestimated, the 19 minutes of shutdown time is multiplied by the full pumping rate, 460 barrels per minute, even though, as pump stations are shut down the rate will decrease throughout the 9 minutes of shutdown.

The second calculated number is the amount of drain down. These calculations were done at 100 foot increments throughout the length of the pipeline. This drain down volume is calculated using electronic elevation data and assumes a complete break in the pipeline. The computer program used develops elevation profiles of the pipeline and provides the volume of a release at each 100 foot point taking into account the large elevation changes in the pipeline. The combination of the pumping rate volume and the drain down volume provides the "Initial Line Fill Volume".

In the Initial Line Fill Volume calculation the program only accounts for large elevation changes. In such, long flat portions that have smaller hills and valleys are calculated as draining fully, when common sense and subject matter studies, such as the California State Fire Marshall report of March 1993, have proven that these smaller elevation changes will prevent much of these areas from draining. Therefore, the worst case discharge has been calculated above reducing the line drainage component to 60% of the computer generated amount.

Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

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- Resources capable of arriving at the staging area within the applicable response tier requirements for non-high volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tanks

There are no breakout tanks in the Response Zone.

Volume

If the Response Zone had breakout tank(s), a worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system.

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Kansas, Missouri, Illinois

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			24,069
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			24,069
Selected Calculation Factors (Based on OSCC Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			12,035
Shoreline Recovery Volume (bbls)			12,035
Shoreline Cleanup Volume (bbls)			24,070
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	[redacted]		
Shallow Water Resp Cpblty (bbls/day)			
Storage Capacity (bbls/day)			
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	6	30	54

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APPENDIX C

EMERGENCY PRE-PLANNING

C.1 Release Detection

C. 2 Leak Detection Systems

C. 3 Discharge Prevention Systems

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EMERGENCY PRE-PLANNING

Leak detection and discharge prevention is accomplished through safe operating procedures and maintenance procedures outlined in the Company Operations and Maintenance (O&M) Manual. The Company Operations and Maintenance Manual is designed to meet the requirements found in Statory Orders and Regulations /99-294 S27, National Energy Board, Operation and Maintenance Manuals, and Title 49, US Code of Federal Regulations, Part 195, Transportation of Hazardous Liquids by Pipeline.

C.1 RELEASE DETECTION

- The Keystone Console and Company Field Employees are responsible for ensuring the integrity of facilities and detecting releases.

- There are four primary types of indications that a release may be occurring:

    - An unexplained hydraulic upset condition observed in the Pipeline system operating data.
    - A consistent unexplainable Pipeline system shortage occurring over several check time periods.
    - An alarm from a Supervisory Control and Data Acquisition-based leak detection system.
    - A report of a direct observation of a release or released product received from an employee or the public.

- All indications, including supposedly direct observation, are subject to confirmation; however, the Company policy is to shut down if any doubt exists as to the integrity of the Pipeline system. The simultaneous occurrence of two or more of the indicators above greatly increases the probability that the Pipeline system has lost integrity.

- Specific guidance for response to abnormal operating conditions and determining the location of a suspected pipeline release may be found in the Company's Operations and Maintenance Manual, maintained separately.

- A form for recording conversations with an observer who reports an emergency is located in Appendix F of this Plan. Copies of this form should be kept readily accessible at telephones.

- Routine actions to be taken by Company Field Employees to ensure facility integrity and detect releases are listed as follows:

    - Keystone Console Monitors Pressures using Supervisory Control and Data Acquisition
    - Routine Station/ROW Checks Performed
    - Routine Aerial Surveillance
    - 24 Hour Emergency Reporting Phone Number Monitored

C.2 LEAK DETECTION SYSTEMS

Leak detection systems utilized along the Pipeline include:

- System-level indication is accomplished through usage of a Supervisory Control and Data Acquisition (SCADA) system. This system is capable of monitoring flow rates, pressure, metering information (delivery / receipt volumes), temperature, and valve

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positions. The Supervisory Control and Data Acquisition system is monitored on a 24-hour per day basis by both the centralized Pipeline Control Center and Secondary Control points.

The location of a spill caused by a catastrophic break, which may be indicative of a Worst Case Discharge, can be inferred by Supervisory Control and Data Acquisition personnel down to a Pipeline section between operating pump stations. This inference is based upon rapid and abrupt changes in operating conditions.

C.3 DISCHARGE PREVENTION SYSTEMS

Pipeline pump stations are designed in a manner that maximizes the containment of leaks on-site and deters the migration of leaks off-site. Discharge prevention is accomplished through the following measures:

- Pipelines and related structures have grounding systems to reduce the possibility of accidental ignition due to lightning.
- Discharge prevention is also accomplished through the use of general housekeeping procedures and leak inspection system

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APPENDIX D

TRAINING AND DRILLS

D.1 Response Team Training

Emergency Response Plan Review
Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
Incident Command System
Training Records Maintenance
Contractor Training
Training Qualifications

D. 2 Response Team Exercises

Quarterly QI Notification Exercise
Annual Equipment Deployment Exercise
Annual Response Team Tabletop Exercise
Government-Initiated Unannounced Exercise
Area Exercises
Exercise Documentation

D. 3 Purpose of Review and Evaluation

Outline of Review
Detection
Notification
Assessment/Evaluation
Mobilization
Response - Strategy
Response - Resources Used
Response - Effectiveness
Command Structure
Measurement
Government Relations
Public Relations

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D.1 RESPONSE TEAM TRAINING

The Company provides training related to discharge prevention, testing and response, including measures to repair Pipeline ruptures and mitigate discharges. The training methods address oil discharges from the Pipeline from several perspectives: human health and safety, rupture control and repair operations, pollution control, and overall (crisis) management of the emergency.

The competency of each training program is closely monitored by the Training Section through observation of and/or participation in actual training sessions.

Through the various training methods described below the Company's training program is intended to ensure the following results:

That all personnel know:

- Their responsibilities under the Plan.
- The name, address and procedures for contacting the operator on a 24-hour basis.
- The name of and procedures for contacting the Qualified Individual on a 24-hour basis.

That all reporting personnel know:

- The Pipelines and Response Zone details for the affected area (Response Zones Annexes).
- The telephone number of the Federal Provincial/State and local agencies and other required notifications (Section 2.0).
- The notification process. (Section 2.0).

That all response personnel know:

- The characteristics and hazards of the oil discharged (Section 3.0 and Appendix G - MSDS).
- The conditions that is likely to worsen emergencies, including the consequences of pipeline malfunctions, and the appropriate corrective actions.
- The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity or environmental damage (Section 3.0).
- The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus (Section 3.0). Only trained persons will be utilized. Company personnel are only trained on the use of handheld Ansul 30# fire extinguisher units for small incipient fires.

Emergency Response Plan Review

All Response Team Members should review their Emergency Response Plan whenever their job position or responsibilities change under the Plan. A copy of this Plan will be available at all times to Team Members.

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HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (29 CFR 1910.120)

Federal and State regulations require that Response Team Members maintain up-to-date Hazardous Waste Operations and Emergency Response training necessary to function in their assigned positions. At a minimum, team members will receive "First Responder Awareness Level" training. All personnel responding to an incident must satisfy the applicable Hazardous Waste Operations and Emergency Response training requirements of 29 CFR 1910.120.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE TRAINING REQUIREMENTS

Responder Classification	Required Training Hours	Refresher
29CFR 1910.120(q) Emergency Response		
First Responder - Awareness Level	2-4 hrs demonstration of	same
First Responder - Operations Level	competency	8 hrs
Hazardous Materials Technician	8 hrs	8 hrs
Hazardous Materials Specialist	24 hrs plus competency	8 hrs
Incident Commander	24 hrs plus competency in specialized areas 24 hrs plus competency	8 hrs
29CFR 1910.120(e) Clean Up Sites		
General Site Workers	40 hrs / 3 days on the job training	8 hrs
Occasional Workers (Limited Tasks)	24 hrs / 1 day on the job training	8 hrs
General Site Workers (Low Hazard)	24 hrs / 1 day on the job training	8 hrs
Supervisors	8 hrs supervisor training	8 hrs
* Previous work experience and/or training certified as equivalent by employer.		

Incident Command System

Response Team Members will receive Incident Command System training and may also receive supplemental training in other related general topics.

Training Records Maintenance

Emergency response training records are maintained at the Company's office. Training records for response personnel will be maintained for as long as personnel have duties in this Emergency Response Plan.

Contractor Training

The Company also recognizes that contract personnel must also have sufficient training to respond emergency response situations. The Company communicates this training need to its key contractors during contract negotiations and often specifically spells out this requirement in its contracts. The Company also tends to use well-known spill response contractors whose reputation and experience levels help ensure personnel who respond will be trained to appropriate levels.

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Training Qualifications

As no formalized method of certifying training instructors has been provided by Occupational Safety and Health Administration, the Company ensures the competency of its instructors and training organizations by selecting trainers and/or organizations with professional reputations and extensive hands-on and classroom experience in their subject matter. The Company personnel with responsibility to coordinate the training program also conduct periodic informal audits of training courses selected for the Company training program to ensure their suitability for the program.

D.2 RESPONSE TEAM EXERCISES

Spill Management Team members, government agencies, contractors, and other resources must participate in response exercises required by Federal, State, or local regulations and as detailed in the "National Preparedness for Response Exercise Program (PREP) Guidelines." The Company (through the Community, Safety and Environment Department) will conduct announced drills to maintain compliance, and each plan-holder must participate in at least one exercise annually. The following table lists the triennial exercise cycle for facilities (see National Preparedness for Response Exercise Program Guidelines for full details).

TRIENNIAL CYCLE		
Total Number	Frequency	Exercise Type/Description
12	Quarterly	Qualified Individual Notification Exercise
3	Annually	Equipment Deployment Exercise *(Facility-owned equipment)*
3	Annual	Response Team Tabletop Exercise
3	Annual	Equipment Deployment Exercise *(facilities with Oill Spill Removal Organization-owned equipment)*
3	3 per Triennial Cycle	Unannounced Exercise *(not a separate exercise)* Actual response can be considered as an unannounced exercise. Credit can also be given for unannounced equipment deployment and Response Team tabletop exercises.
NOTES: 1) All Emergency Response Plan components must be exercised at least once in the Cycle.		

Quarterly QI Notification Exercise

- **Scope:** Exercise communication between Pipeline personnel and the Qualified Individual(s) and/or designated alternate(s). At least once each year, one of the notification exercises should be conducted during non-business hours.
- **Objective:** Contact must be made with a Qualified Individual or designated alternate, as identified in the Plan.
- **General:** All personnel receiving notification shall respond to the notification and verify their receipt of the notification. Personnel who do not respond should be contacted to determine whether or not they received the notification.

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Annual Equipment Deployment Exercise (for operator and/or Oill Spill Removal Organization equipment)

- **Scope:** Demonstrate ability to deploy spill response equipment identified in the Emergency Response Plan.

  May consist entirely of operator owned equipment, or a combination of OSRO and operator equipment.
  The number of equipment deployment exercises conducted should be such that equipment and personnel assigned to each Response Zone are exercised at least one a year. If the same personnel and equipment respond to multiple zones, they need only exercise once per year. If different personnel and equipment response to various Response Zones, each must participate in an annual equipment deployment exercise.

- **Objective:** Demonstrate personnel?s ability to deploy and operate response equipment. Ensure that the response equipment is in proper working order.

- **General:** The Facility may take credit for actual equipment deployment to a spill, or for training sessions, as long as the activities are properly documented.

Annual Response Team Tabletop Exercise

- **Scope:** Exercise the response team's organization, communication, and decision- making in managing a spill response. Each team identified within the Plan must conduct an annual Response Team Tabletop Exercise.

- **Objective:** Exercise the response team in a review of the following:

  Knowledge of the Plan.
  Proper notifications.
  Communications system.
  Ability to access an OSRO.
  Coordination of internal spill response personnel.
  Review of the transitionReview of the transition from a initial team to a regional team.
  Ability to effectively coordinate response activity with the National Response System (NRS) Infrastructure.
  Ability to access information in the Area Contingency Plan.

- **General:** A minimum of one Response Team Tabletop Exercise in a triennial cycle will involve a Worst Case Discharge scenario.

Government-Initiated Unannounced Exercise

- **Scope:** Demonstrate ability to respond to a Worst Case Discharge spill event.

- **Objectives:** Designated Emergency Response Team Members should demonstrate adequate knowledge of their Emergency Response Plan and the ability to organize, communicate, coordinate, and respond in accordance with that Plan.

- **General:** Maximum of 20 unannounced Pipeline and Hazardous Materials Safety Administration exercises conducted annually for the pipeline industry as a whole. A single owner or operator will not be required to participate in a PHMSA-initiated unannounced exercise if they have already participated in one within the previous 36 months.

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Area Exercises

- **Objective:** The purpose of the area exercise is to exercise the entire response community in a particular area. An area is defined as ?that geographic area for which a separate and distinct Area Contingency Plan has been prepared, as described in Oil Pollution Act 90.? The response community includes the Federal, State, and local government and industry. The area exercises are designed to exercise the government and industry interface for spill response.

- **General:** The goal is to ensure that all areas of the country are exercised triennially. All of the area exercises will be developed by an exercise design team. The exercise design team is comprised of representatives from the Federal, State, and local government and industry. A lead plan holder would lead each area exercise. The lead plan holder is the organization (government or industry) that holds the primary plan that is exercised in the area exercise. The lead plan holder would have the final word on designing the scope and scenario of the exercise.

Exercise Documentation

- All exercises should be documented and maintained at the Company office; documentation should specify:

  The type of exercise;
  Date and time of the exercise;
  A description of the exercise;
  The objectives met in the exercise;
  The components of the response plan exercised; and
  Lessons learned.

- Exercise documentation should be kept on file for the required length of time depending on the regulating agency (three (3) years for the U.S. Coast Guard and five (5) years for the Pipeline and Hazardous Materials Safety Administration and the U.S. Environmental Protection Agency).

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D.3 PURPOSE OF REVIEW AND EVALUATION

This Section provides procedures and information useful to responders for post incident/exercise review and evaluation. Post incident/exercise reviews should be conducted in a timely manner following an incident/exercise. The Plan should be evaluated to determine its usefulness during the incident/exercise and appropriate revisions should be made. All incident/exercise documentation should be included in the Plan evaluation process.

Outline of Review

Given below are items a team composed of outside people knowledgeable in spill response and key members of the response teams should examine. These questions are intended as guidelines only; many other questions are likely to be appropriate at each stage of a critique.

- ***Detection***

  Was the spill detected promptly?
  How was it detected? By whom?
  Could it have been detected earlier? How?
  Are any instruments or procedures available to consider which might aid in spill detection?

- ***Notification***

  Were proper procedures followed in notifying government agencies? Were notifications prompt?
  Was management notified promptly/response appropriate?
  Was the Pipeline owner/operator notified promptly? If so, why, how, and who? If not, why not?

- ***Assessment/Evaluation***

  Was the magnitude of the problem assessed correctly at the start?
  What means were used for this assessment?
  Are any guides or aids needed to assist spill evaluation?
  What sources of information were available on winds and on water currents?
  Is our information adequate?
  Was this information useful (and used) for spill trajectory forecasts? Were such forecasts realistic?
  Do we have adequate information on product properties?
  Do we need additional information on changes of product properties with time, i.e., as a result of weathering and other processes?

- ***Mobilization***

  What steps were taken to mobilize spill countermeasures?
  What resources were used?
  Was mobilization prompt?
  Could it have been speeded up or should it have been?
  What about mobilization of manpower resources?
  Was the local spill cooperative used appropriately?
  How could this be improved?
  Was it appropriate to mobilize the Pipeline owner/operator resources and was this promptly initiated?
  What other resources are available and have they been identified and used adequately?

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- ***Response - Strategy***

  Is there an adequate Spill Response Plan for the location?
  Is it flexible enough to cope with unexpected spill events?
  Does the Plan include clear understanding of local environmental sensitivities?
  What was the initial strategy for response to this spill?
  Is this strategy defined in the Spill Plan?
  How did the strategy evolve and change during this spill and how were these changes implemented?
  What caused such changes?
  Are there improvements needed? More training?

- ***Response - Resources Used***

  What resources were mobilized?
  How were they mobilized?
  How did resource utilization change with time? Why?
  Were resources used effectively?

  - Contractors
  - Government agencies
  - Company resources
  - Cooperatives
  - Volunteers
  - Consultants
  - Other (e.g., bird rescue centers)

  What changes would have been useful?
  Do we have adequate knowledge of resource availability?
  Do we have adequate knowledge of waste disposal capabilities?

- ***Response - Effectiveness***

  Was containment effective and prompt?
  How could it have been improved?
  Should the location or the local cooperative have additional resources for containment?
  Was recovery effective and prompt?
  How could it have been improved?
  Should the location or the local cooperative have additional resources for recovery of spilled product?
  Was contaminated equipment disposed promptly and safely?
  Was there adequate in-house product separation, recovery, and disposal?
  How could it have been improved?
  Was there adequate outside disposal resources available?

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- ***Command Structure***

  Who was initially in charge of spill response?
  What sort of organization was initially set up?
  How did this change with time? Why?
  What changes would have been useful?
  Was there adequate surveillance?
  Should there be any changes?
  Were communications adequate?
  What improvements are needed? Hardware, procedures, etc.
  Was support from financial services adequate? Prompt?
  Should there be any changes?
  Is more planning needed?
  Should financial procedures be developed to handle such incidents?

- ***Measurement***

  Was there adequate measurement or estimation of the volume of product spilled?
  Was there adequate measurement or estimation of the volume of product recovered?
  Was there adequate measurement or estimation of the volume of product disposed?
  Should better measurement procedures be developed for either phase of operations?
  If so, what would be appropriate and acceptable?

- ***Government Relations***

  What are the roles and effects of the various government agencies which were involved?
  Was there a single focal point among the government agencies for contact?
  Should there have been better focus of communications to the agencies?
  Were government agencies adequately informed at all stages?
  Were too many agencies involved?
  Are any changes needed in procedures to manage government relations?
  Examples of affected U.S. agencies (there may be others):

  - U.S. Coast Guard
  - Environmental Protection Agency
  - National Oceanic and Atmospheric Administration
  - Dept of Fish and Wildlife
  - State Parks
  - Harbors and Marinas
  - States
  - Cities
  - Counties

  Was there adequate agreement with the government agencies on disposal methods?
  Was there adequate agreement with the government agencies on criteria for cleanup?
  How was this agreement developed?
  Were we too agreeable with the agencies in accepting their requests for specific action items (e.g., degree of cleanup)?
  Should there be advance planning of criteria for cleanup, aimed at specific local environmentally sensitive areas? (Such criteria should probably also be designed for different types of product.)

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- ***Public Relations***

  How were relations with the media handled?
  What problems were encountered?
  Are improvements needed?
  How could public outcry have been reduced? Was it serious?
  Would it be useful to undertake a public information effort to "educate" reporters about product and effects to it if spilled?
  These areas should be investigated shortly after the incident to assure that actions taken are fresh in peoples' minds.

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APPENDIX E

DISPOSAL PLAN

E.1 Overview

E. 2 Waste Classification

E. 3 Waste Handling

E. 4 Waste Storage

E. 5 Waste Disposal

Figure E. 1 Temporary Storage Methods

Figure E. 2 Oily Waste Separation and Disposal Methods

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E.1 OVERVIEW

A major oil spill response would generate significant quantities of waste materials ranging from oily debris and sorbent materials to sanitation water and used batteries. All these wastes need to be classified and segregated (i.e., oily, liquid, etc.), transported from the site, and treated and/or disposed at approved disposal sites. Each of these activities demands that certain health and safety precautions be taken, which are strictly controlled by Federal and State Laws and Regulations. This Section provides an overview of the applicable State Regulations governing waste disposal, and a discussion of various waste classification, handling, transfer, storage, and disposal techniques. It is the responsibility of the Environmental Unit to manage waste disposal needs during an oil spill cleanup.

E.2 WASTE CLASSIFICATION

Oily- Liquid Wastes

Oily liquid wastes (i.e., oily water and emulsions) that would be handled, stored, and disposed during response operations are very similar to those handled during routine storage and transfer operations. The largest volume of oily liquid wastes would be produced by recovery operations (e.g., through the use of vacuum devices or skimmers). In addition, oily water and emulsions would be generated by vehicle operations (e.g., spent motor oils, lubricants, etc.), and equipment cleaning operations.

Non-Oily - Liquid Wastes

Response operations would also produce considerable quantities of non-oily liquid wastes. Water and other non-oily liquid wastes would be generated by the storage area and stormwater collection systems, equipment cleaning (i.e., water contaminated with cleaning agents), and office and field operations (i.e., sewage, construction activities).

Solid Wastes

A solid waste is defined as any discarded material provided that it is not specifically excluded under the regulations. These exclusions cover materials such as domestic sewage and mixtures of sewage discharged through a sewer system or industrial wastewater point source discharges.

A discarded material is any material which is abandoned (disposed, burned or incinerated) or accumulated, stored or treated prior to being abandoned. A discarded material is also any material recycled or any material considered inherently wastelike. Recycled material is considered solid waste when used in a manner constituting disposal, placed on land or burned for energy recovery.

A solid waste may be considered a hazardous waste. A solid waste, as defined above, may be a hazardous waste if it is not excluded from regulation and is either a listed hazardous waste or exhibits the characteristics of a hazardous waste. A solid waste exhibits the characteristics of a hazardous waste if it exceeds the thresholds established in determining the following:

1. ignitability
2. corrosivity
3. reactivity

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4. toxicity

A solid waste may also become a hazardous waste if it is mixed with a listed hazardous waste or, in the case of any other waste (including mixtures), when the waste exhibits any of the characteristics identified above.

Oily - Solid / Semi-Solid Wastes

Oily solid/semi-solid wastes that would be generated by containment and recovery operations include damaged or worn-out booms, disposable/soiled equipment, used sorbent materials, saturated soils, contaminated beach sediments, driftwood, and other debris.

Non-Oily - Solid / Semi-Solid Wastes

Non-oily solid/semi-solid wastes would be generated by emergency construction operations (e.g., scrap, wood, pipe, and wiring) and office and field operations (i.e., refuse). Vessel, vehicle, and aircraft operations also produce solid wastes.

E.3 WASTE HANDLING

A primary concern in the handling of recovered oil and oily debris is contaminating unaffected areas or recontaminating already cleaned areas. Oily wastes generated during the response operations would need to be separated by type and transferred to temporary storage areas and/or transported to incineration or disposal sites. Proper handling of oil and oily wastes is imperative to ensure personnel health and safety.

Safety Considerations

Care shall be taken to avoid or minimize direct contact with oily wastes. All personnel handling or coming into contact with oily wastes shall wear protective clothing. A barrier cream can be applied prior to putting on gloves to further reduce the possibility of oily waste absorption. Safety goggles shall be worn by personnel involved in waste handling activities where splashing might occur. Any portion of the skin exposed to oily waste should be washed with soap and water as soon as possible. Decontamination zones should be set up during response operations to ensure personnel are treated for oil exposure.

Wastes Transfer

During response operations, it may be necessary to transfer recovered oil and oily debris from one point to another several times before the oil and oily debris are ultimately recycled, incinerated or disposed at an appropriate disposal site. Depending on the location of response operations, any or all of the following transfer operations may occur:

- From portable or vessel-mounted skimmers into flexible bladder tanks, storage tanks of the skimming vessel itself, or a barge.
- Directly into the storage tank of a vacuum device.
- From a skimming vessel or flexible bladder to a barge.
- From a vacuum device storage tank to a barge.
- From a barge to a tank truck.
- From a tank truck to a processing system (e.g., oil/water separator).
- From a processing system to a recovery system and/or incinerator.
- Directly into impermeable bags that, in turn, are placed in impermeable containers.
- From containers to trucks.

There are four general classes of transfer systems that may be employed to affect oily waste transfer operations:

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- **Pumps:** Rotary pumps, such as centrifugal pumps, may be used when transferring large volumes of oil, but they may not be appropriate for pumping mixtures of oil and water. The extreme shearing action of centrifugal pumps tends to emulsify oil and water, thereby increasing the viscosity of the mixture and causing low, inefficient transfer rates. The resultant emulsion would also be more difficult to separate into oil and water fractions. Lobe or "positive displacement" pumps work well on heavy, viscous oils, and do not emulsify the oil/water mixture. Double-acting piston and double acting diaphragm pumps are reciprocating pumps that may also be used to pump oily wastes.

- **Vacuum Systems**: A vacuum truck may be used to transfer viscous oils but they usually pick up a very high water/oil ratio.

- **Belt/Screw Conveyors:** Conveyors may be used to transfer oily wastes containing a large amount of debris. These systems can transfer weathered debris laden oil either horizontally or vertically for short distances (i.e., 10 feet) but are bulky and difficult to set up and operate.

- **Wheeled Vehicles:** Wheeled vehicles may be used to transfer liquid wastes or oily debris to storage or disposal sites. These vehicles have a limited transfer volume (i.e., 100 barrels) and require good site access.

E.4 WASTE STORAGE

Interim storage of recovered oil, oily and non-oily waste would be considered to be an available means of holding the wastes until a final management method is selected. In addition, the segregation of wastes according to type would facilitate the appropriate method of disposal. The storage method used would depend upon:

- The type and volume of material to be stored.
- The duration of storage.
- Access.

During an oil spill incident, the volume of oil that can be recovered and dealt with effectively depends upon the available storage capacity. Typical short-term storage options are summarized in Figure E-1. The majority of these options can be used either onshore or offshore.

If storage containers such as bags or drums are used, the container must be clearly marked with the proper Canadian Transport Dangerous Goods/United States Department of Transportation marking to indicate the type of material/waste contained and/or the ultimate disposal option.

Fuel barges may be the best option for temporary storage of oil recovered in open waters and frac tanks for inland spills. Depending on size, these vessels may be able to hold up to 6,000 barrels of oil and water and frac tanks may hold up to 500-550 barrels. The barge deck can be used as a platform for operating oil spill clean-up equipment and storing containment boom.

Steel or rubber tanks can be used to store oil recovered near the shoreline. To facilitate offloading, demulsifiers may be used to break emulsions prior to placing the recovered substance into the barges or storage tanks.

Use of any site for storage is dependent on the approval of the local authorities. The

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following elements affect the choice of a potential storage site:

- Geology.
- Ground water.
- Soil.
- Flooding.
- Surface water.
- Slope.
- Covered material.
- Capacity.
- Climatic factors.
- Land use.
- Toxic air emissions.
- Security.
- Access.
- Public contact.

E.5 WASTE DISPOSAL

Techniques for Disposal of Recovered Oil

Recovery, reuse, and recycling are the best choices for remediation of a spill, thereby reducing the amount of oily debris to be bermed onsite or disposed of at a solid waste landfill. Treatment is the next best alternative, but incineration and burning for energy recovery have more options within the state. There are some limitations and considerations in incinerating for disposal. Environmental quality of incineration varies with the type and age of the facility. Therefore, when incineration becomes an option during an event, local air quality authorities would be contacted for advice about efficiency and emissions of facilities within their authority. Approval of the local air authorities is a requirement for any incineration option. Landfilling is the last option. Final disposal at a solid or dangerous waste landfill is the least environmentally sound method of dealing with a waste problem such as oily debris.

Note: Prior to the disposal of ANY waste products, the Incident Commander or his designee must contact the Keystone / TransCanada Community, Safety and Environmental Department to recieve direction and guidence on the proper disposal methods and procedures.

During an oil spill incident, the Company would consult with the proper regulating agency to identify the acceptable disposal methods and sites appropriately authorized to receive such wastes. The Company maintains a list of approved disposal sites that satisfy local, Province/State, and Federal Regulations and Company requirements. This identification of suitable waste treatment and disposal sites would be prepared by the Environmental Unit in the form of an Incident Disposal Plan which must be authorized by the U.S. Coast Guard and/or the Environmental Protection Agency or National Energy Board. An Incident Disposal Plan would include predesignated interim storage sites, segregation strategies, methods of treatment and disposal for various types of debris, and the locations/contacts of all treatment and disposal site selections. Onsite treatment/disposal is preferred.

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In order to obtain the best overall Incident Disposal Plan, a combination of methods should be used. There is no template or combination of methods that can be used in every spill situation. Each incident should be reviewed carefully to ensure that an appropriate combination of disposal methods is employed.

The different types of wastes generated during response operations would require different disposal methods. To facilitate the disposal of wastes, they should be separated by type for temporary storage, transport and disposal. Figure E-2 lists some of the options that would be available to segregate oily wastes. The figure also depicts methods that may be employed to separate free and/or emulsified water from the oily liquid waste.

The following is a brief discussion of some disposal techniques available for recovered oil and oily debris.

Recycling

This technique entails removing water from the oil and blending the oil with uncontaminated oil. Recovered oil can be shipped to refineries provided that it is exempt from hazardous waste regulations. There it can be treated to remove water and debris, and then blended and sold as a commercial product.

The Company's designated Disposal Specialist is responsible for ensuring that all waste materials be disposed at an internally approved disposal site.

Incineration

This technique entails the complete destruction of the recovered oil by high temperature thermal oxidation reactions. There are licensed incineration facilities as well as portable incinerators that may be brought to a spill site. Incineration may require the approval of the local Air Pollution Control Authority. Factors to consider when selecting an appropriate site for onsite incineration would include:

- Proximity to recovery locations.
- Access to recovery locations.
- Adequate fire control.
- Approval of the local air pollution control authorities.

In Situ Burning / Open Burning

Burning techniques entail igniting oil or oiled debris and allowing it to burn under ambient conditions. These disposal techniques are subject to restrictions and permit requirements established by federal, province/state and local laws. They would not be used to burn Polychlorinated biphenyls, waste oil containing more than 1,000 parts per million of halogenated solvents, or other substances regulated by the Environmental Protection Agency or Environment Canada. Permission for *in situ* burning may be difficult to obtain when the burn takes place near populated areas.

As a general rule, *in situ* burning would be appropriate only when atmospheric conditions will allow the smoke to rise several hundred feet and rapidly dissipate. Smoke from

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burning oil will normally rise until its temperature drops to equal the ambient temperature. Afterwards, it will travel in a horizontal direction under the influence of prevailing winds.

Landfill Disposal

This technique entails burying the recovered oil in an approved landfill in accordance with regulatory procedures. Landfill disposal of free liquids is prohibited by Federal Law in the United States.

With local health department approval, non-burnable debris which consists of oiled plastics, gravel and oiled seaweed, kelp, and other organic material may be transported to a licensed, lined, approved municipal or private landfill and disposed of in accordance with the landfill guidelines and regulations. Landfill designation would be planned only for those wastes that have been found to be unacceptable by each of the other disposal options (e.g., waste reduction, recycling, energy recovery). Wastes would be disposed only at Company-approved disposal facilities. The Disposal Specialist is responsible for ensuring that all waste materials are disposed at a Company internally approved disposal site. Disposal at a non-approved facility would require approval by the Disposal Specialist prior to sending any waste to such a facility.

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FIGURE E-1

TEMPORARY STORAGE METHODS

CONTAINER	ONSHORE	OFFSHORE	SOLIDS	LIQUIDS	NOTES
Barrels	x	x	x	x	May require handling devices. Covered and clearly marked.
Tank Trucks	x	x		x	Consider road access. Barge-mounted offshore.
Dump/Flat Bed Trucks- Roll-offs	x		x		May require impermeable liner and cover. Consider flammability of vapors at mufflers.
Barges		x	x	x	Liquids only in tanks. Consider venting of tanks.
Oil Storage Tanks	x	x		x	Consider problems of large volumes of water in oil.
Bladders	x	x		x	May require special hoses or pumps for oil transfer.
Frac Tanks	x			x	Consider road access.

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FIGURE E-2

OILY WASTE SEPARATION AND DISPOSAL METHODS

TYPE OF MATERIAL	SEPARATION METHODS	DISPOSAL METHODS
LIQUIDS		
Non-emulsified oils	Gravity separation of free water	Incineration Use of recovered oil as refinery/production facility feedstock
Emulsified oils	Emulsion broken to release water by: • heat treatment • emulsion breaking chemicals • mixing with sand • centrifuge • filter/belt press	Use of recovered oil as refinery/production facility feedstock
SOLIDS		
Oil mixed with sand and soil	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oils by sieving	Incineration Use of recovered oil as refinery/production facility feedstock Direct disposal Stabilization with inorganic material Degradation through land farming or composting
Oil mixed with cobbles or pebbles	Screening Collection of liquid oil leaching from materials during temporary storage Extraction of oil from materials by washing with water or solvent	Incineration Direct Disposal Use of recovered oil as refinery/production facility feedstock
Oil mixed with wood and sorbents	Screening Collection of liquid oil leaching from debris during temporary storage Flushing of oil from debris with water	Incineration Direct disposal Degradation through land farming or composting for oil mixed with seaweed or natural sorbents

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APPENDIX F

MISCELLANEOUS FORMS

Forms and Exercise Documentation
File Maintenance Procedures

- Forms and exercise documentation records should be maintained in a separate file in the Facility's office filing system.
- These files must be available for presentation upon request by regulatory agency personnel.

Detailed Incident Report

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National Energy Board
Calgary, Alberta

Appendix 1
DETAILED INCIDENT REPORT

Type or print in black pen

Board Use Only

NEB Incident No. _____ Date Received _____ NEB Investigator _____

Investigator's Comments _____

Secretary
National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta T2P 0X8 • Fax: (403) 292-5503

PART A - OPERATOR INFORMATION

Name of Company _____

Address of Company _____

Pipeline Name _____

PART B - TIME, WEATHER AND LOCATION OF INCIDENT

Date *(month)* _____ *(day)* _____ *(year)* _____

Hour *(24 hour system & time zone)* _____

Weather *temperature:* _____ *°C precipitation:* _____ *windspeed & direction:* _____

CSA Class Location ☐1 ☐2 ☐3 ☐4

Location (provide specific location using a chainage description (MLV, kmP), land survey description or prominent landmarks)

_____

_____

_____

_____

PART C - ORIGIN OF SPILL/RELEASE

Facility Involved:

☐ Line Pipe ☐ Tank Farm ☐ Pump Station ☐ Compressor Station ☐ Regulator/Meter Station ☐ Gas Plant

☐ Other Related Facility *(specify)* _____

Equipment Involved:

☐ Pipe ☐ Valve ☐ Pressure relief device ☐ Fitting ☐ Compressor ☐ Pump ☐ Pressure vessel ☐ Tank

☐ Instrumentation

☐ Other *(specify)* _____

PART D - SPILLS AND RELEASES ***(Report LVP and HVP spills only if in excess of 1.5 m³)***

☐ Gas ☐ LVP ☐ HVP ☐ Toxic Substance

Name of product/substance _____

Volume spilled/released _____ m³ Volume recovered _____ m³

Was there a fire? ☐ Yes ☐ No Was there an explosion? ☐ Yes ☐ No

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PART E - IMMEDIATE CAUSE FOR INCIDENTS ON OPERATING PIPELINES *(Immediate Cause: means unsafe acts or unsafe conditions)*

☐ Failed pipe ☐ Operator personnel error ☐ Other *(specify)* _____

☐ Failed weld ☐ External loading or natural forces Refer to Part H _____

☐ Corrosion Refer to Part G ☐ Equipment malfunction/failure Refer to Part I _____

PART F - LINE PIPE DATA

Type of Failure _____

Nominal Diameter (mm) _____ Wall Thickness (mm) _____ Date of Manufacture _____

Weld Process _____ SMYS (MPa) _____

Pipe Specification ☐ Z 245 ☐ Other *(specify)* _____ Pipe Location: ☐ Below Ground ☐ Above Ground

Maximum Operating Pressure (kPa) _____ Pressure at Time of Incident (kPa) _____

Latest Presure Test Date _____ Maximum Test Pressure (kPa) _____ Test Duration (hrs) _____

PART G - CORROSION FAILURES

Corrosion location: ☐ Internal ☐ External

Type of Corrosion *(specify)* _____

Type of Coating _____

Circumferential Position Looking Downstream (mark an X)

PART H - FAILURES DUE TO EXTERNAL LOAD OR NATURAL FORCES

☐ Damage by operator or its contractor ☐ Damage by other parties ☐ Earth movement ☐ Lightning/Fire

☐ Other *(specify)* _____

Name or Contractor/Other Party _____

Address _____

Telephone ( ) _____ Name of Representative _____

PART I - EQUIPMENT MALFUNCTION/FAILURE

Equipment _____ Manufacturer _____ Model# _____

Year Equipment Installed _____ Year Equipment Manufactured _____

PART J - ESTIMATE OF TOTAL INCIDENT COST *(including repair, cleanup and restoration)*

$

PART K - REPAIR DESCRIPTION *(Description of all repairs to the pipeline made necessary by the incident and date of return to service of the pipeline)*

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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PART L - INJURY AND FATALITY DESCRIPTIONS

☐ Number of Fatalities ☐ Number of Serious Injuries

Serious Injury - includes an injury that results in: fracture of a major bone, amputation of a body part, loss of sight - one or both eyes, internal haemorrhage, third degree burns, unconsciousness, or loss of a body part or function of a body part

NAME	AFFILIATION	FATALITY OR INJURY DESCRIPTION AND CURRENT PATIENT CONDITION
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	

PART M - IMMEDIATE INCIDENT CAUSE OF SERIOUS INJURY/FATALITY *(Immediate Cause - means unsafe acts and conditions)*

☐ Defective/inadequate safety devices, tools or equipment

☐ Improper operation of safety devices, tools or equipment

☐ Improper loading or placement

☐ Hazardous environment (gases, dust, smoke, fumes or vapours)

☐ Congested work area/disorderly workplace

☐ Other *(specify)*

PART N - NARRATIVE OF INCIDENT

Provide a complete description of the incident, including events leading up to, and following the incident. Also include additional information as specified in the guidelines to section 52 of the Onshore Pipeline Regulations. Attach any additional information that may supplement the narrative such as 1) drawing of the incident site 2) photographs 3) schematics 4) maps 5) reports (metallurgical, NDT, inspection, pressure test, etc.)

Attach additional sheets of narrative as required.

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PART O - WITNESS INFORMATION

NAME _____ TELEPHONE NO. ( )_____

_____ ( )_____

_____ ( )_____

_____ ( )_____

_____ ( )_____

PART P - BASIC CAUSES OF INCIDENT *(Identify all basic causes contributing to the incident. Basic Cause - means the real or root causes of why the unsafe acts and unsafe conditions as described in the immediate cause occurred. Several Basic Causes may be assigned for one incident.)*

☐ Inadequate training ☐ Inadequate work standards or procedures ☐ Inadequate materials, tools or equipment

☐ Inadequate design/maintenance ☐ Non-compliance with work standards or procedures

☐ Other *(specify)* _____

Additional comments on selected basic cause: _____

_____

_____

_____

PART Q - CORRECTIVE ACTIONS TAKEN TO PREVENT SIMILAR INCIDENTS *(If no corrective action taken, state reasons why)*

_____

_____

_____

_____

_____

_____

_____

_____

PART R - NAME OF PERSON CONDUCTING A COMPANY INCIDENT INVESTIGATION

Name _____

Title _____

Telephone ( )_____ Fax ( )_____

PART S - NAMES OF OTHER AGENCIES INVESTIGATING INCIDENT

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

PART T - NAME AND TITLE OF COMPANY REPRESENTATIVE FILING REPORT

Name _____ Signature _____

Title _____

Telephone ( )_____ Fax ( )_____ Date *(time)*_____ *(month)*_____ *(day)*_____ *(year)*_____

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NOTICE: This report is required by 49 CFR Part 195. Failure to report can result in a civil penalty not to exceed $25,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $500,000 as provided in 49 USC 60122

Form Approved
OMB No. 2137-0047

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

ACCIDENT REPORT – HAZARDOUS LIQUID PIPELINE SYSTEMS

Report Date _____
No. _____ (DOT Use Only)

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the Office Of Pipeline Safety Web Page at http://ops.dot.gov.*

PART A – GENERAL REPORT INFORMATION Check: ☐ **Original Report** ☐ **Supplemental Report** ☐ **Final Report**

1. a. Operator's OPS 5-digit Identification Number (if known) /_____/
   b. If Operator does not own the pipeline, enter Owner's OPS 5-digit Identification Number (if known) /_____/
   c. Name of Operator _____
   d. Operator street address _____
   e. Operator address _____
   City, County, State and Zip Code

IMPORTANT: IF THE SPILL IS SMALL, THAT IS, THE AMOUNT IS AT LEAST 5 GALLONS BUT IS LESS THAN 5 BARRELS, COMPLETE THIS PAGE ONLY, UNLESS THE SPILL IS TO WATER AS DESCRIBED IN 49 CFR §195.52(A)(4) OR IS OTHERWISE REPORTABLE UNDER §195.50 AS REVISED IN CY 2001.

2. Time and date of the accident
   /_____/ hr. /_____/ month /_____/ day /_____/ year

3. Location of accident
   (If offshore, do not complete a through d. See Part C.1)
   a. Latitude: _____ Longitude: _____
   (if not available, see instructions for how to provide specific location)
   b. _____ City, and County or Parish
   c. _____ State and Zip Code
   d. Mile post/valve station ○ or survey station no. ○ (whichever gives more accurate location)
   _____

4. Telephone report
   /_____/ NRC Report Number /_____/ month /_____/ day /_____/ year

5. Losses *(Estimated)*

Public/Community Losses reimbursed by operator:

Public/private property damage	$_____
Cost of emergency response phase	$_____
Cost of environmental remediation	$_____
Other Costs	$_____
(describe) _____	

Operator Losses:

Value of product lost	$_____
Value of operator property damage	$_____
Other Costs	$_____
(describe) _____	
Total Costs	$_____

6. Commodity Spilled ○Yes ○ No
(If Yes, complete Parts a through c where applicable)
   a. Name of commodity spilled _____
   b. Classification of commodity spilled:
      ○ HVLs /other flammable or toxic fluid which is a gas at ambient conditions
      ○ CO_2 or other non-flammable, non-toxic fluid which is a gas at ambient conditions
      ○ Gasoline, diesel, fuel oil or other petroleum product which is a liquid at ambient conditions
      ○ Crude oil

c. Estimated amount of commodity involved :
○ **Barrels**
○ **Gallons (check only if spill is less than one barrel)**

Amounts:
Spilled : _____
Recovered: _____

CAUSES FOR SMALL SPILLS ONLY (5 gallons to under 5 barrels) ***(For large spills [5 barrels or greater] see Part H)***

○ **Corrosion** ○ **Natural Forces** ○ **Excavation Damage** ○ **Other Outside Force Damage**
○ **Material and/or Weld Failures** ○ **Equipment** ○ **Incorrect Operation** ○ **Other**

PART B – PREPARER AND AUTHORIZED SIGNATURE

_____ (type or print) Preparer's Name and Title
_____ Area Code and Telephone Number
_____ Preparer's E-mail Address
_____ Area Code and Facsimile Number
_____ Authorized Signature _____ (type or print) Name and Title _____ Date _____ Area Code and Telephone Number

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PART C – ORIGIN OF THE ACCIDENT (Check all that apply)

1. Additional location information
   a. Line segment name or ID _____
   b. Accident on Federal land other than Outer Continental Shelf O Yes O No
   c. Is pipeline interstate? O Yes O No

Offshore: O Yes O No *(complete d if offshore)*
d. Area _____ Block # _____
State /__/__/ or Outer Continental Shelf ☐

2. Location of system involved *(check all that apply)*
   ☐ Operator's Property
   ☐ Pipeline Right of Way
   ☐ High Consequence Area (HCA)?
   Describe HCA_____

3. Part of system involved in accident
   O Above Ground Storage Tank
   O Cavern or other below ground storage facility
   O Pump/meter station; terminal/tank farm piping and equipment, including sumps
   O Other *Specify:* _____
   O Onshore pipeline, including valve sites
   O Offshore pipeline, including platforms

If failure occurred on Pipeline, complete items 4 - 9:

4. Failure occurred on
   O Body of Pipe O Pipe Seam O Scraper Trap
   O Pump O Sump O Joint
   O Component O Valve O Metering Facility
   O Repair Sleeve O Welded Fitting O Bolted Fitting
   O Girth Weld
   Other *(specify)* _____

Year the component that failed was installed: /__/__/__/__/

5. Maximum operating pressure *(MOP)*
   a. Estimated pressure at point and time of accident: _____ *PSIG*
   b. MOP at time of accident: _____ *PSIG*
   c. Did an overpressurization occur relating to the accident? OYes O No

a. Type of leak or rupture
   OLeak: O Pinhole O Connection Failure *(complete sec. H5)*
   O Puncture, diameter *(inches)* _____
   ORupture: O Circumferential – Separation
   O Longitudinal – Tear/Crack, length *(inches)* _____
   Propagation Length, total, both sides *(feet)* _____
   ON/A
   OOther _____

b. Type of block valve used for isolation of immediate section:
   Upstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve
   Downstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve

c. Length of segment isolated _____ ft
d. Distance between valves _____ ft
e. Is segment configured for internal inspection tools? OYes O No
f. Had there been an in-line inspection device run at the point of failure? O Yes O No O Don't Know
   O Not Possible due to physical constraints in the system
g. If *Yes*, type of device run *(check all that apply)*
   ☐ High Resolution Magnetic Flux tool Year run: _____
   ☐ Low Resolution Magnetic Flux tool Year run: _____
   ☐ UT tool Year run: _____
   ☐ Geometry tool Year run: _____
   ☐ Caliper tool Year run: _____
   ☐ Crack tool Year run: _____
   ☐ Hard Spot tool Year run: _____
   ☐ Other tool Year run: _____

PART D – MATERIAL SPECIFICATION

1. Nominal pipe size *(NPS)* /__/__/__/__/ in.
2. Wall thickness /__/__/__/__/ in.
3. Specification _____ SMYS /__/__/__/__/
4. Seam type _____
5. Valve type _____
6. Manufactured by _____ in year /__/__/__/__/

PART E – ENVIRONMENT

1. Area of accident
   O In open ditch
   O Under pavement
   O Above ground
   O Underground
   O Under water
   O Inside/under building
   O Other _____

2. Depth of cover: _____ inches

PART F – CONSEQUENCES

1. Consequences *(check and complete all that apply)*

a.	Fatalities	Injuries
Number of operator employees:		_____
Contractor employees working for operator:		_____
General public:		_____
Totals:		_____

b. Was pipeline/segment shutdown due to leak? OYes O No
If Yes, how long? _____ days _____ hours _____ minutes

c. Product ignited OYes O No d. Explosion OYes O No
e. ☐ Evacuation *(general public only)* /__/__/__/__/ people
Reason for Evacuation:
O Precautionary by company
O Evacuation required or initiated by public official

f. Elapsed time until area was made safe:
/__/__/ hr. /__/__/ min.

2. Environmental Impact

a. Wildlife Impact: Fish/aquatic O Yes O No
Birds O Yes O No
Terrestrial O Yes O No

b. Soil Contamination O Yes O No
If Yes, estimated number of cubic yards: _____

c. Long term impact assessment performed: O Yes O No

d. Anticipated remediation O Yes O No
If Yes, check all that apply: ☐ Surface water ☐ Groundwater ☐ Soil ☐ Vegetation ☐ Wildlife

e. Water Contamination: O Yes O No *(If Yes, provide the following)*
Amount in water _____ barrels
Ocean/Seawater O No O Yes
Surface O No O Yes
Groundwater O No O Yes
Drinking water O No O Yes *(If Yes, check below.)*
O Private well O Public water intake

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PART G – LEAK DETECTION INFORMATION

1. Computer based leak detection capability in place? O Yes O No

2. Was the release initially detected by? (check one):
O CPM/SCADA-based system with leak detection
O Static shut-in test or other pressure or leak test
O Local operating personnel, procedures or equipment
O Remote operating personnel, including controllers
O Air patrol or ground surveillance
O A third party O Other (specify) _____

3. Estimated leak duration days ____ hours ____

PART H – APPARENT CAUSE

Important: *There are 25 numbered causes in this Part H. Check the box corresponding to the primary cause of the accident. Check one circle in each of the supplemental categories corresponding to the cause you indicate. See the instructions for guidance.*

H1 – CORROSION

1. ☐ External Corrosion

2. ☐ Internal Corrosion

(Complete items a – e where applicable.)

a. Pipe Coating
O Bare
O Coated

b. Visual Examination
O Localized Pitting
O General Corrosion
O Other _____

c. Cause of Corrosion
O Galvanic O Atmospheric
O Stray Current O Microbiological
O Cathodic Protection Disrupted
O Stress Corrosion Cracking
O Selective Seam Corrosion
O Other _____

d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering accident?
O No O Yes, Year Protection Started: /___/___/___/___/

e. Was pipe previously damaged in the area of corrosion?
O No O Yes ⇒ Estimated time prior to accident: /___/___/ *years* /___/___/ *months* *Unknown* ☐

H2 – NATURAL FORCES

3. ☐ Earth Movement ⇒ O Earthquake O Subsidence O Landslide O Other _____
4. ☐ Lightning
5. ☐ Heavy Rains/Floods ⇒ O Washouts O Flotation O Mudslide O Scouring O Other _____
6. ☐ Temperature ⇒ O Thermal stress O Frost heave O Frozen components O Other _____
7. ☐ High Winds

H3 – EXCAVATION DAMAGE

8. ☐ Operator Excavation Damage (including their contractors/Not Third Party)
9. ☐ Third Party *(complete a-f)*

a. Excavator group
O General Public O Government O Excavator other than Operator/subcontractor

b. Type: O Road Work O Pipeline O Water O Electric O Sewer O Phone/Cable
O Landowner-not farming related O Farming O Railroad
O Other liquid or gas transmission pipeline operator or their contractor
O Nautical Operations O Other _____

c. Excavation was: O Open Trench O Sub-strata (boring, directional drilling, etc...)

d. Excavation was an ongoing activity (Month or longer) O Yes O No If Yes, Date of last contact /___/___/___/

e. Did operator get prior notification of excavation activity?
O Yes; Date received: /___/___/ mo. /___/___/ day /___/___/___/___/ yr. O No
Notification received from: O One Call System O Excavator O Contractor O Landowner

f. Was pipeline marked as result of location request for excavation? O No O Yes *(If Yes, check applicable items i - iv)*
i. Temporary markings: O Flags O Stakes O Paint
ii. Permanent markings: O
iii. Marks were (check one): O Accurate O Not Accurate
iv. Were marks made within required time? O Yes O No

H4 – OTHER OUTSIDE FORCE DAMAGE

10. ☐ Fire/Explosion as primary cause of failure ⇒ Fire/Explosion cause: O Man made O Natural
11. ☐ Car, truck or other vehicle not relating to excavation activity damaging pipe
12. ☐ Rupture of Previously Damaged Pipe
13. ☐ Vandalism

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H5 – MATERIAL AND/OR WELD FAILURES

Material

14. ☐ Body of Pipe	⇒	O Dent	O Gouge	O Bend	O Arc Burn	O Other _____
15. ☐ Component	⇒	O Valve	O Fitting	O Vessel	O Extruded Outlet	O Other _____
16. ☐ Joint	⇒	O Gasket	O O-Ring	O Threads		O Other _____

Weld

17. ☐ Butt	⇒	O Pipe	O Fabrication			O Other _____
18. ☐ Fillet	⇒	O Branch	O Hot Tap	O Fitting	O Repair Sleeve	O Other _____
19. ☐ Pipe Seam	⇒	O LF ERW	O DSAW	O Seamless	O Flash Weld	
		O HF ERW	O SAW	O Spiral		O Other _____

*Complete a-g if you indicate **any** cause in part H5.*

a. Type of failure:
O Construction Defect ⇒ O Poor Workmanship O Procedure not followed O Poor Construction Procedures
O Material Defect

b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site? O Yes O No

c. Was part which leaked pressure tested before accident occurred? O Yes, *complete d-g* O No

d. Date of test: /__/__/__/__/ yr. /__/__/ mo. /__/__/ day

e. Test medium: O Water O Inert Gas O Other _____

f. Time held at test pressure: /__/__/ hr.

g. Estimated test pressure at point of accident: _____ *PSIG*

H6 – EQUIPMENT

20. ☐ Malfunction of Control/Relief Equipment	⇒	O Control valve	O Instrumentation	O SCADA	O Communications
		O Block valve	O Relief valve	O Power failure	O Other _____
21. ☐ Threads Stripped, Broken Pipe Coupling	⇒	O Nipples	O Valve Threads	O Dresser Couplings	O Other _____
22. ☐ Seal Failure	⇒	O Gasket	O O-Ring	O Seal/Pump Packing	O Other _____

H7 – INCORRECT OPERATION

23. ☐ Incorrect Operation

a. Type: O Inadequate Procedures O Inadequate Safety Practices O Failure to Follow Procedures
O Other _____

b. Number of employees involved who failed a post-accident test: drug test: /__/__/__/__/ alcohol test /__/__/__/__/

H8 – OTHER

24. ☐ Miscellaneous, *describe:* _____

25. ☐ Unknown
O Investigation Complete O Still Under Investigation *(submit a supplemental report when investigation is complete)*

PART I – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT *(Attach additional sheets as necessary)*

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Preliminary Incident Report

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TransCanada
In business to deliver

date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Preliminary Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline at Station/MLV Location, near Town, Province, on date of occurrence

Further to our verbal report of date to Board Staff Member Mr. x, the following is TransCanada's Preliminary Incident Report in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations and Section 5 of the Transportation Safety Board Regulations.

(a) describe the incident, including the events leading up to and following the incident;

(b) list all relevant agencies contacted and persons affected by the incident;

(c) summarize any losses or impacts to people (e.g., injury, fatalities), environment (e.g., terrain, habitats, animals), production (e.g., interruption or reduction in service), and property;

If this were a gas release incident, use the following canned statement:

The environmental impact of this gas release is related to greenhouse gas emissions to atmosphere. This incident resulted in a maximum emission of _____ kt of methane which corresponds to _____ kt of CO_2 equivalents. The gas released from this incident will be included in our annual green house gas emission report to Statistics Canada.

Aside: Following is the formula for calculating kilotonnes of methane and kilotonnes of CO_2:

$$\frac{10^3\ m^3 \times 0.71}{1000} = \text{kt Methane}$$

$$\text{kt Methane} \times 21 = \text{kt } CO_2 \text{ equivalents}$$

(d) identify any unsafe acts or conditions contributing to or causing the incident;

(e) provide details on any emergency response,

(f) state any corrective actions taken or planned to be taken to minimize the effects of the incident.

Yours very truly,
TransCanada PipeLines Ltd.

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(Legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

Detailed Incident Report

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TransCanada
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date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Detailed Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline, Station/MLV Location, near Town, Province, on date of occurrence

The following is TransCanada's Detailed Incident Report, in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations, 1999 and Section 5 of the Transportation Safety Board Regulations.

Board Staff Member Mr. (name) was notified of the event type on date of occurrence. The Preliminary Incident Report was filed with the Board on date.

a) provide any details regarding the failure mechanism and detailed analysis of the failed component (if necessary);

(b) identify the underlying causes of the incident;

(c) update the progress of any corrective actions taken or planned to be taken to minimize the effects of the incident;

(d) state any actions taken or planned to be taken to prevent a similar incident.

Yours very truly,
TransCanada PipeLines Limited

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

Unauthorized Activity

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TransCanada
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450 - 1st Street S.W
Calgary, Alberta, Canada T2P 5H1
tel 403.920-7069
fax 403.920-2319
E-mail roel_lancee@transcanada.com

Date

National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta
T2P 0X8

Attention: Ms. Claudine Dutil-Berry, Secretary

Dear Madame:

Re: Unauthorized event type at TransCanada PipeLines Limited ("TransCanada") Canadian Mainline Station/MLV Location, near Town, Province, on date of occurrence

TransCanada PipeLines Limited ("TransCanada") files this Incident Report to report unauthorized mechanical excavation activities pursuant to the reporting requirements of Section 13 of the National Energy Board's Pipeline Crossing Regulations Part II.

Board Staff Member _____ was initially notified of the unauthorized_____ on date of notification.

a.) Date of Occurrence

b.) Location of occurrence (Legal Land Description, MLV, mileage post, etc)

c.) Indicate whether the activity involved mechanical excavation

d.) Location of pipeline markers with respect to the unauthorized activity

e.) Indicate whether a permit was issued by pipeline company (yes or no)

f.) Name of landowner or facility owner, address and contact information (phone, fax, e-mail if applicable)

g.) Name of excavator or contractor, address and contact information (phone, fax, e-mail if applicable)

h.) Name of Pipeline company representative dealing with violation and contact information (phone, fax, e-mail if applicable)

i.) Concerns the pipeline company may have regarding the safety of the pipeline as a result of the construction or installation or of the excavation

j.) Any action the company intends to take or has taken

Mr. _____ met with Mr. _____ on date and discussed the requirements of notifying Info-Excavation prior to undertaking any mechanical excavation activities within the province and of having a Company Representative present to locate the pipeline and monitor the excavation when excavating on or within 30-metres of the TQM pipeline Right-of-Way. Mr. _____ provided Mr. _____ with a copy of the Integrated Public Awareness Package to remind him of their discussions.

Yours very truly,
TransCanada PipeLines Limited

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager
(appropriate Land Representative)
J. Baggs
K. Black
D. King
B. McConaghy
G. Scaman
J. Scott
D. Wishart

cc: S. Berthelet National Energy Board

Incident & Issue Tracking No. _____

South Dakota Supplemental Emergency Response and Equipment Statement

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1.1 SUPPLEMENTAL EMERGENCY RESPONSE AND EQUIPEMENT

The purpose of this is to fulfill the South Dakota Department of Environment and Natural Resources request for additional information regarding TransCanada – Keystone Pipeline's ability to respond to a spill specifically in South Dakota

- Detail description of company owned assets is found in appropriately marked Appendix A: RESPONSE EQUIPMENT/RESOURCES. Additional information is linked to Appendix F. The trailer for the Keystone Response Zone 3, North Dakota, South Dakota, and Nebraska is appropriately located in Yankton, South Dakota.

- Keystone Pipeline's primary contractor, National Response Corporation, is strategically aligned with Coteau Environmental based in Watertown, SD. Currently, no other National Response Corporation assets or Sub-Contractors reside inside of South Dakota borders.

- Keystone Pipeline fully expects to have the required assets for a spill within the four (4) hour time frame previously stated in the Response Plan.

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APPENDIX G

MATERIAL SAFETY DATA SHEET(S)

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TransCanada Keystone Oil Pipeline

Typical Crude Oil MSDS

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1. Product and Company Identification

Product Name: Typical Crude Oil

Synonyms: Not Available

Intended Use: Chemical feedstock

Chemical Family: Blend of Heavy Petroleum Crude, Medium Sweet Crude and Synthetic Crude

Supplier: TransCanada Keystone Pipeline LP
450 – First Street S.W.,
P.O. Box 1000, Station M Calgary, Alberta, CANADA, T2P 4K6

Emergency Phone: **1-800-982-7222 (24 Hour) CANADA**
1-800-477-8066 (24 Hour) USA

2. Composition/Information on Ingredients

Hazardous Ingredients:

				Exposure Limits				
Name	**CAS#**	**TWA (ppm)**	**TWA (Mg/M³)**	**STEL (ppm)**	**STEL (Mg/M³)**	**CEIL (ppm)**	**CEIL (Mg/M³)**	**% by Weight**
Crude Oil (Hydrocarbon C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulfide	7783-06-04	10	14	15	21	20	28	<0.5
Benzene	71-43-2		3.2		16			0.1-1
Toluene	108-88-3	50	188					1-5
Xylene	1330-20-7							

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H_2S) LC50 Inhalation Mouse = 673 ppm 1 hour, LC50 Inhalation Rat = 444 ppm for 4 hours.

Benzene. LD50 Oral rat = 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat = 4300 mg/Kg. LC50 Inhalation rat = 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat = 5000 mg/Kg. LC50 Inhalation rat = 8000 ppm for 4 hrs. LD50 Dermal rabbit = 14000 mg/Kg.

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3. First Aid Measures

Eye: Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.

Skin: Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.

Inhalation (Breathing): Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.

Ingestion (Swallowing): If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

4. Protective Clothing

Respiratory: Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

Skin: Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Eye: Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Other: As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.

5. Physical Data

Appearance:	Black Brown
Physical State:	Liquid
Odour:	Petroleum Odor
Vapor Pressure (mm Hg):	Not Available
Vapor Density:	Not Available
Boiling Point/Range:	10oC - 1000oC
Freezing/Melting Point:	Not Available
Solubility in Water:	Not Available
Specific Gravity:	0.92-0.94 (Water =1)
Percent Volatile:	100 vol.%
pH (1% soln/water)	Not Applicable
Odor Threshold	0.13 ppm H2S
Freezing Point	Not Available
Molecular Weight	Not Applicable
Melting Point	Not available
Density	Not Available

Evaporation Rate (nBuAc=1): Not Available

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6. Stability and Reactivity

Stability: This product is stable

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.

Hazardous Polymerization: Will not occur

Materials to Avoid (Incompatible Materials): Strong acids, strong oxidizers, chlorine

7. Toxicological Information

Routes of entry: Ingestion, inhalation, eye contact, skin contact.

TLV: TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH.
Hydrogen Sulfide:
TWA: 10ppm, 14 mg/m3 ACGIH
STEL: 2.5 ppm STEL ACGIH
CEILING: 20 ppm, 28 mg/m3 Alberta OEL
Consult local authorities for acceptable exposure limits. Consult local authorities for acceptable exposure limits.
Benzene, TWA: (1ppm 3.2 mg/m3) STEL: 5.0 ppm (16 mg/m)³) from Alberta OEL's SKIN
ACGIH (TLV) (United States) TWA 0.5 ppm. STEL 2.5 ppm (SKIN)

Toxicity to animals: Hydrocarbons C5 and C6 Rich
LD50: Not available
LC50: Not available
Hydrogen Sulphide (H2S)
LC50 Inhalation Mouse = 673 ppm 1 hour
LC50 Inhalation RAT = 444ppm for 4 hours
Remark: No additional remark

Chronic effects: This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficient evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has fetotoxic effects in animal studies. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.
Remark: No additional remark

Acute effects: Sensitizing Capability: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.

Ingestion: Pulmonary aspiration hazard if swallowed and vomiting occurs.

Skin: Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.

Eyes: Eye contact with product or product vapours may result in eye irritation.

Inhalation: May cause headache, dizziness, loss of appetite and loss of consciousness. Product vapours are irritating to the respiratory tract.
Remark: This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Synergistic: Not available

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8. Fire and Explosion

Auto-ignition temperature: Not available

Flash points: CLOSED CUP: -40°C (-40°F)

Flammable Limits: Not available

Extinguishing Media: Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool contained vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special fire fighting procedures: Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.

Flammability: Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

Risks of explosion: This material is sensitive to static discharge. This product is not sensitive to mechanical impact.

9. Preventative Measures

Waste Disposal: Dispose of in accordance with all federal, provincial and local regulations.

Storage: Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.

Ventilation: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Spill and Leak: Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

10. Classification/Regulatory Information

TDG road/rail: TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5°C (140.9°F). Closed cup tes method.

PIN: 1267 - PETROLEUM CRUDE OIL

WHMIS: WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).

Other: This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

Refer to federal, state, and local legislation for further requirements.

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APPENDIX H

BASICS OF OIL SPILL RESPONSE

H.1 Dikes, Berms and Dams
Figure H.1 Culvert Blocking

H.2 Deflection Boom
Figure H.2 Deflective Booming Technique(Single Boom method)
Figure H.3 Deflective Booming Technique(Single Boom method)
Figure H.4 Deflective Booming Technique(Cascade method)

H.3 Containment Boom
Figure H.5 Containment Booming (Catenary method)

H.4 Diversion Boom
Figure H.6 Open Chevron Boom Technique
Figure H.7 Closed Chevron Boom Technique

H.5 Shoreline Recovery

H.6 Ice Operations
Figure H.8 Ice Slotting Technique
Figure H.9 Deflective Board Recovery Strategy
Figure H.10 Close up view of Deflective Board

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H.1 DIKES, BERMS AND DAMS

Dikes, berms, and dams are land-based tactics, with the objective of containing spilled oil and limiting spreading of oil slicks, thus minimizing impacts to the environment. Dikes, berms and dams are embankment structures built-up from the existing terrain, placed to contain and accumulate oil for recovery. These barriers can serve to:

- Contain and stabilize a contaminated area.
- Contain or divert oil on water or oil that has potential to migrate.
- Create cells for recovery.
- Use natural depressions to act as containment areas for recovery.

The tactic may be deployed in association with a recovery tactic, such as Shoreline Recovery or On-land Recovery. Dikes, berms, and dams are most effective when placed before oil arrives. Dikes, berms, and dams can also be used to exclude oil from a sensitive area, which is covered in the Beach Berms and Exclusion Dams tactic. The tactic can also be used in conjunction with an excavation tactic to enhance containment volumes (see Pits, Trenches, and Slots).

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Plan a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy response resources.
4. Construct the containment structure and ensure it does not leak.
5. Consider the need to remove any water-bottom that may collect beneath the oil inside the structure.
6. Monitor the containment structure on an appropriate basis.
7. If oil collects in the structure, utilize an appropriate recovery system for removal.

Tactic Description

This tactic involves building an embankment perpendicular to the flow of the oil slick or around a contaminated area. Dike, berm, and dam structures can be constructed with a wide variety of materials including: soil, gravel, snow, sand bags, oil boom, timbers and logs. Selection of the construction material depends on the operating environment, location, available materials, and whether the structure is to be temporary or permanent. The containment area should be lined with an impermeable membrane, such as plastic sheeting, to keep oil and oily water from leaking or migrating into the soil. The structure may include a method to regulate flow, such as a weir or spill way. Dikes, berms, and dams can be built by manual labor or with earth-moving equipment depending on the location and available resources.

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Deployment Configurations

BERMS

A containment berm can be constructed of available materials such as earth, gravel, or snow. Use earth-moving equipment or manual labor to construct the berm. Form the materials into a horseshoe shape ahead of the flow of oil. Use plastic sheeting to line the walls of a soil berm to prevent oil penetration. Sandbags filled with sand or other heavy material also make excellent containment barriers.

DAMS

An underflow dam can be used when there is too much water flow to allow for a complete blockage of a drainage channel. The dam is built of earth, gravel, or other barriers such as sandbags or plywood sheets. Wherever possible, line the upstream side of the dam with plastic sheeting to prevent erosion and penetration of oil into the dam material.

Underflow dams use inclined culverts or pipes to move water downstream while leaving the spill contained behind the dam. The capacity of the pipe(s) should exceed the stream flow rate. It may be necessary to use pumps to remove water behind a dike. Valves or culvert plugs can also be used to control flow rate.

Pipes must be placed on the upstream side of the dam, with the elevated end on the downstream side. Make sure that the upstream end of the pipe is submerged and below the oil/water interface. The height of the elevated downstream end of the pipe will determine the water level behind the dam.

EXISTING ROADS

Roadways that are built up above the terrain can be used as dikes. However, road construction usually allows for natural drainage through culverts or bridges. These drainage structures must be controlled to turn the road into a barrier.

CULVERT BLOCKING

A culvert can be blocked using sheet metal, plywood barriers, or inflatable culvert plugs. Use a full block only when the culvert will be blocked for the entire cleanup operation, if the oil floating on the water will not contaminate additional soil or tundra, and if blocking the water flow will not threaten the road. Otherwise, an adjustable weir or culvert plug should be used.

Plywood and/or sandbags can also be used as culvert blocks, but are more labor-intensive and pose a higher potential for injury. A wood block may require a headwall with kickers oriented to support the boards or plywood. Place the blocking materials over the upstream end of the culvert. Plastic sheeting over the outside of the block will prevent oil penetration.

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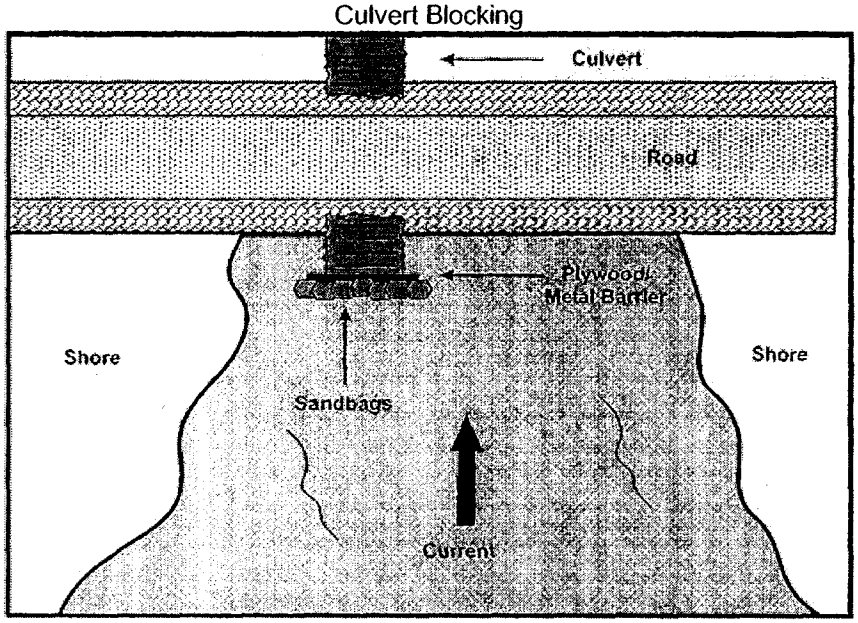
FIGURE H.1
Culvert Blocking



EARTH MOVING EQUIPMENT

A bulldozer, road grader, or front-end loader drives around the spill with its blade angled towards the spill, pushing earth or snow into a berm. Once the perimeter has been covered with an initial berm, shore-up areas as necessary.

SNOW

Because of the absorbent quality of snow, it makes an excellent berm for both containment and recovery. A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow. A snow berm is built around the areas of heaviest oiling to contain oil or diesel spilled to tundra and/or ice in winter.

MESH FENCE

Plastic mesh fencing may be used to quickly construct an underflow dam system. The mesh fencing is placed across the drainage and held in place with stakes. Absorbent boom, oil boom, plywood, or even dry dead grass can be placed on the upstream side of the fencing. Running water will find its way under the barrier fence, but oil floating on top of the water will be trapped. The advantages of this system are that it is lightweight and mobile.

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H.2 DEFLECTION BOOM

Objective & Strategy

The objective is to direct spilled oil away from a location to be protected or simply to change the course of the slick. "Deflection" is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom and then releasing it into the current again with a new trajectory. The angle is chosen to prevent oil from entraining beneath the boom skirt. Boom may be held in place by anchors, vessels, or a boom control device.

Deflection Boom may be used to temporarily avoid impacts to a sensitive area, but there is no recovery associated with the tactic, thus no oil is removed from the environment.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Identify, prioritize, and select sensitive areas to be protected from impact.
3. Select a deployment configuration that best supports the operating environment and available resources.
4. Mobilize to the location and deploy the tactic.
5. Place boom using secured anchor systems, mooring points, vessels, boom control devices, etc.
6. Monitor and adjust the boom on an appropriate basis.

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BOOM ANGLE

Select the appropriate boom angle to keep oil from entraining under the boom. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

ANCHOR SYSTEMS

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating equipment.

DEPLOYMENT CONFIGURATIONS

Single Boom

Boom is deployed from a site at an optimum angle to the current and anchored to deflect the oil away from a location. Figures H.2 and H.3 illustrate two single boom deflection techniques.

FIGURE H.3
Deflective Booming Technique (Single Boom Method)

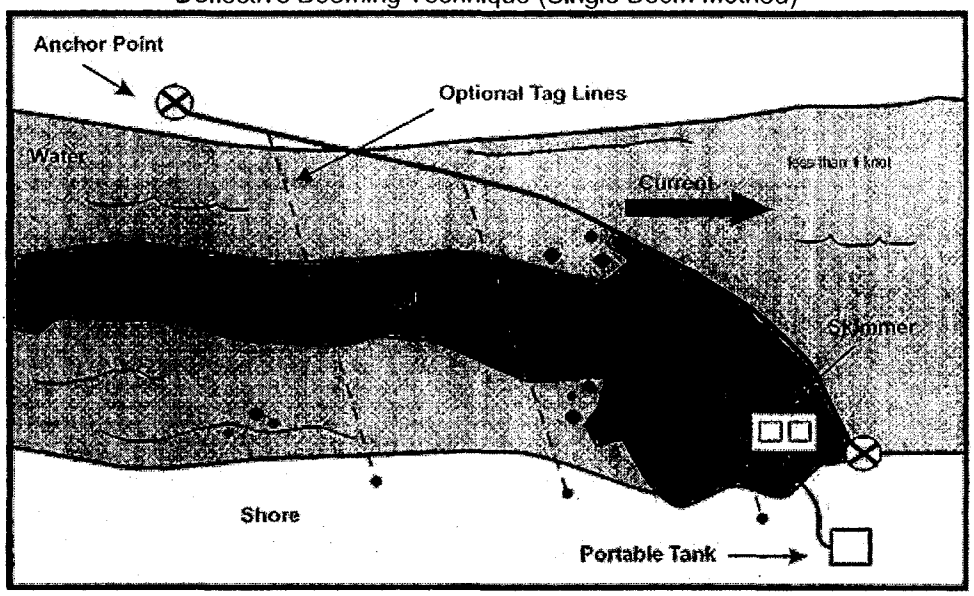

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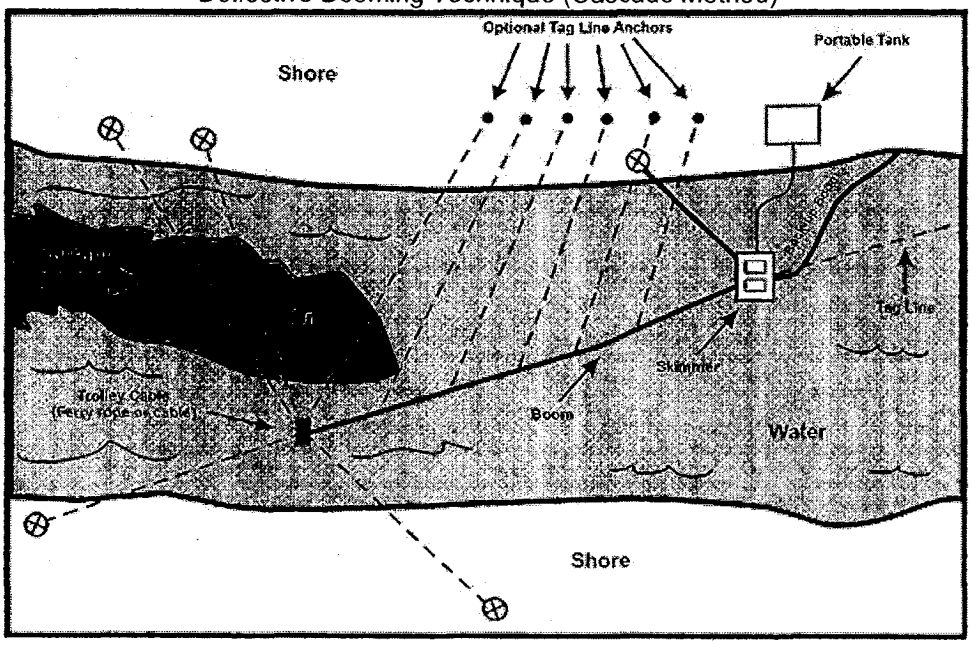
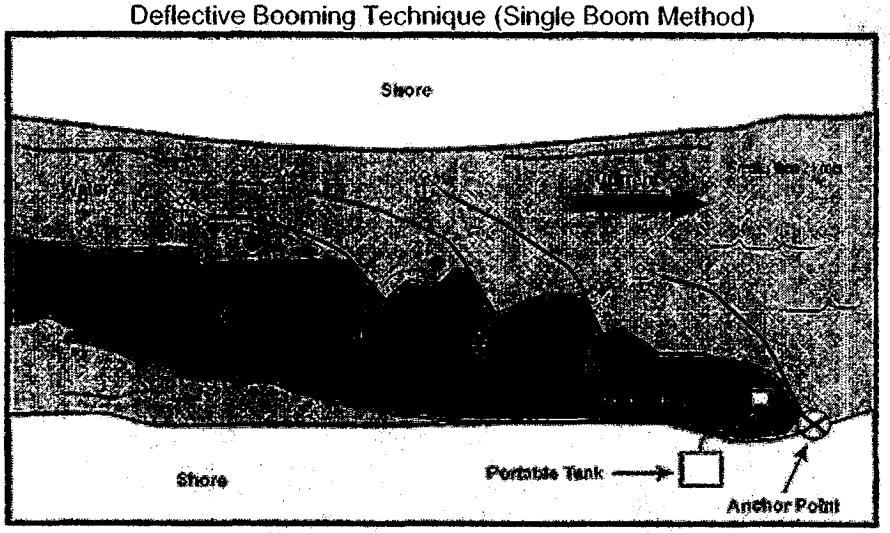
FIGURE H.4
Deflective Booming Technique (Cascade Method)



Cascade

Several booms are deployed in a cascade configuration when a single boom cannot be used because of fast current or because it is necessary to leave openings in the boom for vessel traffic, etc. This configuration can be used in strong currents where it may be impossible to effectively deploy one continuous section of boom. Shorter sections of boom used in a cascade deployment are easier to handle in faster water, thereby increasing efficiency. Additional equipment may be required to set and maintain this system as compared to the single boom configuration.

FIGURE H.2
Deflective Booming Technique (Single Boom Method)



H.3 CONTAINMENT BOOM

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Objective & Strategy

Containment booming is a fixed-boom tactic. The objective is to corral spilled oil on the water, usually near the source, thus minimizing spreading and impacts to the environment. It is usually deployed with Shoreline Recovery.

This tactic can be deployed for oil spill migrating downstream or downhill to water or through water.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Select a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy the tactic.
4. Place boom, using secure anchor system or mooring points.
5. Monitor the boom on an appropriate basis.
6. If oil collects in the boom, utilize an appropriate recovery tactic to remove it.

Tactic Description

Containment boom systems are comprised of the appropriate oil boom for containment and concentration, and anchoring systems to hold the boom in place.

Containment boom systems are not recommended for the fast water environment because of the high probability of fixed-boom failure and the difficulty of anchoring in this environment.

Containment boom systems are not recommended for the broken ice environment, because of the high probability of fixed-boom failure and loss due to ice encounters.

Anchoring systems are often deployed first and then the boom is set from one anchor to the adjacent anchor. Boom can be placed from shoreline to shoreline.

A second layer of containment boom, outside the primary boom, has two advantages:

1. It breaks the sea chop and reduces its impact on the primary boom,
2. It may capture oil that has escaped if the primary boom fails.

Figure H.5 illustrates a simple containment booming technique.

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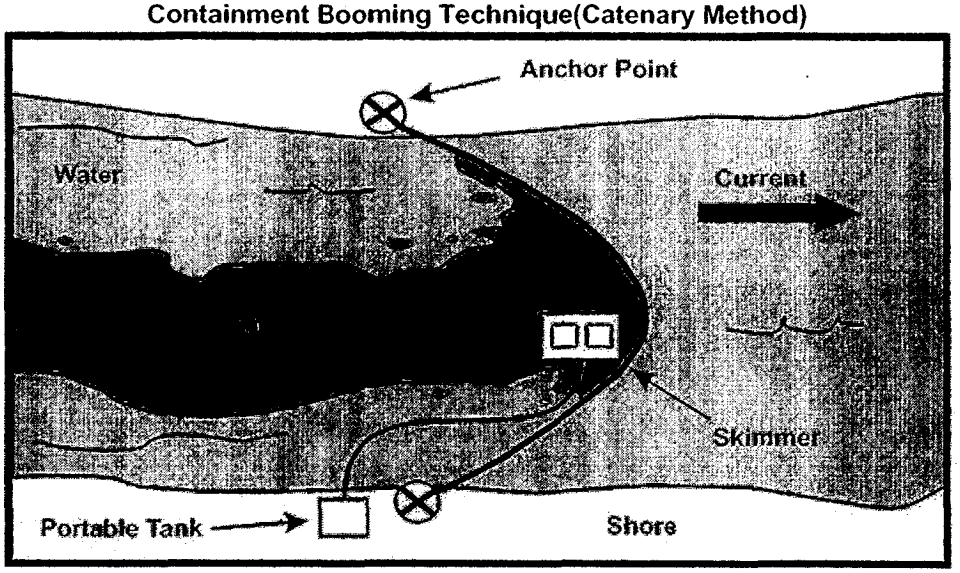
Deployment Considerations

- It is often advisable to "line" the containment boom with sorbent materials (passive recovery) to recover the sheen and reduce decontamination costs.
- If the oil slick is moving, due to wind or current, consider containment at the source and ahead of the leading edge.
- If spill is moving in excess of 1 knot consider the Diversion Boom Tactic.
- Anchor systems must be selected based on the maximum stress that might be expected to occur on the boom array, considering stronger currents and winds than when the anchor is set.
- Site conditions will influence deployment configuration options.
- Combinations of Containment Boom and Diversion Boom tactics are often used together to optimize success.

FIGURE H.5
Containment Booming Technique(Catenary Method)



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H.4 DIVERSION BOOM

Objective & Strategy

The objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. For the purposes of maintaining consistent and clear terms, diversion is always associated with oil recovery, in contrast with the term deflection, which is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The Diversion Boom tactic is for water-born spills where there is some current, usually from 0.5 to 3.0 knots. The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom to a recovery location. The angle is chosen to prevent oil from entraining beneath the boom skirt. Oil can be diverted to a shoreline or away from a shoreline or shoal waters. This tactic is always associated with a Shoreline Recovery. Figures H.6 and H.7 illustrate two diversionary booming techniques. These techniques are the Open Checvron and the Closed Chevron technique respectively.

FIGURE H.6
Open Chevron Booming Technique

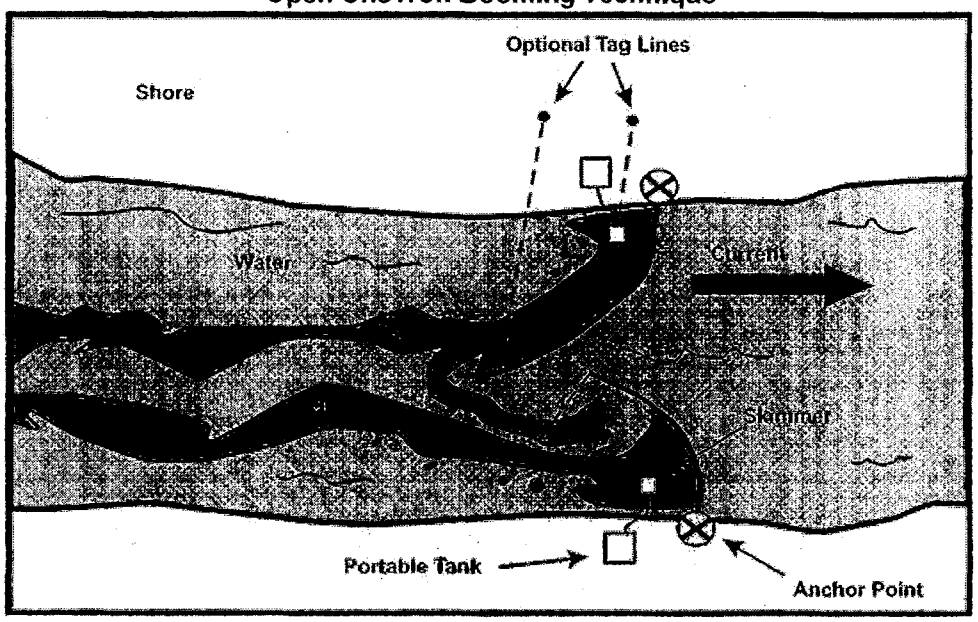

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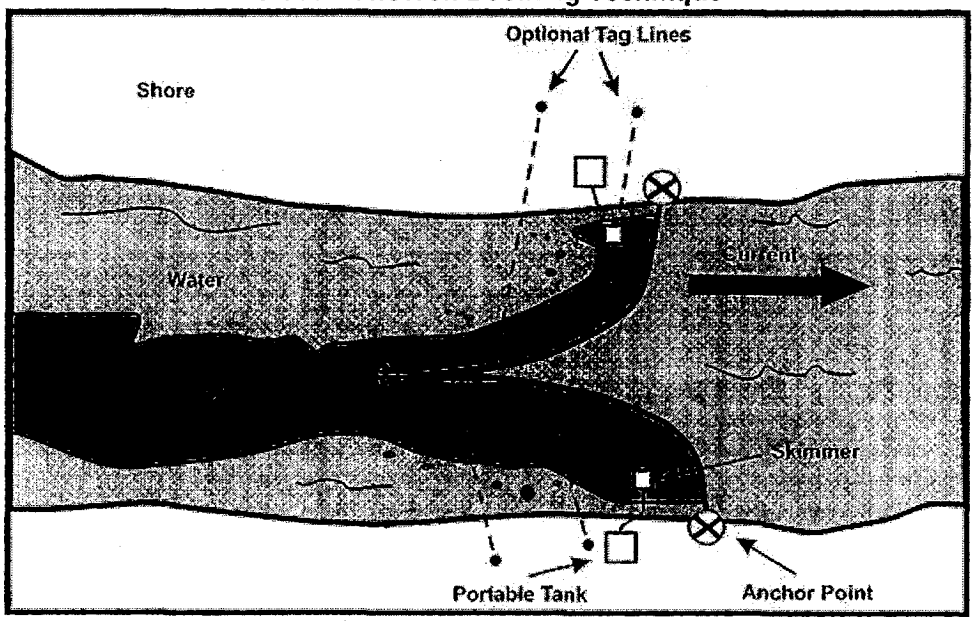
FIGURE H.7
Closed Chevron Booming Technique



ANCHOR SYSTEMS

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating environment.

Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Note that the angle relative to the current decreases rapidly as the current increases. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Single Boom

A basic diversion technique is to divert oil from a current to a recovery site along a shoreline. The recovery site is chosen where there is minimal current and a suitable recovery system can be deployed. The boom is then anchored at the site and deployed at an optimum angle to the current and secured/anchored to divert the oil to the shoreline for recovery.

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H.5 SHORELINE RECOVERY

Objective & Strategy

The objective is to remove spilled oil that has been diverted to a designated recovery site accessible from the shore.

Shoreline Recovery is usually deployed as part of another tactic, such as Diversion Boom strategy. When deployed in conjunction with another tactic, fewer personnel may be required.

The general strategy is to:

1. Identify the primary recovery site.
2. Assess site conditions and access routes.
3. Determine the appropriate recovery and storage systems based on oil type, access, and deployment restrictions.
4. Mobilize and deploy equipment to recover and temporarily store the oil from the recovery site.
5. Take precautions to minimize contamination of the shoreline at the collection site.
6. Man and monitor the system as appropriate.
7. Store and transfer recovered oil and oily water according to an approved waste management plan.

Tactic Description

Shoreline recovery systems can be deployed from land access routes (beaches, all-terrain vehicles), or water access. Access to the recovery site and the oil type will influence/dictate the options of equipment to be used.

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SKIMMING SYSTEMS

Shoreline recovery requires at least one portable skimming system to remove spilled oil. The typical portable skimming system includes:

- Skimmer with pump and power pack
- Hose (suction and discharge with fittings)
- Oil transfer and decanting pump(s)
- Repair kit (tools and extra parts)

There are many models of skimmers to choose from, but they all fall into three types:

- **Weir skimmers** draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. Weir skimmers can recover oil at high rates, but they can also recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant it back into the environment. Otherwise, the recovered water takes available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity.
- **Oleophilic skimmers** pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a storage device. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface. Oleophilic skimmers are a good choice where liquid storage capacity is limited.
- **Suction skimmers** use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best at sites with road access.

Primary Oil Storage Devices

Primary oil storage devices for shoreline recovery can be portable tanks, bladders, or truck-mounted tanks on the shoreline. If access is not restricted, larger systems can be used and deployed by heavy lifting equipment. If the site is accessible by road, vacuum trucks may be used for oil recovery, storage, and transport.

Recovery Location

Selection of a shoreline recovery location is critical to the success of this tactic. A recovery site should be in calm water with minimal currents. The site must have enough level ground to set up and operate a power pack and portable tanks. Sites with road access are preferred, but if not available, the site must have some other suitable access. Shelter, food and water for the response crew must also be considered in selecting a site.

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H.6 ICE OPERATIONS

Objective & Strategy

Much like that of diversion booming, the objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. With a layer of ice preventing the use of booming equipment, other response strategies must be employed.

Tactic Description

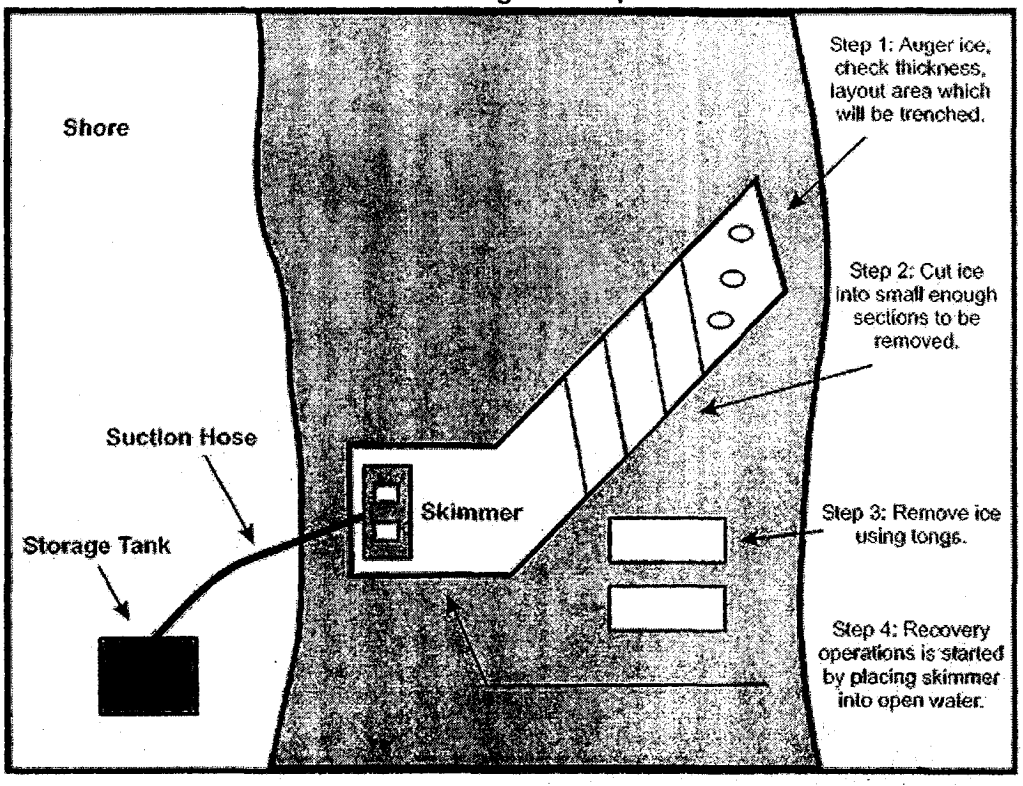
ICE SLOTTING

Ice slotting (Figure H.8) may be used in cases where the ice is thick enough to support the response equipment and personnel. Consideration for the weakening and cracking of the ice must be taken when conducting ice slotting operations.

Slotting Angle

The slot should be angled at approximately 30 degrees to the river's edge. The slotting needs to be wide enough to place a skimming system into the water to recover the oil. The lead end of the slot should have a slight curve which parallels the river current to allow the current to push the oil towards the recovery area.

FIGURE H.8
Ice Slotting Technique



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DEFLECTION BOARDS

In place of using booming equipment it may be possible to use flat boards, such as plywood, to divert the oil under the ice into a recovery area, which has been cut out. To use this form of diversion, the depth of the water under the ice and the speed of the current ice must be considered. The angle in which the boards are placed is derived much like that of deflection booming. In any current above 3 knots, a series of cascading boards should be considered. Also, the depth of the water must be considered. The stronger the current the deeper the boards must be placed to prevent entrainment. If the water is not deep enough to place the boards to prevent entrainment, ice slotting methods may be required. Figure H.9 illustrates the overall method of using deflective boards. Figure H.10 illustrates a close up of the deflective board response method.

FIGURE H.9
Deflective Boards Recovery Srategy

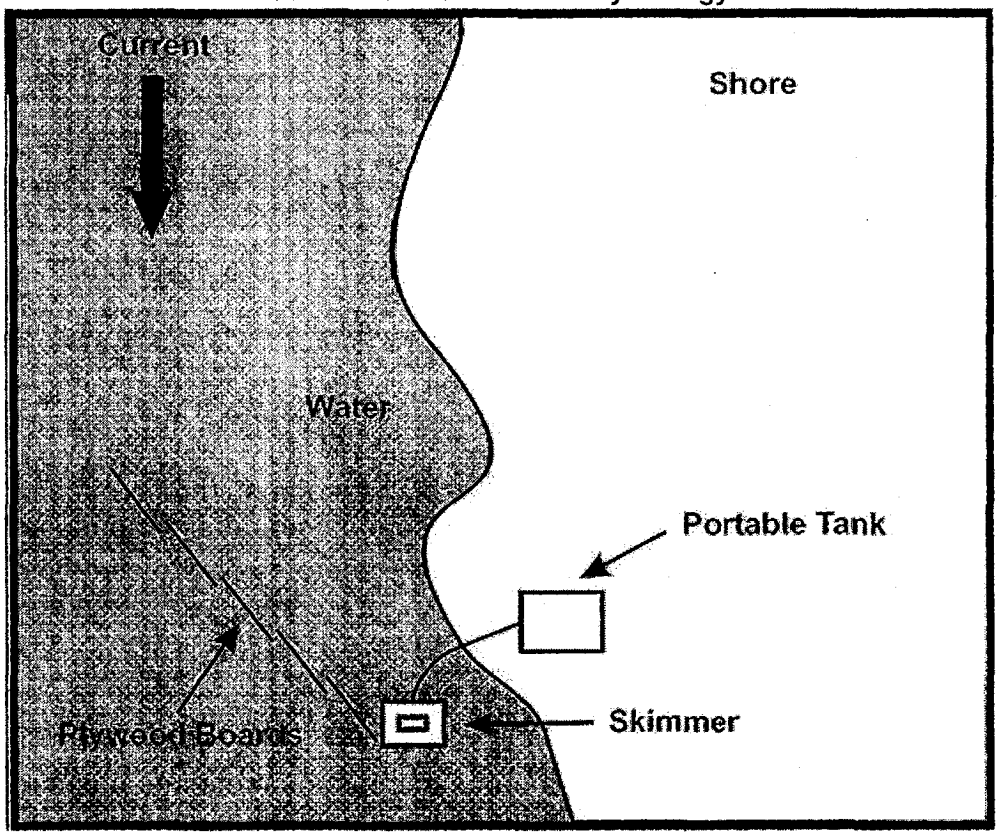

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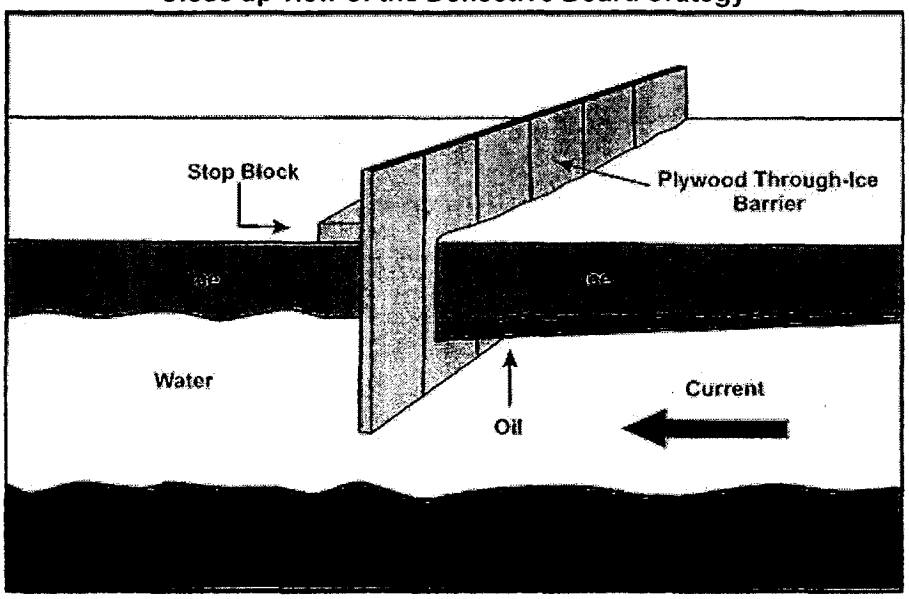
FIGURE H.10
Close up view of the Deflective Board Srategy



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APPENDIX I

MEDIA RELATIONS

I.1 Introduction

I.2 Dealing with Agencies, the Media and the Public

I.3 The Public Wants to Know

I.4 Target Audiences

I.5 Media Statements

I.6 Holding Statements

I.7 Media Advisories

I.8 Press Releases

I.9 New Confrences

I.10 Media Center

I.11 Post Incident Public Affairs

Figure I.1 Media Holding Statement

Figure I.2 Procedures and Considerations

Figure I.3 Layout for Press Conference

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I.1 INTRODUCTION

Goals:

- Provide a coordinated communications response to ensure appropriate information is disseminated in an accurate and timely manner
- Communicate concisely the nature of the emergency, the steps being taken to address it and the effectiveness of those measures
- Control the communications environment as much as possible in an effort to protect the reputation of the Company

I.2 DEALING WITH AGENCIES, THE MEDIA AND THE PUBLIC

Only official Company spokespersons are authorized to release incident information. Receptionists and others may receive calls or be required to take messages. They should take the following information from each caller and pass the details to the Public Information Officer as soon as possible.

- Name
- Media outlet-publication, TV/radio station and market they are serving
- Time of call
- Nature of request
- Phone and fax number(s)
- E-mail address

Deadline

The Company's goal is to prioritize and return media calls as soon as possible knowing that a reporter working on a breaking news story will attempt to fill the information void. The Company will want to be the ones to fill that void. It may not be possible to return all phone calls. Reporters might also be directed to other sources such as our website or instructed to call back at a specific time.

Objectives During Emergencies

- Provide as much relevant information as possible about how the Company is responding to the incident to build and maintain stakeholder and media trust
- Present an accurate, compassionate and up-to-date account of the crisis
- Balance the resolution of the technical emergency while managing human issues

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- Maintain an accurate record of what is happening and actions being taken to respond to the crisis
- Present a positive and accurate perception of the Company
- Identify factual and interpretative errors and develop a strategy to respond
- Bring positive developments to the forefront quickly
- Prepare spokespersons to deliver the message
- Communicate the policies, attitudes and actions of the Company to convey that the organization has a plan in place to deal with the crisis
- Maintain credibility in the communication process by ensuring consistency in the message and the information being disseminated

I.3 THE PUBLIC WANTS TO KNOW

- Does the Company care?
- Does the Company have a plan in place?
- Is Company's priority to keep people and the environment safe?
- Is the Company doing everything possible to address the situation?

It is the job of the Public Information Officer or Company spokesperson to convey to the audiences and to assist Executive Management to convey that the answer to all these questions is a resounding **"Absolutely."**

I.4 TARGET AUDIENCES

Each emergency is unique and requires careful judgment to determine which audiences to target and which audiences have priority. Given the media's pervasive and instant capability to relay information and impact public opinion, it is clearly the key audience for Company's communications strategy and actions.

The following list indicates the audiences who should be considered when developing the key messages that will be communicated by the media.

Internal

- Employees and Employees' families
- Affiliated Companies/Businesses

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External (Local, Regional, National, and International)

- Media
- Environmental Community
- Impacted Communities/General Public
- Contractors
- Site Investigators
- Industry Associations
- Elected Officials
- Vendors
- Shareholders
- Securities Exchanges
- Analysts
- Neighboring Businesses
- Regulators
- Governmental Entities
- General Public
- Bankers

When responding, always prepare for the worst possible scenario. It is important to recognize that no two incidents will be the same. The Company must remain flexible and adapt a response to meet the unique characteristics of the current situation.

I.5 MEDIA STATEMENTS

Three types of media statements for communicating information can be generated:

1. **Holding Statement**
2. Media Advisory
3. Press Release

I.6 HOLDING STATEMENTS

A holding statement should be prepared **immediately** to reduce media frustration and quickly establish a channel of communication. Immediate action will help to fill the information void with accurate details. The holding statement is the response to any inquiries made to the Company prior to a press release being issued. The holding statement should contain the following:

- Nature of incident
- Time and date of incident
- Location of incident
- Impact of the incident (e.g., any people involved? Injuries? Damage?)
- Report fatalities only if cleared by the Public Information Officer and Legal and only after the family has been notified.

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- It is OK to say "no information is available" on any given topic if the information is not yet known
- Status of emergency crews – en route or on the scene
- "The Company's trained emergency response teams are supporting rescue units. The Company's teams are trained to deal with incidents of this nature."
- "It is just too early to tell what caused this incident. There will be a thorough investigation."
- When to expect an update

Not Release

Fatalities unless cleared by the Public Information Officer and Legal Officer
Names of injured or deceased
Nature of injuries
Any Company communication or Company record
Any opinion as to the cause of the incident
Hazardous Materials involved

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Holding Statement Template

DATE:(YY/MM/DD) _____ TIME: _____ ☐ AM

☐ PM

MY NAME IS: _____ MY JOB TITLE IS: _____

_____

This is the information I can give you so far:

At *(time)* _____ ☐ AM ☐ PM, on _____

(date), a(n) (fire, explosion, gas release, spill – specify) occurred at (Company's name) _____'s _____location, located _____ _____ kilometers *(east/west/north/south)* _____ of *(nearest town or city)* _____.

Presently, *(number of personnel)* _____ Company employees or Contract personnel, are (O.K., not injured, are being treated for injuries, etc. – specify).

_____

_____.

Note: The names and condition of the injured can only be released after they have been released by the proper authorities.

The *(plant / pipeline / office, etc. – specify)* _____

_____

_____ has been shut down and isolated.

Company staff have activated the Emergency Response Plan and are directing emergency response procedures to protect the Public, our employees and the environment.

The cause of the (fire, explosion, gas release, spill, etc. – specify) _____is not yet known and no estimate of damage is available. Further information will be released as it becomes available.

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I.7 MEDIA ADVISORIES

A media advisory should be issued immediately after the holding statement has been finalized. Essentially, the holding statement is the media advisory; the only difference is that the media advisory is issued externally. The Public Information Officer has overall responsibility for ensuring this advisory is issued externally.

I.8 PRESS RELEASES

Press releases should be prepared for distribution by the Public Information Officer as soon possible, preferably within an hour of the incident. Subsequent news releases should be issued as new information becomes available.

They should include the following details:

- Time, date and location of the release
- Spokesperson name and contact number
- Summary of holding statement information
- Current status of the incident
- Status of the investigation
- Concern for public health and safety, safety of responders and environmental impact
- Involvement of authorities and outside responders
- Time of next update or news conference, if warranted
- Refer to media specific web site, if available

Consider using other tools for the media when appropriate:

- Fact Sheets
- Backgrounders
- Visuals (e.g., maps, etc.)

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I.9 NEWS CONFERENCES

A number of factors will determine the need for a news conference, including:

- The level of media interest the story has generated;
- The need to make technical experts available to journalists to explain complex details such as nature of a substance released, environmental impact, public health threats, etc.;
- A significant change in the status of the situation; or
- The investigation is complete and the results are ready for release.

Strategy

- If possible, hold press conferences at a location removed from Company property
- Give media some type of guideline for the timing (i.e., there will NOT be a briefing before a given time)
- Determine who will open the news conference and what the ground rules will be (e.g., time limits, etc.)
- Determine who will make statements and whether there will be a question period
- It is appropriate to outline the ground rules for those attending the press conference before the conference formally begins
- Prepare opening statement and review potential questions with key spokesperson. Any new information released during the press conference should be cleared with the Public Information Officer.

Note: Media should never be left unattended on Company property. If necessary, arrange for media escorts. Also, arrange for any Security personnel or law enforcement as deemed necessary.

News Conference Checklist

- Check with Public Information Officer (and spokesperson) to select the best time for the conference. (Arrange for Technical Advisor to be present.) Keep in mind demands of the news cycle. Late morning and early afternoon are typically best for electronic media. Late afternoon will better serve the print media and might facilitate a "live shot" by electronic media
- Stage the conference at a local hotel or hall. Keep in mind accommodations for cameras, reporters, technical staff, parking for live or satellite trucks and cable run for television crews

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- Distribute media advisory of time and location, including directions and parking information
- Compile list of media who have indicated they will attend. If possible, determine if there is a particular area of interest
- Invite outside officials, as appropriate
- Compile background information that may serve as a resource for reporters

I.10 MEDIA CENTER

The need to establish a media center will be determined by the Public Information Officer. The level of media interest in the story will be a key factor in determining if a media center is needed.

If a media center is established appropriate news organizations will be notified by way of fax and e-mail distribution. Access to the media center should be confined only to credentialed "working press." Arrange for Security personnel or law enforcement as deemed necessary.

Media Center Checklist

- Work Tables and Chairs
- External telephone lines (might not be possible if center is located in the field)
- Radio
- Television/VCR
- Podium with microphone and audio distribution (mult box)
- Extension cords
- Blank audio and videotapes
- Copier/Fax machine
- Laptop computer and printer
- If the center is in the field, you might need a generator to provide power
- Car battery adapter for PC
- Cell phone car adapter
- Power generator (if remote location)

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Supplies

- The Company letterhead
- Pens and pencils
- Background material
- Past press releases
- Fact sheets
- Maps
- Refreshments

I.11 POST INCIDENT PUBLIC AFFAIRS

Once the incident is concluded, the Public Information Officer should prepare one final press release, possibly in the form of a chronology, to describe the incident and the subsequent response. The media may also be looking for any follow-up information as to the cause of the incident, people involved, long term effects on the company, costs associated with the incident, etc. These requests will have to be considered on a case-by-case basis. All releases should be reviewed by the Legal Officer and approved by the Incident Commander (or a higher authority) prior to being released.

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FIGURE I.1

MEDIA HOLDING STATEMENT

The following statement is an example of how to address reporters when you need more time to gather facts before speaking to them.

Open:

Hi_____. I'm _____, and I am the spokesperson for _____ _____.

I am in the process of gathering more facts for you regarding _____ _____.

I know you want accurate information, so I will need_____(how much time) to get these facts confirmed.

Basic Facts: (If confirmed)

I can tell you...Who: (Background -- optional at this point)

When:

Where:

What:

Priority:
"A preliminary investigation into the _____has already begun. That is all the information I have for you at this time.

Holding Statement:

We could meet back here (or via phone) at _____ o'clock.

Meantime, let me get your business card, cell phone, etc...

Questions & Offers: (Optional)

What is your deadline?

I can give you our web address for more information on our Company.

I can provide our public affairs contact and number (or provide your business card):

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FIGURE I.2

PROCEDURES AND CONSIDERATIONS	
Identify Your Audience • Employees • Clients • Local Media • National / International Media • Special Interest Groups • Stakeholders • Agencies / Public Officials • Industry Associations • Suppliers • Competitors	Identify Key Message(s) • People / Safety • Environment • Property • Potential Impacts of Incident • Basis for Company's Position / Action(s) • Business Continuity
Prepare Official Company Statement • Facility / Personnel Fact Sheet(s) • Issues Applicable to Identified Audience • No Speculation of Any Kind • Confidentiality Issues • Express Care and Concern • Do Not Accept Liability or Offer Compensation • Include Photos / Video • Must be Reviewed and Approved by Incident Commander and Legal Officer	Identify Communications Methods • Media Advisory • Toll-free Telephone • Web-Site • Press Release • Telephone Interviews • Personal Interviews • Press Briefings (Alone or Jointly?) • Holding Statement
Determine Support Requirements • Personnel • Equipment • Physical Space • Photos, Videos, Charts, Graphs, Maps	Determine Frequency of Communications • Times per Shift • Daily • Corporate IC's Discretion • Maintain Awareness of Audience Deadlines / Schedules • Obtain Corporate IC's Approval
Identify Spokesperson(s) if Applicable • Ensure Understanding of Incident • Ensure Familiarity With Expected Audience • Ensure Understanding of Confidentiality / Privacy Issues • Brief on Anticipated Questions and Answers • Ensure Equal Treatment of All Audience Members • Establish Conference Duration • Do Not Underestimate the Impact of Television Reports • Coordinate Responses if Joint Conference • Be Positive • Be Supportive of Agencies, Investigators, and Responders	Monitor Audience Reaction to and Perception of Message • Hostile Press • Special Interest Groups • Public Outrage or Increased Demands • Attempts to Place Blame • Distribution of Disinformation
Revise/Update Message • Answer Earlier Questions • Provide Additional Facts • Address Previous and New Concerns • Adjust Position as suitable or Necessary but Do Not Appear to "Flip-Flop" or Waiver • Maintain Awareness of Audience Deadlines / Schedules • Must be Reviewed and Approved by Incident Commander and Legal Officer	

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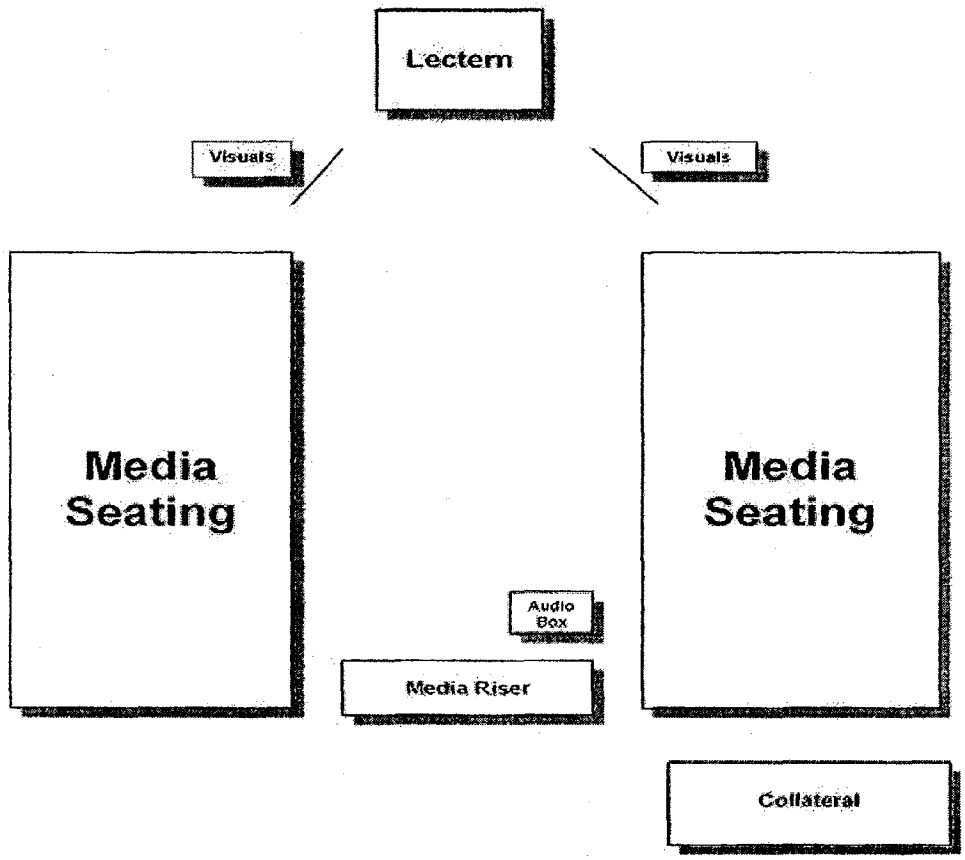
FIGURE I.3

LAYOUT FOR PRESS CONFERENCE



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REGULATORY CROSS REFERENCE

DOT/PHMSA 49 CFR Part 194 Cross Reference
ONSHORE PIPELINE REGULATION, 1999 SOR/99-294
Annex A to Can/CSA-Z-731-03

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DOT/PHMSA 49 CFR PART 194		
§ 194.105	BRIEF DESCRIPTION	LOCATION in PLAN
(a)	... determine the worst case discharge ... provide methodology, including calculations, used to arrive at the volume.	App B
(b)	The worst case discharge is the largest volume, in barrels, of the following:	-----
(b)(1)	... maximum release time in hours, plus the maximum shutdown response time in hours, multiplied by the maximum flow rate expressed in barrels per hour, plus the largest line drainage volume after shutdown of the line section (s) ...; or	App B
(b)(2)	The largest foreseeable discharge for the line section(s) within a response zone, expressed in barrels, based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective or preventative action taken; or	App B
(b)(3)	If the response zone contains one or more breakout tanks, the capacity of the single largest tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system, expressed in barrels.	App B
(b)(4)	Operators may claim prevention credits for breakout tank secondary containment and other specific spill prevention measures as follows:...	App B
§ 194.107	BRIEF DESCRIPTION	LOCATION in PLAN
(a)	Each response plan must plan for resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge.	App A
(b)	An operator must certify in the plan ... reviewed NCP and each applicable ACP...	Foreword
(b)(1)	As a minimum to be consistent with the NCP as a facility response plan must:	-----
(b)(1)(i)	Demonstrate an operator's clear understanding of the function of the Federal response structure...	§ 4.0
(b)(1)(ii)	Establish provisions to ensure the protection of safety at the response site; and	§ 4.0 (Command), § 5.0
(b)(1)(iii)	Identify the procedures to obtain any required Federal and State permissions for using alternative response strategies such as in-situ burning and dispersants...	§ 6.7, App. E
(b)(2)	As a minimum, to be consistent with the applicable ACP the plan must:	-----
(b)(2)(i)	Address the removal of a worst case discharge and the mitigation or prevention of a substantial threat of a worst case discharge;	§ 3, App B
(b)(2)(ii)	Identify environmentally and economically sensitive areas;	§ 6.0
(b)(2)(iii)	Describe the responsibilities of the operator and of Federal, State and local agencies in removing a discharge and in mitigating or preventing a substantial threat of a discharge; and	§4.0
(b)(2)(iv)	Establish the procedures for obtaining an expedited decision on use of dispersants or other chemicals.	§ 6.8
(c)	Each response plan must include:	----
(c)(1)	A core plan consisting of ...	----
(c)(1)(i)	An information summary as required in § 194.113,	Fig 1.1
(c)(1)(ii)	Immediate notification procedures,	§ 2.0

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(c)(1)(iii)	Spill detection and mitigation procedures,	§ 3.0
(c)(1)(iv)	The name, address, and telephone number of the oil spill response organization, if appropriate,	Fig 2.5, App A
(c)(1)(v)	Response activities and response resources,	§ 3.0, App A
(c)(1)(vi)	Names and telephone numbers of Federal, State, and local agencies which the operator expects to have pollution control responsibilities or support,	Fig 2.5
(c)(1)(vii)	Training procedures,	App D
§ 194.107	BRIEF DESCRIPTION	LOCATION in PLAN
(c)(1)(viii)	Equipment testing,	App D.2
(c)(1)(ix)	Drill program - an operator will satisfy the requirement for a drill program by following the National Preparedness for Response Exercise Program (PREP) guidelines. An operator choosing not to follow PREP guidelines must have a drill program that is equivalent to PREP. The operator must describe the drill program in the response plan and OPS will determine if the program is equivalent to PREP.	App D.2
(c)(1)(x)	Plan review and update procedures;	§ 1.4
(c)(2)	An appendix for each response zone that includes the information required in paragraph (c)(1)(i)-(ix) of this section and the worst case discharge calculations that are specific to that response zone. An operator submitting a response plan for a single response zone does not need to have a core plan and a response zone appendix. The operator of a single response zone onshore pipeline shall have a single summary in the plan that contains the required information in § 194.113.7; and.	Annexes
(c)(3)	A description of the operator's response management system including the functional areas of finance, logistics, operations, planning, and command. The plan must demonstrate that the operator's response management system uses common terminology and has a manageable span of control, a clearly defined chain of command, and sufficient trained personnel to fill each position.	§ 4.0
§ 194.107	BRIEF DESCRIPTION	LOCATION in PLAN
(a)	Each operator shall maintain relevant portions of its response plan at the operator's headquarters and at other locations from which response activities may be conducted, for example, in field offices, supervisor's vehicles, or spill response trailers.	Foreword Distribution List
(b)	Each operator shall provide a copy of its response plan to each qualified individual	Foreword Distribution List
§ 194.113	BRIEF DESCRIPTION	LOCATION in PLAN
(a)	The information summary for the core plan, required by § 194.107, must include:	----
(a)(1)	The name and address of the operator.	Fig 1.1
(a)(2)	For each response zone which contains one or more line sections that meet the criteria for determining significant and substantial harm as described in § 194.103, a listing and description of the response zones, including county(s) and state(s).	Fig 1.1, Response Zone Annexes
(b)	The information summary for the response zone appendix, required in § 194.107, must include:	----
(b)(1)	The information summary for the core plan.	Fig 1.1
(b)(2)	The names or titles and 24-hour telephone numbers of the qualified individual (s) and at least one alternate qualified individual(s);	Fig 1.1, Fig 2.2

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(b)(3)	The description of the response zone, including county(s) and state(s), for those zones in which a worst case discharge could cause substantial harm to the environment.	Fig 1.1, Response Zone Annexes
(b)(4)	A list of line sections for each pipeline contained in the response zone, identified by milepost or survey station number, or other operator designation.	Fig 1.1
(b)(5)	The basis for the operator's determination of significant and substantial harm.	Foreword
(b)(6)	The type of oil and volume of the worst case discharge.	App B
§ 194.115	**BRIEF DESCRIPTION**	**LOCATION in PLAN**
(a)	Each operator shall identify and ensure, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge.	App A
(b)	An operator shall identify in the response plan the response resources which are available to respond within the time specified, after discovery of a worst case discharge, or to mitigate the substantial threat of such a discharge.	App A
§ 194.117	**BRIEF DESCRIPTION**	**LOCATION in PLAN**
(a)	Each operator shall conduct training to ensure that:	-----
(a)(1)	All personnel know --	-----
(a)(1)(I)	Their responsibilities under the response plan	
(a)(1)(ii)	The name and address of, and the procedure for contacting, the operator on a 24-hour basis	§ 4.0
(a)(1)(iii)	The name of, and procedures for contacting, the qualified individual on a 24-hour basis	§ 2.0, Fig 2.2
(a)(2)	Reporting personnel know --	-----
(a)(2)(I)	The content of the information summary of the response plan.	Fig 1.1
(a)(2)(ii)	The toll-free telephone number of the National Response Center	Fig 2.5
(a)(2)(iii)	The notification process	§ 2.0, Fig 2.5
(a)(3)	Personnel engaged in response activities know --	-----
(a)(3)(I)	The characteristics and hazards of the oil discharged	Fig 3.2, App G
a)(3)(ii)	The conditions that are likely to worsen emergencies, including the consequences of facility malfunctions or failures, and the appropriate corrective actions.	§ 3.0
(a)(3)(iii)	The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity, or environmental damage	§ 3.0
(a)(3)(iv)	The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus	§ 3.0
(b)	Each operator shall maintain a training record for each individual that has been trained as required by this section. Theses records must be maintained in the following manner as long as the individual is assigned duties under the response plan	App D.1
(b)(1)	Records for operator personnel must be maintained at the operator's headquarters	App D.1
(b)(2)	Records for personnel engaged in response, other than operator personnel, shall be maintained as determined by the operator.	App D.1
(b)(3)	Nothing in this section relieves an operator from the responsibility to ensure that all response personnel are trained to meet the OSHA standards for emergency response operations in 29 CFR 1910.120 ...	App D.1

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§ 194.119	BRIEF DESCRIPTION	LOCATION in PLAN
(a)	Each owner shall submit two copies...	Distribution
(b)	...PHMSA will notify the operator of any alleged deficiencies...	-----
(c)	The operator...may petition PHMSA for reconsideration within 30 days...	-----
(d)	...PHMSA will approve the Response Plan...	-----
(e)	...The operator may submit a certification to PHMSA...that the operator has obtained, through contract or other approved means, the necessary private personnel and equipment to record, to the maximum extent practicable, to a worst case discharge...	Foreword (Operator's Statement)
(f)	...PHMSA may require an operator to provide a copy of the response plan to the OSC...	-----
§ 194.121	**BRIEF DESCRIPTION**	**LOCATION in PLAN**
(a)	Each operator shall update its response plan to address new or different operating conditions or information. In addition, each operator shall review its response plan in full at least every 5 years from the date of the last submission or the last approval as follows:	§ 1.4
(a)(1)	For substantial harm plans, an operator shall resubmit every 5 years from the last approval date.	§ 1.4
(a)(2)	For significant and substantial harm plans, an operator shall resubmit every 5 years form the last approval date.	§ 1.4
(b)	If a new or different operating condition or information would substantially affect the implementation of a response plan, the operator must immediately modify its response plan to address such a change...	§ 1.4
(b)(1)	An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved plan;	§ 1.4
(b)(2)	Relocation or replacement of the pipeline in a way that substantially affects the information included in the response plan, such as a change to the worst case discharge volume;	§ 1.4
(b)(3)	The type of oil transported, if the type affects the required response resources, such as a change from crude oil to gasoline;	§ 1.4
(b)(4)	The name of the spill removal organization;	§ 1.4
(b)(5)	Emergency response procedures;	§ 1.4
(b)(6)	The qualified individual;	§ 1.4
(b)(7)	A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities; and	§ 1.4
(b)(8)	Any other information relating to circumstances that may affect full implementation of the plan.	§ 1.4
(c)	If PHMSA determines that a change to a response plan does not meet the requirements of this part, PHMSA will notify the operator of any alleged deficiencies, and provide operator...opportunity to correct deficiencies.	-----
(d)	An operator who disagrees with a determination that proposed revisions to a plan are deficient may petition PHMSA for reconsideration, within 30 days from the date of receipt of PHMSA's notice...	-----

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S 32.34	BRIEF DESCRIPTION	LOCATION in PLAN
-----	Directions for Use of Manual;	§ 1.0
-----	Emergency Preparedness and Response Policy;	§ 3.0
-----	Description of Initial Responses to Incident Calls;	§ 3.1
-----	Management of Threat Information;	§ 3.1
-----	Definitions and Levels of Emergencies;	§ 3.1
-----	Corporate and Operational Chains of Command;	§ 4.0
-----	Internal and External Contact Lists;	Fig. 2.2, 2.5
-----	External Communication Information (e.g. media outlets);	
-----	Description of General and Site Specific Emergency Response Procedures;	§ 3.0
-----	Roles and Responsibilities (e.g. checklist of duties);	§ 4.0
-----	Site-Specific Emergency Information (e.g. control points);	
-----	Lists of Persons in Emergency Planning Zones (or on separate file);	Fig. 2.2
-----	Environmental or Other Areas Requiring Special Consideration or Protection;	§ 6.0
-----	Detailed Product Information (e.g. MSDS);	App. G
-----	Description and Location of Response Equipment;	App. A
-----	Internal and External Reporting Requirements;	§ 2.0
-----	Area Maps;	Fig. 1.2
-----	Training Requirements;	App. D
-----	Role of Government Departments;	§ 4.6
-----	Manual Updating Procedure and Schedule;	§ 1.4
-----	Forms and Records; and	App. F
-----	Manual Distribution List.	Foreword

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ANNEX A TO CAN/CSA-Z731-03	
SAMPLE TABLE OF CONTENTS FOR AN EMERGENCY PREPAREDNESS MANUAL	
REFERENCE	LOCATION
1 Administration	-----
1.1 Emergency Preparedness Policy	Sec. 1.1
1.2 Purpose of This Manual	Sec. 1.2
1.3 Distribution of This Manual	Foreword, Sec. 1.3
1.4 Definitions	Glossary of Terms/Acronyms
2 Organization of Emergency Areas	Annexes
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5 Emergency Response	-----
5.1 Emergencies Caused by Human Activity	Fig. 3.1
5.2 Natural Disasters	Fig. 3.1
6 Emergency Resources	-----
6.1 Contact List	Fig 2.2, 2.5
6.2 Personnel/Equipment	App. A
7 Training	-----
7.1 Employees	App. D.1
7.2 Contractors	App. D.1
7.3 Training Drills	App. D.2
8 Checklists	App. F
8.1 Role Checklists	App. F
8.2 Equipment Checklists	App. F

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GLOSSARY OF TERMS AND ACRONYMS

Glossary

Acronyms

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GLOSSARY OF TERMS

This glossary contains definitions of terms that will be used frequently during the course of response operations.

Activate: The process of mobilizing personnel and/or equipment within the response organization to engage in response operations.

Activator: An individual in the response organization whose responsibilities include notifying other individuals or groups within the organization to mobilize personnel and/or equipment.

Adverse Weather: The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operating environment. Factors to consider include significant wave height, ice, temperature, weather - related visibility, and currents within the Captain of the Port (COTP) zone in which the systems or equipment are intended to function.

Agency Representative: Individual assigned to an incident from an agency who has been delegated full authority to make decisions on all matters affecting that agency's participation in response operations.

Area Committee: As defined by Sections 311(a)(18) and (j)(4) of CWA, as amended by OPA, means the entity appointed by the President consisting of members from Federal, State, and local agencies with responsibilities that include preparing an Area Contingency Plan for the area designated by the President. The Area Committee may include ex-officio (i.e., non-voting) members (e.g., industry and local interest groups).

Area Contingency Plan: As defined by Sections 311(a)(19) and (j)(4) of CWA, as amended by OPA, means the plan prepared by an Area Committee, that in conjunction with the NCP, shall aliress the removal of a discharge including a worst-case discharge and the mitigation or prevention of a substantial threat of such a discharge from a vessel, offshore facility, or onshore facility operating in or near an area designated by the President.

Average Most Probable Discharge : A discharge of the lesser of 50 barrels or 1% of the volume of the worst case discharge.

AWAY Team: A predesignated team from various departments in Houston, is responsible for arriving at the scene of an oil spill incident as soon as possible to provide both immediate and longer-term management of the field activities.

Barrel (bbl): Measure of space occupied by 42 U.S. gallons at 60 degrees Fahrenheit.

Bioremediation Agents: Means microbiological cultures, enzyme aliitives, or nutrient aliitives that are deliberately introduced into an oil discharge and that will significantly increase the rate of biodegradation to mitigate the effects of the discharge.

Boom: A piece of equipment or a strategy used to either contain free floating oil to a confined area or protect an uncontaminated area from intrusion by oil.

Booming Strategies: Strategic techniques which identify the location and quantity of boom required to protect certain areas. These techniques are generated by identifying a potential spill source and assuming certain conditions which would affect spill movement on water.

Bulk: Material that is stored or transported in a loose, unpackaged liquid, powder, or granular form capable of being conveyed by a pipe, bucket, chute, or belt system.

Chemical Agents: Means those elements, compounds, or mixtures that coagulate, disperse, dissolve, emulsify, foam, neutralize, precipitate, reduce, solubilize, oxidize, concentrate, congeal, entrap, fix, make the pollutant mass more rigid or viscous, or otherwise facilitate the mitigation of deleterious effects or the removal of the oil pollutant from the water. Chemical agents include biological aliitives, dispersants, sinking agents, miscellaneous oil spill control agents, and burning agents, but do not include solvents.

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Clean-up Contractor: Persons contracted to undertake a response action to clean up a spill.

Cleanup: For the purposes of this document, cleanup refers to the removal and/or treatment of oil, hazardous substances, and/or the waste or contaminated materials generated by the incident. Cleanup includes restoration of the site and its natural resources.

Coastal Waters: For the purpose of classifying the size of discharges, means the waters of the coastal zone except for the Great Lakes and specified ports and harbors on inland rivers.

Coastal Zone: As defined for the purpose of the NCP, means all United States waters subject to the tide, United States waters of the Great Lakes, specified ports and harbors on inland rivers, waters of the contiguous zone, other waters of the high seas subject to the NCP, and the land surface or land substrata, ground waters, and ambient air proximal to those waters. The term coastal zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Coast Guard District Response Ground (DRG): As provided for by CWA sections 311(a)(20) and (j)(3), means the entity established by the Secretary of the department in which the USCG is operating within each USCG district and shall consist of: the combined USCG personnel and equipment, including firefighting equipment, of each port within the district; aliitional prepositioned response equipment; and a district response advisory team.

Command: The act of controlling manpower and equipment resources by virtue of explicit or delegated authority.

Command Post: A site located at a safe distance form the spill site where response decisions are made, equipment and manpower deployed, and communications hanuled. The Incident Commander and the On-Scene Coordinators may direct the on-scene response from this location.

Communications Equipment: Equipment that will be utilized during response operations to maintain communication between the Company employees, contractors, Federal/State/Local agencies. (Radio/ telephone equipment and links)

Containment Boom: A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.

Contingency Plan: A document used by (1) federal, state, and local agencies to guide their planning and response procedures regarding spills of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies occurring upon their vessels or at their facilities.

Contract or Other Approved Means: For OPA 90, a written contract with a response contractor; certification by the facility owner or operator that personnel and equipment are owned, operated, or under the direct control of the facility, and available within the stipulated times; active membership in a local or regional oil spill removal organization; and/or the facility?s own equipment.

Critical Areas to Monitor : Areas which if impacted by spilled oil may result in threats to public safety or health.

Cultural Resources: Current, historic, prehistoric and archaeological resources which include deposits, structures, ruins, sites, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to the historical or prehistorical culture of people in the state as well as to the natural history of the state.

Damage Assessment: The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.

Decontamination: The removal of hazardous substances from personnel and their equipment necessary to prevent adverse health

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effects.

Discharge: Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Dispersants: Means those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.

Diversion Boom: A floatation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert the product towards a pick up point, or away from certain areas.

Drinking Water Supply: As defined by Section 101(7) of CERCLA, means any raw or finished water source that is or may be used by a public water system (as defined in the Safe Drinking Water Act) or as drinking water by one or more individuals.

EM: Emergency Management. Serves as the focal point for senior management support of an incident.

Economically Sensitive Areas: Those areas of explicit economic importance to the public that due to their proximity to potential spill sources may require special protection and include, but are not limited to: potable and industrial water intakes; locks and dams; and public and private marinas.

Emergency Management : The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Emergency Service: Those activities provided by state and local government to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.

EnvironmentallySensitive Areas: Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird ookeries, endangered or threatened species (flora and fauna) habitat, wilulife preserves or conservation areas, parks, beaches, dunes, or any other area protected or managed for its natural resource value.

Facility: Either an onshore facility or an offshore facility and includes, but is not limited to structures, equipment, and appurtenances thereto, used or capable of being used to transfer oil to or from a vessel or a public vessel. A facility includes federal, state, municipal, and private facilities.

Facility Operator: The person who owns, operates, or is responsible for the operation of the facility.

Federal Fund: The spill liability trust fund established under OPA.

Federal Regional ResponseTeam: The federal response organization (consisting of representatives from selected federal and state agencies) which acts as a regional body responsible for planning and preparedness before an oil spill occurs and providing advice to the FOSC in the event of a major or substantial spill.

Federal Response Plan (FRP): Means the agreement signed by 25 federal departments and agencies in April 1987 and developed under the authorities of the Earthquake Hazards Reduction Act of 1977 and the Disaster Relief Act of 1974, as amended by the Stafford Disaster Relief Act of 1988.

First Responders, First Response Agency: A public health or safety agency (e.g., fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.

Hanule: To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.

Harmful Quantity Of Oil: The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or

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sheen upon or discoloration of the surface of the water or a shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.

Hazardous Material: Any nonradioactive solid, liquid, or gaseous substance which, when uncontrolled, may be harmful to humans, animals, or the environment. Including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants.

Hazardous Substance: Any substance designed as such by the Administrator of theEPA pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act; regulated pursuant to Section 311 of the Federal Water Pollution Control Act, or discharged by the SERC.

Hazardous Waste: Any solid waste identified or listed as a hazardous waste by the Administrator of the EPA pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C., Section 6901,et seq as amended. The EPA Administrator has identified the characteristics of hazardous wastes and listed certain wastes as hazardous in Title 40 of the Code of Federal Regulations, Part 261, Subparts C and D respectively.

HAZMAT: Hazardous materials or hazardous substances, exposure to which may result in adverse effects on health or safety of employees.

HAZWOPER: Hazardous Waste Operations and Emergency Response Regulations published by OSHA to cover worker safety and health aspects of response operations.

Heat Stress: Dangerous physical condition caused by over exposure to extremely high temperatures.

Hypothermia: Dangerous physical condition caused by over exposure to freezing temperatures.

Incident: Any event that results in a spill or release of oil or hazardous materials. Action by emergency service personnel may be required to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Briefing Meeting: Held to develop a comprehensive, accurate, and up-to-date understanding of the incident, nature of status of control operations, and nature and status of response operations; ensure the adequacy of control and response operations; begin to organize control and response operations; and prepare for interactions with outside world.

Incident Command Post (ICP): That location at which all primary command functions are executed.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, with responsibility for the management of assigned resources at an incident.

Incident Commander (IC): The one individual in charge at any given time of an incident. The Incident Commander will be responsible for establishing a unified command with all on-scene coordinators.

Indian Tribe: As defined in OPA section 1001, means any Indian tribe, band, nation, or other organized group or community, but not including any Alaska Native regional or village corporation, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and has governmental authority over lands belonging to or controlled by the Tribe.

Initial Cleanup: Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of cleanup increases significantly without timely remedial action. All sites must be evaluated to determine whether initial cleanup is total cleanup, however, this will not be possible in all cases due to site conditions (i.e., a site where overland transport or flooding may occur).

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Initial Notification: The process of notifying necessary the Company personnel and Federal/ State/Local agencies that a spill has occurred, including all pertinent available information surrounding the incident.

Initial Response Actions: The immediate actions that are to be taken by the spill observer after detection of a spill.

Inland Area: The area shoreward of the boundary lines defined in 46 CFR part 7, except that in the Gulf of Mexico, it means the area shoreward of the lines of demarcation (COLREG lines) as defined in §80.740 through 80.850 of this chapter. The inland area does not include the Great Lakes.

Inland Waters: State waters not considered coastal waters; lakes, rivers, ponds, streams, underground water, et. al.

Inland Zone: Means the environment inland of the coastal zone excluding the Great Lakes, and specified ports and harbors on inland rivers. The term inland zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Interim Storage Site: A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.

Lead Agency: The government agency that assumes the lead for directing response activities.

Lead Federal Agency: The agency which coordinates the federal response to incident on navigable waters. The lead federal agencies are:

- **U.S. Coast Guard:** Oil and chemically hazardous materials incidents on navigable waters.
- **Environmental Protection Agency:** Oil and chemically hazardous materials incidents on inland waters.

Lead State Agency: The agency which coordinates state support to federal and/or local governments or assumes the lead in the absence of federal response.

Loading: Transfer from Facility to vehicle.

Local Emergency Planning Committee (LEPC): A group of local representatives appointed by the State Emergency Response Commission (SERC) to prepare a comprehensive emergency plan for the local emergency planning district, as required by the Emergency Planning and Community Right-to-know Act (EPCRA).

Local Response Team: Designated Facility individuals who will fulfill the roles determined in the oil spill response plan in the event of an oil or hazardous substance spill. They will supervise and control all response and clean-up operations.

Lower Explosive Limit: Air measurement utilized to determine the lowest concentration of vapors that support combustion. This measurement must be made prior to entry into a spill area.

Marinas: Small harbors with docks, services, etc. for pleasure craft.

Medium Discharge: Means a discharge greater than 2,100 gallons (50 Bbls) and less than or equal to 36,000 gallons (85+ Bbls) or 10% of the capacity of the largest tank, whichever is less and not to exceed the WCD.

National Contingency Plan: The plan prepared under the Federal Water Pollution Control Act (33 United State Code §1321 et seq) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 United State Code § 9601 et seq), as

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revised from time to time.

National Pollution Funds Center (NPFC): Means the entity established by the Secretary of Transportation whose function is the administration of the Oil Spill Liability Trust Fund (OSLTF). Among the NPFC?s duties are: providing appropriate access to the OSLTF for federal agencies and states for removal actions and for federal trustees to initiate the assessment of natural resource damages; providing appropriate access to the OSLTF for claims; and coordinating cost recovery efforts.

National Response System (NRS): Is the mechanism for coordinating response actions by all levels of government in support of the OSC. The NRS is composed of the NRT, RRTs, OSC, Area Committees, and Special Teams and related support entities.

National Strike Force (NSF): Is a special team established by the USCG, including the three USCG Strike Teams, the Public Information Assist Team (PIAT), and the National Strike Force Coordination Center. The NSF is available to assist OSCs in their preparedness and response duties.

National Strike Force Coordination Center (NSFCC): Authorized as the National Response Unit by CWA section 311(a)(23) and (j)(2), means the entity established by the Secretary of the department in which the USCG is operating at Elizabeth City, North Carolina, with responsibilities that include administration of the USCG Strike Teams, maintenance of response equipment inventories and logistic networks, and conducting a national exercise program.

Natural Resource: Land, fish, wilulife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the state, federal government, private parties, or a municipality.

Navigable Waters: As defined by 40 CFR 110.1 means the waters of the United States, including the territorial seas. The term includes:

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

Interstate waters, including interstate wetlands;

All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, and wetlands, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

- that are or could be used by interstate or foreign travelers for recreational or other purposes;
- from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; and
- that are used or could be used for industrial purposes by industries in interstate commerce.

All impoundments of waters otherwise defined as navigable waters under this section;

Tributaries of waters identified in paragraphs (a) through (d) of this definition, including adjacent wetlands; and

Wetlands adjacent to waters identified in paragraphs (a) through (e) of this definition: Provided, that waste treatment systems (other than cooling ponds meeting the criteria of this paragraph) are not waters of the United States.

Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act jurisdiction remains with EPA.

Nearshore Area: For OPA 90, the area extending seaward 12 miles from the boundary lines defined in 46 CFR Part 7, except in the Gulf of Mexico. In the Gulf of Mexico, it means the area extending seaward 12 miles from the line of demarcation defined in §80.740 -

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80.850 of title 33 of the CFR.

Non-persistent or Group I Oil: A petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions:

1. At lease 50% of which by volume, distill at a temperature of 340 degrees C (645 degrees F);
2. At least 95% of which volume, distill at a temperature of 370 degrees C (700 degrees F).

Ocean: The open ocean, offshore area, and nearshore area as defined in this subpart.

Offshore area: The area up to 38 nautical miles seaward of the outer boundary of the nearshore area.

Oil or Oils: Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil, diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil does not include any substance listed in Table 302.4 of 40 CFR Part 302 adopted August 14, 1989, under Section 101(14) of the federal comprehensive environmental response, compensation, and liability act of 1980, as amended by P. L. 99-499.

Oil Spill Liability Trust Fund: Means the fund established under section 9509 of the Internal Revenue Code of 1986 (26 U.S.C. 9509).

Oily Waste: Product contaminated waste resulting from a spill or spill response operations.

On-Scene Coordinator (OSC): Means the federal official predesignated by the EPA or the USCG to coordinate and direct response under subpart D.

On-site: Means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a response action.

Open Ocean: means the area from 38 nautical miles seaward of the outer boundary of the nearshore area, to the seaward boundary of the exclusive economic zone.

Owner or Operator: Any person, individual, partnership, corporation, association, governmental unit, or public or private organization of any character.

Persistent Oil: A petroleum-based oil that does not meet the distillation criteria for a non-persistent oil. For the purposes of this Appendix, persistent oils are further classified based on specific gravity as follows:

1. Group II specific gravity less than .85
2. Group III specific gravity between .85 and less than .95
3. Group IV specific gravity .95 and including 1.0
4. Group V specific gravity greater than 1.0

Plan Holder: The plan holder is the industry transportation related facility for which a response plan is required by federal regulation to be submitted by a vessel or facility?s owner or operator.

Post Emergency Response: The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and cleanup of the sites has begun.

Post Emergency: The phase of response operations conducted after the immediate threat of the release has been stabilized, and cleanup operations have begun.

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Primary Response Contractors or Contractors: An individual, company, or cooperative that has contracted directly with the plan holder to provide equipment and/or personnel for the containment or cleanup of spilled oil.

Qualified Individual (QI): That person or entity who has authority to activate a spill cleanup contractors, act as liaison with the "On-Scene Coordinator" and obligate funds required to effectuate response activities.

Recreation Areas: Publicly accessible locations where social/sporting events take place.

Regional Response Team (RRT): The Federal response organization (consisting of representatives from selected Federal and State agencies) which acts as a regional body responsible for overall planning and preparedness for oil and hazardous materials releases and for providing advice to the OSC in the event of a major or substantial spill.

Remove or Removal: As defined by section 311(a)(8) of the CWA, refers to containment and removal of oil or hazardous substances from the water and shorelines or the taking of such other actions as may be necessary to minimize or mitigate damage to the public health or welfare (including, but not limited to, fish, shellfish, wilulife, public and private property, and shorelines and beaches) or to the environment. For the purpose of the NCP, the term also includes monitoring of action to remove discharge.

Response Activities: The containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, or the taking of other actions as necessary to minimize or mitigate damage to public health or welfare, or the environment.

Response Contractors: Persons/companies contracted to undertake a response action to contain and/or clean up a spill.

Response Guidelines: Guidelines for initial response that are based on the type of product involved in the spill, these guidelines are utilized to determine clean-up methods and equipment.

Response Plan: A practical manual used by industry for responding to a spill. Its features include: (1) identifying the notifications sequence, responsibilities, response techniques, etc. in a easy to use format; (2) using decision trees, flowcharts, and checklists to insure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from data required by regulatory agencies to prevent confusion during a spill incident.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Responsible Party: Any person, owner/operator, or facility that has control over an oil or hazardous substance immediately before entry of the oil or hazardous substance into the atmosphere or in or upon the water, surface, or subsurface land of the state.

Response Priorities: Mechanism used to maximize the effective use of manpower and equipment resources based upon their availability during an operational period.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Restoration: The actions involved in returning a site to its former condition.

Rivers and Canals: A body of water confined within the inland area that has a project depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.

Securing the Source: Steps that must be taken to stop discharge of oil at the source of the spill.

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Sinking Agents: Means those aiiitives applied to oil discharges to sink floating pollutants below the water surface.

Site Characterization: An evaluation of a cleanup site to determine the appropriate safety and health procedures needed to protect employees from identified hazards.

Site Conditions: Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.

Site Safety and Health Plan: A site specific plan developed at the time of an incident that addresses:

- Safety and health hazard analysis for each operation.
- Personal protective equipment to be used.
- Training requirements for site workers.
- Medical surveillance requirements.
- Air monitoring requirements.
- Site control measures.
- Decontamination procedures.
- Emergency response procedures.
- Confined space entry procedures.

Site Security and Control: Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.

Skimmers: Mechanical devices used to skim the surface of the water and recover floating oil. Skimmers fall into four basic categories (suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices) which vary in efficiency depending on the type of oil and size of spill.

Snare Boom: Oil will adhere to the material of which this boom is made of and thus collect it.

Sorbents: Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.

Spill: An unauthorized discharge of oil or hazardous substance into the waters of the state.

Spill Observer: The first Facility individual who discovers a spill. This individual must function as the first responder and person-in-charge until relieved by an authorized supervisor.

Spill of National Significance (SONS): Means a spill which due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of federal, state, local, and responsible party resources to contain and cleanup the discharge.

Spill Management Team: The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Spill Response: All actions taken in responding to spills of oil and hazardous materials, e.g.: receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.

Spill Response Personnel: Federal, state, local agency, and industry personnel responsible for participating in or otherwise involved

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'n spill response. All spill response personnel will be pre-approved on a list maintained in each region.

Staging Areas: Designated areas near the spill site accessible for gathering and deploying equipment and/or personnel.

State Emergency Response Commission(SERC): A group of officials appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Re-authorization Act of 1986 (SARA). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local Emergency Response Plans.

Surface Collecting Agents: Means those chemical agents that form a surface film to control the layer thickness of oil.

Surface Washing Agent: Is any product that removes oil from solid surfaces, such as beaches and rocks, through a detergency mechanism and does not involve dispersing or solubilizing the oil into the water column.

Tanker: A self-propelled tank vessel constructed or adapted primarily to carry or hazardous material in bulk in the cargo spaces.

Tidal Current Tables: Tables which contain the predicted times and heights of the high and low waters for each day of the year for designated areas.

Trajectory Analysis: Estimates made concerning spill size, location, and movement through aerial surveillance or computer models.

Transfer: Any movement of oil to, from, or within a vessel by means of pumping, gravitation, or displacement.

Trustee: Means an official of a federal natural resources management agency designated in subpart G of the NCP or a designated state official or Indian tribe or, in the case of discharges covered by the OPA, a foreign government official, who may pursue claims for damages under section 1006 of the OPA.

Underwriter: An insurer, a surety company, a guarantor, or any other person, other than an owner or operator of a vessel or facility, that undertakes to pay all or part of the liability of an owner or operator.

Unified Command: The method by which local, state, and federal agencies and the responsible party will work with the Incident Commander to:

- Determine their roles and responsibilities for a given incident.
- Determine their overall objectives for management of an incident.
- Select a strategy to achieve agreed-upon objectives.
- Deploy resources to achieve agreed-upon objectives.

Unified or Coordinated Command Meeting: Held to obtain agreement on strategic objectives and response priorities; review tactical strategies; engage in joint planning, integrate response operations; maximize use of resources; and minimize resolve conflicts.

Volunteers: An individual who donates their services or time without receiving monetary compensation.

Waste: Oil or contaminated soil, debris, and other substances removed from coastal waters and adjacent waters, shorelines, estuaries, tidal flats, beaches, or marshes in response to an unauthorized discharge. Waste means any solid, liquid, or other material intended to be disposed of or discarded and generated as a result of an unauthorized discharge of oil. Waste does not include substances intended to be recycled if they are in fact recycled within 90 days of their generation or if they are brought to a recycling facility within that time.

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Waters of the United States: See **Navigable Waters** in this Glossary.

Wetlands: Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include playa lakes, swamps, marshes, bogs, and similar areas such as sloughs, prairie potholes, wet meadows, prairie river overflows, mudflats, and natural ponds (40 CFR 112.2(y)).

Wilulife Rescue: Efforts made in conjunction with Federal and State agencies to retrieve, clean, and rehabilitate birds and wilulife affected by an oil spill.

Worst Case Discharge: The largest foreseeable discharge under adverse weather conditions. For facilities located above the high water line of coastal waters, a worst case discharge includes those weather conditions most likely to cause oil discharged from the facility to enter coastal waters.

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ACRONYMS

AMIO	-	Alien Migration Interdiction Operation
AQI	-	Alternate Qualified Individual
AM	-	Ante Meridiem
ACP	-	Area Contingency Plan
ACP	-	Area Contingency Plans
Avg.	-	Average
bbl/hr	-	Barrel per Hour
Br	-	Branch
BLM	-	Bureau of Land Management
CANUSCENT	-	Canada - United States Joint Inland Pollution Contingency Plan - Annex II
CA	-	Canada
CA NEB	-	Canadian National Energy Board
COTP	-	Captain of the Port
Ctr.	-	Center
CAS Number	-	Chemical Abstracts Service
CST	-	Civil Support Team
CG	-	Coast Guard
CFR	-	Code of Federal Regulations
Cont'd	-	Continued
CMT	-	Crisis Management Team
DOA	-	Dead on Arrival
Dept.	-	Department
DOD	-	Department of Defense
DENR	-	Department of Environment and Natural Resources
DHS	-	Department of Homeland Security
DOI	-	Department of Interior
DNR	-	Department of Natural Resources
DOT	-	Department of Transportation
D.C.	-	District of Columbia
Div.	-	Division
DOCL	-	Documentation Unit Leader
EMS	-	Emergency Management System
EM	-	Emergency Manager
EOC	-	Emergency Operations Center
ESA	-	Endangered Species Act
EET	-	Environmental Emergency Team
EDRC	-	Estimated Daily Recovery Capability
ETA	-	Estimated Time of Arrival
etc.	-	Et Cetera
exempli gratia e.g.	-	For Example
FAA	-	Federal Aviation Administration
FBI	-	Federal Bureau of Investigation
FOSC	-	Federal On-Scene Coordinator
Ft./Sec.	-	Feet/Second
FIR	-	Field Investigation Report

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FR	-	Fire Retardant
FWD	-	Forward
Freq.	-	Frequency
GRP	-	Group
Gru Sups.	-	Group Supervisors
HAZMAT	-	Hazardous Material
HAZWOPER	-	Hazardous Waste Operations and Emergency Response Standard
HVAC	-	Heating, Ventilating, and Air Conditioning
HEPA OVV	-	High Efficiency Particle Air Device
HF ERW	-	High Frequency Electric-Resistance Weld
HLS	-	Homeland Security
Hrs.	-	Hours
ID NO.	-	Identification Number
IL	-	Illinois
IDNR	-	Illinois Department of Natural Resources
IAW	-	In Accordance With
IAP	-	Incident Action Plan
ICS	-	Incident Command System
ICS	-	Incident Command System
IC	-	Incident Commander
IMH	-	Incident Management Handbook
IMS	-	Incident Management System
Info.	-	Information
KS	-	Kansas
KM	-	Kilometer
KP	-	Kilometer Point
LE	-	Law Enforcement
LO	-	Liaison Officer
LPG	-	Liquefied Petroleum Gas
LEPC	-	Local Emergency Planning Committee
LRT	-	Local Response Team
LSC	-	Logistics Section Chief
LF ERW	-	Low Frequency Electric-Resistance Weld
LEL	-	Lower Explosive Limit
MO	-	Missouri
MSDS	-	Material Safety Data Sheets
MEDEVAC'D	-	Medical Evacuation
NCP	-	National Contingency Plan
NE	-	Nebraska
NEECP (CA)	-	National Environmental Emergencies Contingency Plan
NFPA	-	National Fire Protection Association
NIMS	-	National Incident Management System
ND	-	North Dakota
NOAA	-	National Oceanographic Atmospheric Administration
NCP (U.S.)	-	National Oil and Hazardous Substances Contingency Plan
NRC	-	National Response Center
NRDAR	-	Natural Resource Damage Assessment and Restoration

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N	-	No
NW	-	North West
N/A	-	Not Available
OSHA	-	Occupational Safety & Health Administration
OSRO	-	Oil Spill Removal Organization
OSRP	-	Oil Spill Response Plan
OSRV	-	Oil Spill Response Vessel
OSC	-	On-Scene Coordinate
OSC	-	Operation Section Chief
OP	-	Operational Period
Op.	-	Operations
OPS	-	Operations
O&M	-	Operations and Maintenance
OCC	-	Operations Coordination Center
OV	-	Organic Vapor
PPM	-	Parts Per Million
PFD	-	Personal Floatation Device
PPE	-	Personal Protective Equipment
PHMSA	-	Pipeline and Hazardous Materials Safety Administration
PSC	-	Planning Section Chief
PSC	-	Planning Section Chief
POC	-	Point of Contact
PVC	-	Polyvinyl Chloride
P.M.	-	Post Meridiem
PREP	-	Preparedness for Response Exercise Program
Prot.	-	Protection
PWSD	-	Public Water Supply District
QI	-	Qualified Individual
RPT	-	Regional Preparedness Team
Req.	-	Required
RCRA	-	Resource Conservation and Recovery Act
RESL	-	Resource Leader
RMA	-	Response Management Associates, Inc
RP	-	Responsible Party
RPIC	-	Responsible Party Incident Commander
Rev.	-	Revision
R/W	-	Right-of-Way
RWD	-	Rural Water District
SAR	-	Search and Rescue
SART	-	Search and Rescue Transporter
SD	-	South Dakota
SI	-	Security Incident
SO	-	Security Officer
SCBA	-	Self Contained Breathing Apparatus
SSPs	-	Site Safety Plans
SITL	-	Situation Unit Leader
Spec.	-	Special

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SPCC	-	Spill Prevention, Control, and Countermeasure
SORS	-	Spilled oil Recovery System
Sq. Ft.	-	Square Foot
STAM	-	Staging Area Manager
SERC	-	State Emergency Response Center
SERC	-	State Emergency Response Commission
SOSC	-	State On-Scene Coordinator
SOR	-	Statutory Orders and Regulations
SCADA	-	Supervisory Control and Data Acquisition
TOC	-	Table of Contents
TC	-	TC Oil Pipeline Operations Inc.
TSD	-	Temporary Storage and Disposal
TSC	-	Temporary Storage Capacity
TGLO	-	Texas General Land Office
id est, I.E.	-	That is
TBA	-	To be Assigned
TSB	-	Transportation Safety Board
UC	-	Unified Command
UN Number	-	United Nations
US	-	United States
USCG	-	United States Coast Guard
EPA	-	US Environmental Protection Agency
USN	-	US Navy Supervisor Salvage
Vsl.	-	Vessel
VOSS	-	Vessel of Opportunity Skimmer System
VOC	-	Volatile Organic Compound
Vol.	-	Volume
W	-	West
WCD	-	Worst Case Discharge
Y	-	Yes

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RESPONSE ZONE INFORMATION

Hardisty Pump Station/ Regina Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.
Addresses:	Physical Address 717 Texas Street Houston, Texas 77002
24 Hour Emergency Contact Phone Numbers:	1-800-830-9865 (24 Hours)
Telephone/Fax:	Telephone references, including 24 hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Alberta, Saskatchewan
Areas/Counties Traversed:	Western Saskatchewan, Eastern Alberta

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 41,504 Bbls

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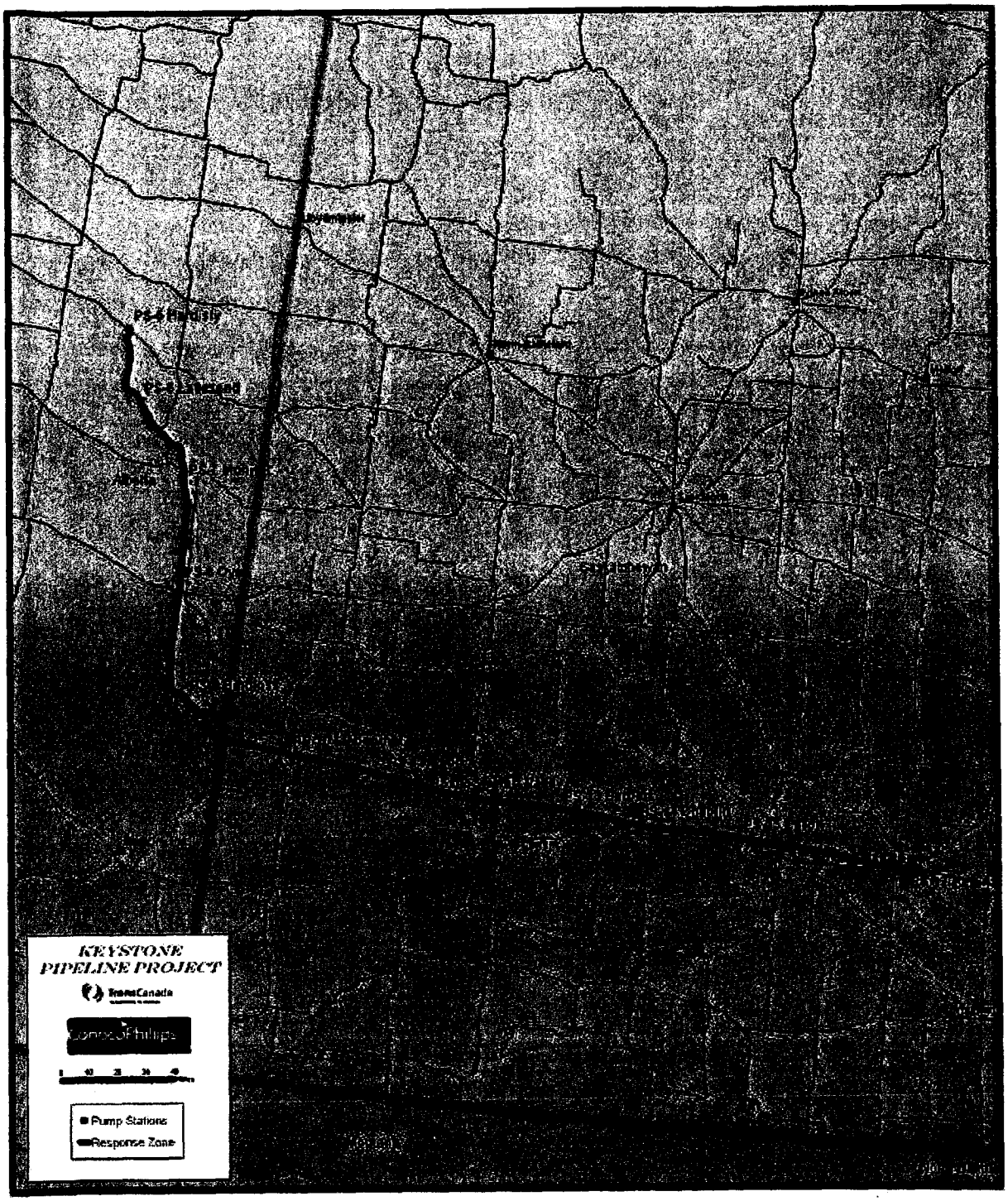
N

Response Zone Layout Map
Hardisty PS to Regina PS

Map Prepared By
Response Management Associates
(281) 320 9796



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RESPONSE ZONE COMPANY CONTACTS				
POSITION TITLE	NAME	OFFICE	HOME	CELL

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Area: Hardisty Pump Station / Regina Pump Station

Qualified Individuals:

Qualified Individuals			
NAME	OFFICE	HOME	CELL
Randall W. Schmidgalll	(204) 957-6832		
John Hayes	(403) 920-6467		(403) 461-9245

Alternate Qualified Individuals:

Alternate Qualified Individuals			
NAME	OFFICE	HOME	CELL

Pipeline Specifications:

The tables below list the pipeline facilities within the East Response Zone Response Zone.

Pipeline Specifications			
Location	Type of Oil	State	County
Hardisty PS / Lakesend PS	Crude Oil	Alberta	Eastern Alberta
Lakesend PS / Monitor PS	Crude Oil	Alberta	Eastern Alberta
Monitor PS / Oyen PS	Cude Oil	Alberta	Eastern Alberta
Oyen PS / Bindloss PS	Crude Oil	Alberta	Eastern Alberta
Blindloss PS / Cabri PS	Crude Oll	Alberta	Eastern Alberta
Cabri PS / Herbert PS	Crude Oil	Saskatchewan	Western Saskatchewan
Herbert PS / Caron PS	Crude Oil	Saskatchewan	Western Saskatchewan
Caron PS / Regina PS	Crude Oll	Saskatchewan	Western Saskatchewan

Company Owned Response Equipment:

Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Response Trailer		See Equipment List - Appendix A

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Breakout Tanks:

Breakout Tanks			
FACILITY NAME	TANK NUMBER	CAPACITY (BBLS)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES
Alberta

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. * Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.		
AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Alberta		
Oyen Fire Department	Oyen, Alberta	911
Oyen RCMP Detachment	Oyen, Alberta	(403) 664-3505/3883
Palliser Regional EMS - Medicine Hat	Medicine Hat, Alberta	(403) 529-8800
Ralston Fire Department	Ralston, Alberta	(403) 544-4448
Special Areas No. 3 Fire Department (Youngstown)	Youngstown, Alberta	(403) 779-3733
Empress Ambulance Services (Alberta Medivac)	Oyen, Alberta	(403) 664-2456
Empress Fire Department	Empress, Alberta	(403) 565-3746
Etzikom Fire Department	Bow Island, Alberta	(403) 545-2424
Acadia Valley Fire Department	Acadia Valley, Alberta	(403) 972-3808
Walsh Fire Department	Walsh, Alberta	(403) 937-3936
Redcliff Disaster Services	Redcliff, Alberta	(403) 548-3618
Redcliff Fire Department	Redcliff, Alberta	(403) 548-3425
Schuler Fire Department	Schuler, Alberta	(403) 526-2888
Seven Persons Fire Department	Seven Persons, Alberta	(403) 832-3750
Hilda Fire Department	Hilda, Alberta	(403) 838-2510
Irvine Fire Department	Irvine, Alberta	(403) 529-8285
Jenner Fire Department	Jenner, Alberta	(403) 898-2204
Medicine Hat Disaster Services	Medicine Hat, Alberta	(403) 529-8450

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EXTERNAL NOTIFICATION REFERENCES
Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Western Saskatchewan		
Bindloss Fire Department	Bindloss, Alberta	(403) 379-2278
Bow Island Fire Department	Bow Island, Alberta	(403) 545-2424
Pense Fire Department	Pense, Saskatchewan	(306) 345-2302
Piapot Fire Department	Piapot, Saskatchewan	(306) 558-2022/2011
Shaunavon RCMP Detachment	Shaunavon, Saskatchewan	(306) 297-5555
Fox Valley Fire Department	Fox Valley, Saskatchewan	(306) 666-2151
Frontier Ambulance Services	Frontier, Saskatchewan	(306) 296-4554
Frontier Fire Department	Frontier, Saskatchewan	(306) 296-4554/4778
Stewart Valley Fire Department	Stewart Valley, Saskatchewan	(306) 778-2105/2152
Swift Current Ambulance Services	Swift Current, Saskatchewan	(306) 773-2666
Swift Current Fire Department	Swift Current, Saskatchewan	(306) 778-2760
Swift Current RCMP Detachment	Swift Current, Saskatchewan	(306) 778-5550
Cereal Fire Department	Cereal, Alberta	(403) 326-2195
CFB Suffield Military Police Detachment	Ralston, Alberta	(403) 544-4303/4506
Chaplin Fire Department	Chaplin, Saskatchewan	(306) 395-2561/2598
Val Marie Ambulance Services	Val Marie, Saskatchewan	(306) 298-4911
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012/2022
Abbey Fire Department	Abbey, Alberta	(306) 689-2933
Central Butte Ambulance Services	Central Butte, Saskatchewan	(306) 694-2111/4610
Climax Fire Department	Climax, Saskatchewan	(306) 293-2131
Caronport Fire Department	Caronport, Saskatchewan	(306) 756-3253

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Moose Jaw Ambulance Services	Moose Jaw, Saskatchewan	(306) 694-2151
Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 693-9700
Maple Creek RCMP Detachment	Maple Creek, Saskatchewan	(306) 662-5550
Moose Jaw Fire Department	Moose Jaw, Saskatchewan	(306) 692-2792
Moose Jaw RCMP Detachment	Moose Jaw, Saskatchewan	(306) 691-4670
Morse Fire Department	Morse, Saskatchewan	(306) 629-3282
Morse RCMP Detachment	Morse, Saskatchewan	306) 629-4100
Gull Lake Ambulance Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake EMO Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake Fire Department	Gull Lake, Saskatchewan	(306) 672-4273
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
RCMP - Gull Lake Community Detachment	Swift Current, Saskatchewan	(306) 672-3140
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829/7830
Rural Municipality of Riverside No.168 Fire Depart	Pennant, Saskatchewan	(306) 626-3255
Maple Creek EMO Services	Maple Creek, Saskatchewan	(306) 662-2244
Sceptre Fire Department	Sceptre, Saskatchewan	(306) 623-4244
Herbert Fire Department	Herbert, Saskatchewan	(306) 784-2400
Burstall Ambulance Services	Burstall, Saskatchewan	(306) 679-2271
Burstall EMO Services	Burstall, Saskatchewan	(306) 679-2000
Burstall Fire Department	Burstall, Saskatchewan	(306) 679-2108/2215
Cabri Ambulance Services	Cabri, Saskatchewan	(306) 587-2547
Cabri Fire Department	Cabri, Saskatchewan	(306) 587-2500
Cabri RCMP Detachment	Cabri, Saskatchewan	(306) 587-6400
Eastend Fire Department	Eastend, Saskatchewan	(306) 295-3634

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Elkwater Fire Department	Elkwater, Alberta	(403) 893-2005
Shaunavon Ambulance Services	Shaunavon, Saskatchewan	(306) 297-2644
Shaunavon EMO Services	Shaunavon, Saskatchewan	(306) 297-9381
Shaunavon Fire Department	Shaunavon, Saskatchewan	(306) 297-4131
Kipling Fire Department	Kipling, Saskatchewan	(306) 736-8461
Leader Ambulance Services	Leader, Saskatchewan	(306) 628-3828
Leader EMO Services	Leader, Saskatchewan	(306) 628-3868
Leader Fire Department	Leader, Saskatchewan	(306) 628-3868
Leader RCMP Detachment	Leader, Saskatchewan	(306) 628-4600
Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560
Richmound Ambulance Services	Leader, Saskatchewan	(306) 679-7182
RM of Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 692-3446
RM of Wheatland EMO Services	Mortlach, Saskatchewan	(306) 355-2233
Medicine Hat Police Service	Medicine Hat, Alberta	(403) 529-8400
Maple Creek Ambulance	Maple Creek, Saskatchewan	(306) 662-2611
Medicine Hat Fire Department	Medicine Hat, Alberta	(403) 529-8282

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RESPONSE ZONE INFORMATION

Regina Pump Station / Haskett Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.
Addresses:	Physical Address 717 Texas Street Houston, Texas 77002
24 Hour Emergency Contact Phone Numbers:	1-800-830-9865 (24 Hours)
Telephone/Fax:	Telephone references, including 24 hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Saskatchewan, Manitoba
Areas/Counties Traversed:	Eastern Saskatchewan, Southwestern Manitoba

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 51,413 Bbls

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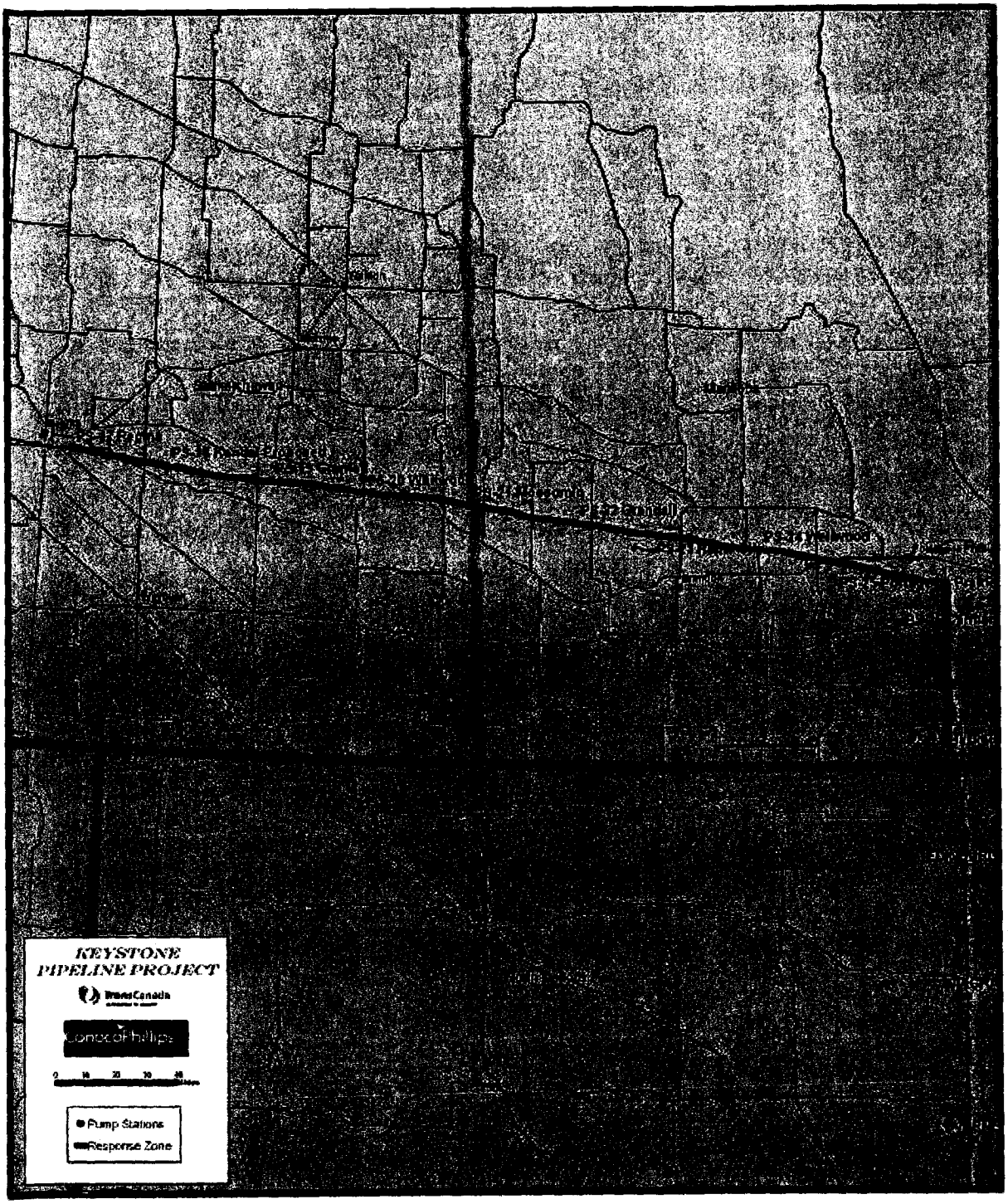
Response Zone Layout Map
Regina PS to Haskett PS

Map Prepared By
Response Management Associates
(281) 320 9796



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RESPONSE ZONE COMPANY CONTACTS				
POSITION/TITLE	NAME	OFFICE	HOME	CELL

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Area: Regina Pump Station / Haskett Pump Station

Qualified Individuals:

Qualified Individuals			
NAME	OFFICE	HOME	CELL
Randall W. Schmidgall	(204) 957-6832		
John Hayes	(403) 920-6467		(403) 461-9245

Alternate Qualified Individuals:

Alternate Qualified Individuals			
NAME	OFFICE	HOME	CELL

Pipeline Specifications:

The tables below list the pipeline facilities within the East Response Zone Response Zone.

Pipeline Specifications			
Location	Type of Oil	State	County
Regina PS / Kendal PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Kendal PS / Grenfell PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Grenfell PS / Moosomin PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Moosomin PS / Rapid City PS	Crude Oil	Manitoba	Southwestern Manitoba
Rapid PS / Portage La Prairie PS	Crude Oil	Manitoba	Southwestern Manitoba
Portage La Prairie PS / Carman PS	Crude Oil	Manitoba	Southwestern Manitoba
Carman PS / Haskett PS	Crude Oil	Manitoba	Southwestern Manitoba

Company Owned Response Equipment:

Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Response Trailer		See Equipment List - Appendix A

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Breakout Tanks:

Breakout Tanks			
FACILITY NAME	TANK NUMBER	CAPACITY (bbl)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES
Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Saskatchewan		
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012/2022
Balgonie Fire Department	Balgonie, Saskatchewan	(306) 771-2206
Montmartre Fire Department	Montmartre, Saskatchewan	(306) 424-2040
Montmartre RCMP Detachment	Montmartre, Saskatchewan	(306) 424-6400
Moosomin Ambulance Services	Moosomin, Saskatchewan	(306) 435-2962
Moosomin Fire Department	Moosomin, Saskatchewan	(306) 435-2105
Moosomin RCMP Detachment	Moosomin, Saskatchewan	(306) 435-3361
Carry The Kettle Fire Department	Sintaluta, Saskatchewan	(306) 727-2135
White City Fire Department	White City, Saskatchewan	(306) 781-2303
Whitewood Fire Department	Whitewood, Saskatchewan	(306) 735-2331
Wolseley Fire Department	Wolseley, Saskatchewan	(306) 698-2288
Grenfell Fire Department	Grenfell, Saskatchewan	(306) 697-2217
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829/7830
Indian Head RCMP Detachment	Indian Head, Saskatchewan	(306) 695-5200
Indian Head Fire Department	Indian Head, Saskatchewan	(306) 695-3887
Glenavon Fire Department	Glenavon, Saskatchewan	(306) 429-2220
Grenfell Ambulance Services	Grenfell, Saskatchewan	(306) 697-2707
Kipling Ambulance Service	Kipling, Saskatchewan	(306) 736-2553

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Kipling RCMP Detachment	Kipling, Saskatchewan	(306) 736-6400
Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560

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EXTERNAL NOTIFICATION REFERENCES
Manitoba

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Southwestern Manitoba		
Brandon Ambulance	Brandon, Manitoba	(204) 729-2400/2406
North Eastman Health Association Inc	Pinawa, Manitoba	(204) 753-2015
Oak Bank RCMP Detachment	Oak Bank, Manitoba	(204) 444-3847
Oak River Fire Department	Oak River, Manitoba	(204) 566-2126
Shoal Lake RCMP Detachment	Shoal Lake, Manitoba	(204) 759-2390
Souris RCMP Detachment	Souris, Manitoba	(204) 483-2854
South Eastman Health/EMS	Ste. Anne, Manitoba	(204) 935-2730
Emerson Fire Department	Emerson, Manitoba	(204) 373-2335/2414
Emerson RCMP	Emerson, Manitoba	(204) 373-2505
Falcon / Whiteshell Fire Department	Falcon Lake, Manitoba	(204) 349-8772
Steinbach Ambulance Services	Steinbach, Manitoba	(204) 346-6411
Steinbach Fire Department	Steinbach, Manitoba	(204) 326-1109/9877
Steinbach RCMP Detachment	Steinbach, Manitoba	(204) 326-1234/4452
City of Brandon Emergency Management Services	Brandon, Manitoba	(204) 729-2239
St. Pierre-Jolys Fire Department	St. Pierre-Jolys, Manitoba	(204) 433-7117
St. Pierre-Jolys RCMP Detachment	St. Pierre-Jolys, Manitoba	(204) 433-7908
Ste. Anne Fire Department	Ste. Anne, Manitoba	(204) 422-9110
Ste. Anne Police Service	Ste. Anne, Manitoba	(204) 422-8209
Austin Fire Department	Austin, Manitoba	(204) 637-2169
McAuley Fire Department	McAuley, Manitoba	(204) 722-2211

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Broadview Fire Department	Broadview, Saskatchewan	(306) 696-2533
Broadview RCMP Detachment	Broadview, Saskatchewan	(306) 696-5200
MacGregor Fire Department	MacGregor, Manitoba	(204) 685-2161
MacGregor RCMP	Portage la Prairie, Manitoba	(204) 857-4445
Morris RCMP Detachment	Morris, Manitoba	(204) 746-2323
Cartier Ambulance	Elie, Manitoba	(204) 353-4161
Cartier Fire Department	Elie, Manitoba	(204) 353-2214/2424
Virden & Wallace Fire Department	Virden, Manitoba	(204) 748-1304
Virden Ambulance Services	Virden, Manitoba	(204) 748-4332
Virden RCMP Detachment	Virden, Manitoba	(204) 748-2046
Whitemouth Ambulance Services	Whitemouth, Manitoba	(204) 348-7700
Whitemouth Fire Department	Whitemouth, Manitoba	(204) 348-7911
Winnipeg Fire Paramedic Service	Winnipeg, Manitoba	(204) 986-6380
Winnipeg Police Service	Winnipeg, Manitoba	(204) 986-6222
Winnipeg RCMP Detachment	Winnipeg, Manitoba	(204) 983-5420
Hadashville Ambulance Services	Hadashville, Manitoba	(204) 426-5328
MacDonald Ambulance Services	Oak Bluff, Manitoba	(204) 837-3332
Rapid City EMO	Rapid City, Manitoba	(204) 826-2679
Rapid City Fire Department	Rapid City, Manitoba	(204) 826-2652/2679
Sanford Fire Department	Sanford, Manitoba	(204) 736-2255
St. Malo Fire Department	St. Malo, Manitoba	(204) 347-5246/
St. Pierre-Jolys Ambulance Service	St. Pierre-Jolys, Manitoba	(204) 433-7701
Hamiota - Ambulance EMS	Hamiota, Manitoba	(204) 764-4207
Gladstone RCMP Detachment	Gladstone, Manitoba	(204) 385-3035
Hamiota Fire Department	Hamiota, Manitoba	(204) 764-3050/3055
Hamiota RCMP Detachment	Hamiota, Manitoba	(204) 759-2704/2732

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Headingley Fire Department	Headingley, Manitoba	(204) 837-5766
Headingley RCMP Detachment	Headingley, Manitoba	(204) 888-0358
Headingley Traffic Services	Winnipeg, Manitoba	(204) 984-6911
Ile des Chenes Ambulance Services	St. Pierre-Jolys, Manitoba	(204) 433-3330
Brandon Fire Department	Brandon, Manitoba	(204) 729-2400/2406
Brandon RCMP Detachment	Brandon, Manitoba	(204) 726-7500/7522
Carberry - Assiniboine EMS	Carberry, Manitoba	(204) 834-3548
Carberry Ambulance Services	Carberry, Manitoba	(204) 834-3548
Carberry Fire Department	Carberry, Manitoba	(204) 834-2212
Carberry RCMP Detachment	Carberry, Manitoba	(204) 834-2905
Miniota Fire Department	Miniota, Manitoba	(204) 567-3683/3813
Minnedosa Ambulance Services	Minnedosa, Manitoba	(204) 867-5555
Minnedosa EMO Services	Minnedosa, Manitoba	(204) 867-5273
Minnedosa Fire Department	Minnedosa, Manitoba	(204) 867-2727
Minnedosa RCMP Detachment	Minnedosa, Manitoba	(204) 867-2916
Emerson Ambulance Department	Emerson, Manitoba	(204) 373-2002
Neepawa Ambulance Services	Neepawa, Manitoba	(204) 476-7840
Neepawa Fire Department	Neepawa, Manitoba	(204) 476-7654
Neepawa RCMP Detachment	Neepawa, Manitoba	(204) 476-7340
Portage la Prairie Ambulance Central Region Health	Portage la Prairie, Manitoba	(204) 857-5444
Portage la Prairie Fire Department	Portage la Prairie, Manitoba	(204) 239-5154
Portage la Prairie RCMP Detachment	Portage la Prairie, Manitoba	(204) 857-8767/4445
RM of Reynolds Fire Department	Hadashville, Manitoba	(204) 426-2265/2266
Richer Fire Department	Richer, Manitoba	(204) 422-5929
Ritchot Fire Department	Ile Des Chenes, Manitoba	(204) 981-6782
Rivers Ambulance Services	Rivers, Manitoba	(204) 328-6201

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Rivers Fire Department	Rivers, Manitoba	(204) 328-7437/7930
Rivers Police Services	Rivers, Manitoba	(204) 328-7430
RM of Tache Fire Department	Lorette, Manitoba	(204) 878-9977
MacGregor Ambulance Services	MacGregor, Manitoba	(204) 685-2161
Dominion City Fire Department	Dominion City, Manitoba	(204) 427-2628

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RESPONSE ZONE INFORMATION

North Dakota, South Dakota, Nebraska

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.
Addresses:	Physical Address 717 Texas Street Houston, Texas 77002
24 Hour Emergency Contact Phone Numbers:	1-800-830-9865 (24 Hours)
Telephone/Fax:	Telephone references, including 24 hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	North Dakota, South Dakota, Nebraska
Areas/Counties Traversed:	Cavalier, Pembina, Walsh, Nelson, Steele, Barnes, Ransom, Sargent, Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, Yankton, Cedar, Wayne, Stanton, Platte, Colfax, Butler, Seward, Jefferson, Saline, Gage

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 27,329 Bbls

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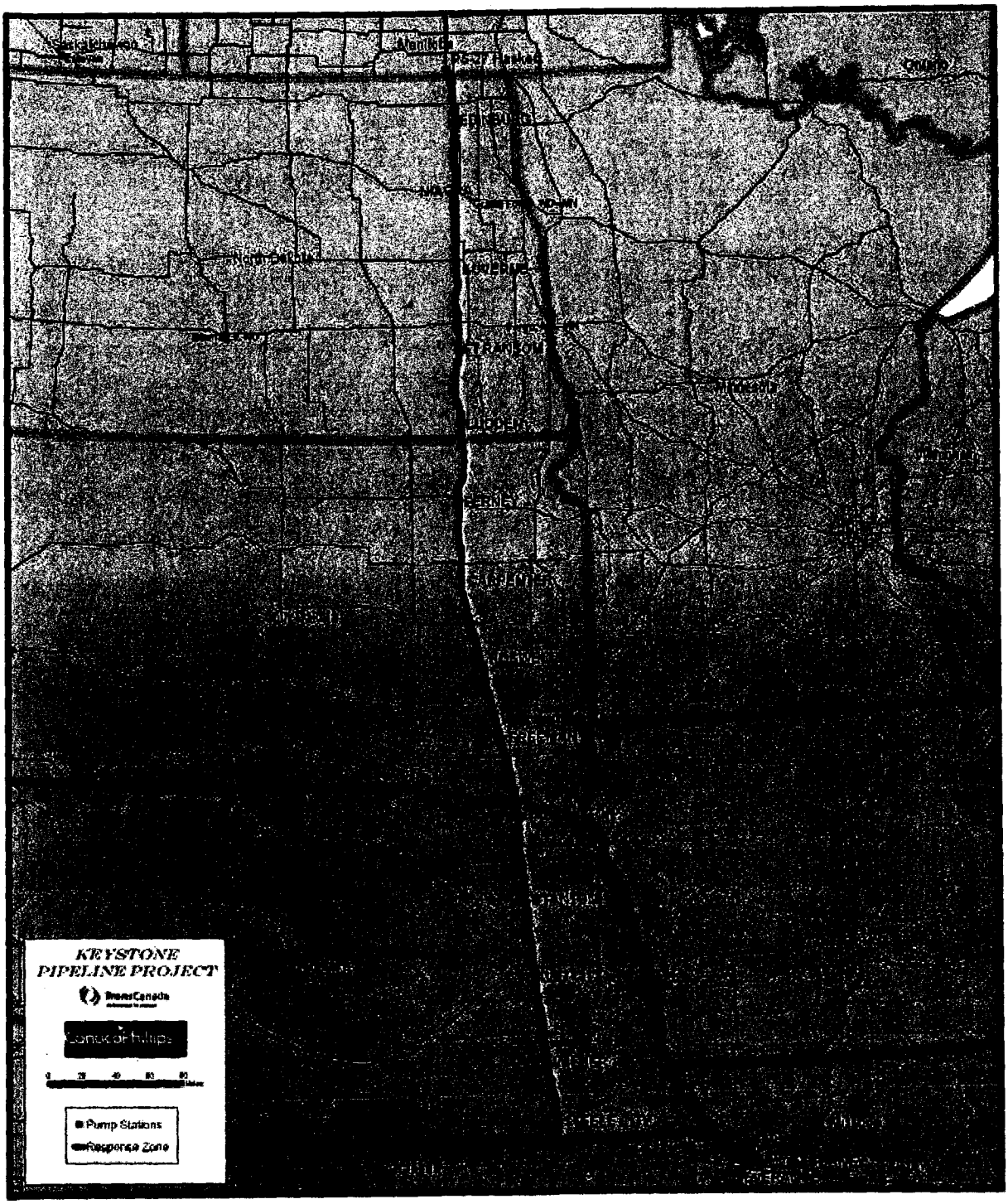
Response Zone Layout Map
North Dakota, South Dakota, Nebraska

Map Prepared By
Response Management Associates
(281) 320 9796



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RESPONSE ZONE COMPANY CONTACTS				
POSITION/TITLE	NAME	OFFICE	HOME	CELL

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Area: North Dakota, South Dakota, Nebraska

Qualified Individuals:

Qualified Individuals			
NAME	OFFICE	HOME	CELL
Rodrick McGillivray	(605) 692-1415 X3311	(605) 692-4306	(605) 695-0214
Wayne Barreth	(406) 787-6372 ext. 26		(701) 770-6540
John Hayes	(403) 920-6467		(403) 461-9245

Alternate Qualified Individuals:

Alternate Qualified Individuals			
NAME	OFFICE	HOME	CELL

Pipeline Specifications:

The tables below list the pipeline facilities within the East Response Zone Response Zone.

Pipeline Specifications			
Location	Type of Oil	State	County
US-CAN Border / Edinburg PS	Crude Oil	North Dakota	Cavalier,Pembina,Walsh
Edinburg PS / Niagara PS	Crude Oil	North Dakota	Walsh,Nelson
Niagara PS / Luverne PS	Crude Oil	North Dakota	Nelson,Steele
Luverne PS / Fort Ransom PS	Crude Oil	North Dakota	Steele,Barnes,Ransom
Fort Ransom PS / Ludden PS	Crude Oil	North Dakota	Ransom,Sargent
Ludden PS / Ferney PS	Crude Oil	North Dakota ,South Dakota	Sargent,Marshall,Day
Ferney PS / Carpenter PS	Crude Oil	South Dakota	Day,Clark
Carpenter PS / Roswell PS	Crude Oil	South Dakota	Clark,Beadle,Kingsbury,Miner
Roswell PS / Freeman PS	Crude Oil	South Dakota	Miner,Hanson,McCook,Hutchinson
Freeman PS / Hartington PS	Cude Oil	Nebraska ,South Dakota	Hutchinson,Yankton,Cedar

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Hartington PS / Stanton PS	Crude Oil	Nebraska	Cedar,Wayne,Stanton
Stanton PS / David City PS	Crude Oil	Nebraska	Stanton,Platte,Colfax,Butler
David City PS / Wilber PS	Crude Oil	Nebraska	Butler,Seward,Saline
Wilber PS/Steele City PS	Crude Oil	Nebraska	Saline,Jefferson
Steele City / State Line	Crude Oil	Nebraska	Jefferson,Gage

Company Owned Response Equipment:

Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Responses Trailer		See Equipment List - Appendix A

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Breakout Tanks:

Breakout Tanks			
FACILITY NAME	TANK NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES
Nebraska

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Cedar		
Cedar County	Hartington, Nebraska	(402) 254-7411
Cedar County (LEPC)	Hartington, Nebraska	(402) 254-7411
Cedar County Sheriff & Emergency Mgmt.	Hartington, Nebraska	(402) 254-6884
City of Hartington	Hartington, Nebraska	(402) 254-6353
Wayne		
City of Wayne	Wayne, Nebraska	(402) 375-1733
Wayne County (LEPC)	Wayne, Nebraska	(402) 833-5190
City of Wayne Fire Department	Wayne, Nebraska	(402) 375-1122
City of Wayne Electric Distribution Department	Wayne, Nebraska	(402) 375-2896
City of Wayne Police Department	Wayne, Nebraska	(402) 375-2626
City of Wayne Public Works Department	Wayne, Nebraska	(402) 375-1300
City of Wayne Water Department	Wayne, Nebraska	(402) 375-5250
Stanton		
Stanton County LEPC	Stanton, Nebraska	(402) 439-2631
Stanton County Sheriff	Stanton, Nebraska	(402) 439-2212
City of Stanton	Stanton, Nebraska	(402) 439-2119
Village of Pilger	Stanton, Nebraska	(402) 396-3563
Platte		
Platte County LEPC	Columbus, Nebraska	(402) 564-1206
Platte County Sheriff	Columbus, Nebraska	(402) 564-3229
City of Columbus	Columbus, Nebraska	(402) 562-4224
Colfax		

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Colfax County	Schuyler, Nebraska	(402) 352-8502
Colfax County LEPC	Schuyler, Nebraska	(402) 352-8522
Colfax County Sheriff	Schuyler, Nebraska	(402) 352-8526
Village of Leigh	Leigh, Nebraska	(402) 487-3303
Village of Richland	Richland, Nebraska	(402) 564-0609
City of Schuyler Schools	Schuyler, Nebraska	(402) 352-3527
Butler		
David City Electric & Light Department	David City, Nebraska	(402) 367-3197
David City Park & Auditorium Department	David City, Nebraska	(402) 367-3914
David City Police Department	David City, Nebraska	(402) 367-3133
David City Power Plant	David City, Nebraska	(402) 367-3138
David City Water & Sewer Department	David City, Nebraska	(402) 367-3132
Butler County First Responder / Sheriff	David City, Nebraska	(402) 367-7400
Butler County LEPC	David City, Nebraska	(402) 367-3125
Seward		
Village of Bee	Bee, Nebraska	(402) 643-6247
Village of Goehner	Goehner, Nebraska	(402) 534-4311
Village of Staplehurst	Staplehurst, Nebraska	(402) 535-2507
City of Milford	Milford, Nebraska	(402) 761-3247
City of Seward	Seward, Nebraska	(402) 643-2928
City of Seward Electric Department	Seward, Nebraska	(402) 643-3151
City of Seward Fire Department	Seward, Nebraska	(402) 643-6088
City of Seward Police Department	Seward, Nebraska	(402) 643-2759
City of Seward Sheriff	Seward, Nebraska	(402) 643-2359
City of Seward Water Department	Seward, Nebraska	(402) 643-3433
Seward County	Seward, Nebraska	(402) 643-6262
Seward County LEPC	Seward, Nebraska	(402) 643-4722

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Jefferson		
Village of Diller	Diller, Nebraska	(402) 793-5991
City of Fairbury	Fairbury, Nebraska	(402) 729-2476
Jefferson Co. Emergency Management Agency/Planning	Fairbury, Nebraska	(402) 729-3602
Jefferson County LEPC	Fairbury, Nebraska	(402) 729-3602
Jefferson County Sheriff	Fairbury, Nebraska	(402) 729-2284
Village of Plymouth	Plymouth Village, Nebraska	(402) 656-3132
Saline		
City of Wilber	Wilber, Nebraska	(402) 821-2320
City of Wilber Fire Department	Wilber, Nebraska	(402) 821-2647
City of Wilber Police Department	Wilber, Nebraska	(402) 821-2201
Village of Dorchester	Dorchester, Nebraska	(402) 946-3201
Village of Swanton	Swanton, Nebraska	(402) 448-2285
Saline County	Wilber, Nebraska	(402) 826-2363
Saline County LEPC	Wilber, Nebraska	(402) 821-3010
Saline County Sheriff	Wilber, Nebraska	(402) 821-2111
Gage		
Gage County LEPC	Beatrice, Nebraska	(402) 223-1305
Gage County Sheriff / First Responder	Beatrice, Nebraska	(402) 223-1382

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EXTERNAL NOTIFICATION REFERENCES
North Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Cavalier		
Fremont Township	Walhalla, North Dakota	(701) 549-2748
Cavalier County Fire Department	Langdon, North Dakota	(701) 256-3911
Cavalier County LEPC	Langdon, North Dakota	(701) 256-3911
Cavalier County Water Resource	Langdon, North Dakota	(701) 256-2220
Cavalier County	Langdon, North Dakota	(701) 256-2229
Pembina		
Pembina County	Cavalier, North Dakota	(701) 265-4231
Pembina County LEPC	Cavalier, North Dakota	(701) 265-4849
Pembina County Water Resource Board	Cavalier, North Dakota	(701) 265-4511
City of Cavalier	Cavalier, North Dakota	(701) 265-8800
City of Walhalla	Walhalla, North Dakota	(701) 549-3176
Drayton, North Dakota	Drayton, North Dakota	(701) 265-4231
Walsh		
Norton Township	Fordville, North Dakota	(701) 593-6249
Town of Norton	Park River, North Dakota	(701) 331-0810
Vesta Township	Adams, North Dakota	(701) 944-2790
Walsh County LEPC	Grafton, North Dakota	(701) 352-2311
City of Grafton	Grafton, North Dakota	(701) 352-1561
City of Minto	Minto, North Dakota	(701) 248-3480
City of Park River	Park River, North Dakota	(701) 284-6426
City of Lankin	Lankin, North Dakota	(701) 593-6322

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Golden Township	Park River, North Dakota	(701) 284-6846
Nelson		
Nelson County Fire Department	Lakota, North Dakota	(701) 247-2474
Nelson County First Responder	Lakota, North Dakota	(701) 247-2474
Petersburg Township, Nelson County	Petersburg, North Dakota	(701) 345-6134
Adler Township, Nelson County	Petersburg, North Dakota	(701) 345-8287
Nelson County	Lakota, North Dakota	(701) 247-2463
Dodds Township, Nelson County	Lakota, North Dakota	(701) 247-2279
Michigan City	Michigan, North Dakota	(701) 259-2553
Steele		
Steele County LEPC	Finley, North Dakota	(701) 524-2742
Steele County	Finley, North Dakota	(701) 945-2572
City of Finley	Finley, North Dakota	(701) 352-1651
Barnes		
Township of Baldwin	Hope, North Dakota	(701) 945-2436
Township of Cuba	Valley City, North Dakota	(701) 845-0533
Valley City	Valley City, North Dakota	(701) 845-1700 ext. 17
Barnes County	Sanborn, North Dakota	(701) 646-6983
Barnes County Emergency Manager (LEPC)	Valley City, North Dakota	(701) 845-8510
Township of Alta	Valley City, North Dakota	(701) 845-2744
Township of Grand Prairie	Valley City, North Dakota	(701) 845-2544
Township of Noltimier	Valley City, North Dakota	(701) 845-3835
Township of Norma	Oriska, North Dakota	(701) 924-8629
Ransom		
City of Lisbon	Lisbon, North Dakota	(701) 683-4472 - Rvrsd Bldg Ctr
Ransom County LEPC	Lisbon, North Dakota	(701) 683-5823, x125
Sargent		
Southwest Township	Forman, North Dakota	(701) 724-3452

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Verner Township	Oakes, North Dakota	(701) 742-3711
Verner Township	Gwinner, North Dakota	(701) 753-7161
City of Forman	Forman, North Dakota	(701) 724-3673
Sargent County First Responder	Forman, North Dakota	(701) 724-3302
Sargent County LEPC	Forman, North Dakota	(701) 724-6241, x113
Jackson Township	Forman, North Dakota	(701) 724-3420
Denver Township	Gwinner, North Dakota	(701) 753-7671

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EXTERNAL NOTIFICATION REFERENCES
South Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marshall		
City of Britton, South Dakota	Britton, South Dakota	(605) 448-5721
BDM Rural Water System, Inc.	Britton, South Dakota	(605) 448-5417
Marshall County LEPC	Britton, South Dakota	(605) 448-2401
Marshall County South Dakota	Britton, South Dakota	(605) 448-2116
Mc Cook Co., SD County Emergency Management	Britton, South Dakota	(605) 425-2791
Day		
City of Webster, South Dakota	Webster, South Dakota	(605) 345-3241
Day County, South Dakota LEPC	Webster, South Dakota	(605) 345-9500
Clark		
City of Clark, South Dakota	Clark, South Dakota	(605) 532-3512
Clark County, South Dakota	Clark, South Dakota	(605) 532-5921
Clark County, South Dakota LEPC	Clark, South Dakota	(605) 532-5953
Beadle		
Beadle County, South Dakota	Huron, South Dakota	(605) 352-5010
Beadle County, South Dakota LEPC	Huron, South Dakota	(605) 353-8421
City of Huron, South Dakota	Huron, South Dakota	(605) 353-8500
Kingsbury		
City of De Smet, South Dakota	De Smet, South Dakota	(605) 854-3731
Kingsbury County Fire Department / First Responder	De Smet, South Dakota	(605) 854-3832
Kingsbury County, South Dakota	De Smet, South Dakota	(605) 854-3832
Kingsbury County, South Dakota LEPC	De Smet, South Dakota	(605) 854-3711

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Miner		
Miner County Fire Department / First Responder	Howard, South Dakota	(605) 772-4671
Miner County, South Dakota LEPC	Howard, South Dakota	(605) 772-4533
Hanson		
Spring Lake Township	Canova, South Dakota	(605) 523-2546
Hanson County, South Dakota	Alexandria, South Dakota	(605) 239-4717
Hanson County Fire Department	Alexandria, South Dakota	(605) 239-4717
Hanson County, South Dakota LEPC	Alexandria, South Dakota	(605) 239-4218
Edgerton Township	Alexandria, South Dakota	(605) 239-4361
McCook		
McCook County, South Dakota LEPC	Salem, South Dakota	(605) 425-2466
McCook Co., SD County Emergency Management	Salem, South Dakota	(605) 425-2791
Hutchinson		
Pleasant Township	Bridgewater, South Dakota	(605) 449-4669
Valley Township	Menno, South Dakota	(605) 387-5480
Molan Township	Menno, South Dakota	(605) 387-5250
City of Olivet	Olivet, South Dakota	(605) 387-5596
Hutchinson County, South Dakota	Menno, South Dakota	(605) 387-4217
Hutchinson County, South Dakota LEPC	Menno, South Dakota	(605) 387-5104
Grandview Township	Freeman, South Dakota	(605) 925-4142
Yankton		
Utica Township	Utica, South Dakota	(605) 665-1341
City of Yankton Fire Department	Yankton, South Dakota	(605) 668-5210
City of Yankton, Department of Public Works	Yankton, South Dakota	(605) 668-5251
City of Yankton, South Dakota	Yankton, South Dakota	(605) 668-5210
Yankton County, South Dakota	Yankton, South Dakota	(605) 668-3567
Yankton County LEPC	Yankton, South Dakota	(605) 668-5289

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Yankton County Fire Department	Yankton, South Dakota	(605) 668-3567
Jamesville Township	Jamesville, South Dakota	(605) 387-5756
Mission Hill Township	Mission Hill, South Dakota	(605) 665-7592

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RESPONSE ZONE INFORMATION

Kansas, Missouri, Illinois

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc.
Addresses:	Physical Address 717 Texas Street Houston, Texas 77002
24 Hour Emergency Contact Phone Numbers:	1-800-830-9865 (24 Hours)
Telephone/Fax:	Telephone references, including 24 hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Kansas, Missouri, Illinois
Areas/Counties Traversed:	Marshall, Nemaha, Brown, Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, St. Charles, Madison, Bond, Fayette, Marion, Doniphan

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 24,069 Bbls

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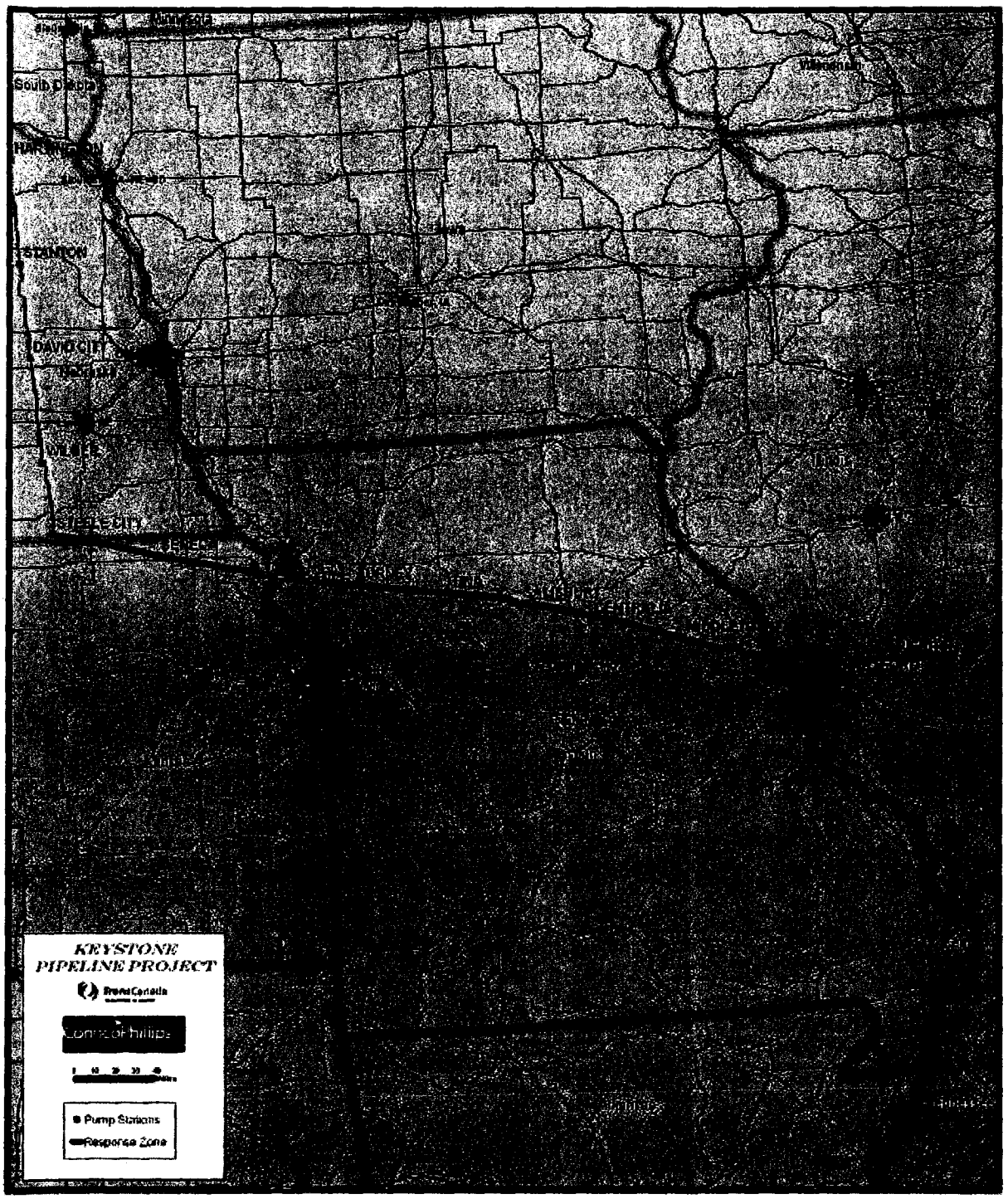
Response Zone Layout Map
Kansas, Missouri, Illinois

Map Prepared By
Response Management Associates
(281) 320 9798



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RESPONSE ZONE COMPANY CONTACTS				
POSITION/TITLE	NAME	OFFICE	HOME	CELL

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Area: Kansas, Missouri, Illinois

Qualified Individuals:

Qualified Individuals			
NAME	OFFICE	HOME	CELL
Rodrick McGillivray	(605) 692-1415 X3311	(605) 692-4306	(605) 695-0214
Wayne Barreth	(406) 787-6372 ext. 26		(701) 770-6540
John Hayes	(403) 920-6467		(403) 461-9245

Alternate Qualified Individuals:

Alternate Qualified Individuals			
NAME	OFFICE	HOME	CELL

Pipeline Specifications:

The tables below list the pipeline facilities within the East Response Zone Response Zone.

Pipeline Specifications			
Location	Type of Oil	State	County
State Line / Seneca PS	Crude Oil	Kansas	Marshall,Nemaha
Seneca PS / Severance PS	Crude Oil	Kansas	Nemaha,Brown,Doniphan
Severance PS / Turney PS	Crude Oil	Kansas ,Missouri	Doniphan,Buchanan,Clinton
Turney PS / Tina PS	Crude Oil	Missouri	Clinton,Caldwell,Carroll
Tina PS / Salisbury PS	Crude Oil	Missouri	Carroll,Chariton
Salisbury PS / Centralia PS	Crude Oil	Missouri	Chariton,Randolph,Audrain
Centralia PS / Middletown PS	Crude Oil	Missouri	Audrain,Montgomery
Middletown PS / Saint Paul PS	Crude Oil	Missouri	Montgomery,Lincoln
Saint Paul PS / Hartford PS	Crude Oil	Illinois ,Missouri	Lincoln,St. Charles,Madison
Hartford PS / Patoka Terminal	Crude Oil	Illinois	Madison,Bond,Fayette,Marion

Company Owned Response Equipment:

Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Response Trailer		See Equipment List - Appendix A

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Breakout Tanks:

Breakout Tanks			
FACILITY NAME	TANK NUMBER	CAPACITY (bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES
Illinois

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Madison		
City of Edwardsville	Edwardsville, Illinois	(618) 692 7520
City of Edwardsville Fire Department	Edwardsville, Illinois	(618) 692-7541
City of Edwardsville, Illinois Public Works	Edwardsville, Illinois	(618) 692-7535
City of Wood River Fire Department	Wood River, Illinois	(618) 251-3100
Madison County	Edwardsville, Illinois	(618) 692-4482
Madison County (LEPC)	Edwardsville, Illinois	(618) 296 4482
Madison Co. IL Emergency Svcs. and Disaster Agency	Edwardsville, Illinois	(618) 692-0537
City of Highland Fire Department	Highland, Illinois	(618) 654-5901
Madison Co. Ambulance (Fire Dept) First Respons	Edwardsville, Illinois	(618) 692-4433
Bond		
Bond County (LEPC)	Greenville, Illinois	(618) 644-1442
Bond County First Responder (Fire Department)	Greenville, Illinois	(618) 664-2151
Bond Co. IL Emergency Svcs. and Disaster Agency	Greenville, Illinois	(618) 644-1442
City of Greenville	Greenville, Illinois	(618) 664-1644
City of Greenville Public Works Department	Greenville, Illinois	(618) 664-1644
Village of Pocahontas	Pocahontas, Illinois	(618) 669-2431
Fayette		
Fayette County	Vandalia, Illinois	(618) 283-5000
Fayette County (LEPC)	Vandalia, Illinois	(618) 283-4292
Fayette County Ambulance / First Responder	Vandalia, Illinois	(618) 283-2141

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City of Alton Fire Department	Alton, Illinois	(618) 463-3565
City of Vandalia, Illinois	Vandalia, Illinois	(618) 283-1196
City of Vandalia Public Works Department	Vandalia, Illinois	(618) 283-1296
Marion		
Army Corps of Engineers - St. Louis District	Illinois	(314) 331-8583
City of Patoka	Patoka, Illinois	(618) 432-5855
City of Salem Marion County	Salem, Illinois	(618) 548-2222
Marion County (LEPC)	Salem, Illinois	(618) 548-2600
Marion Co. Ambulance (Fire Dept) / First Response	Salem, Illinois	(618) 548-2141
Marion County Department of Environmental Quality	Salem, Illinois	(618) 692-0537

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EXTERNAL NOTIFICATION REFERENCES
Kansas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marshall		
City of Axtell	Axtell, Kansas	(785) 736-2834
City of Beattie	Beattie, Kansas	(785) 353-2527
City of Summerfield	Summerfield, Kansas	(785) 244-6531
Marshall County LEPC First Responder	Marysville, Kansas	(785) 562-3141
Marshall County Public Works Department	Marysville, Kansas	(785) 562-5349
Nemaha		
Nemaha Co. Emergency Management / First Responder	Seneca, Kansas	(785) 336-2135
City of Oneida Sewerage Department	Oneida, Kansas	(785) 336-3038
City of Seneca	Seneca, Kansas	(785) 336-2747
Brown		
Padonia Township	Hiawatha, Kansas	(785) 742-2777
Walnut Township	Walnut, Kansas	(785) 467-3250
Mission Township	Hiawatha, Kansas	(785) 474-3564
Brown County Fire Department	Hiawatha, Kansas	(785) 742-7125
City of Hiawatha	Hiawatha, Kansas	(785) 742-2967
Morrill Township	Morrill, Kansas	(785) 459-2277
City of Fairview	Fairview, Kansas	(785) 467-3521
City of Hamlin	Hamlin, Kansas	(785) 742-2995
City of Robinson	Robinson, Kansas	(785) 544-7766
Irving Township	Hiawatha, Kansas	(785) 544-6691
Brown County LEPC	Hiawatha, Kansas	(785) 547-3415

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Powhattan Township	Powhattan, Kansas	(785) 467-3520
Robinson Township	Robinson, Kansas	(785) 544-6831
Doniphan		
City of Denton	Denton, Kansas	(785) 359-6952
City of Denton Fire Department	Denton, Kansas	(785) 359-6641
Wayne Township	Troy, Kansas	(785) 985-2400
Wold River Township	Severance, Kansas	(785) 442-3775
City of Troy	Troy, Kansas	(785) 985-2101
City of Severance	Severance, Kansas	(785) 359-6589
Independence Township	Independence, Kansas	(785) 988-4425
Doniphan Co. Emergency Management / Zoning Dept.	Troy, Kansas	(785) 985-2229
Doniphan County Fire District No. 1	Wathena, Kansas	(785) 989-3265
Doniphan County Fire District No. 2	Highland, Kansas	(785) 359-6699
Doniphan County Fire District No. 3	Denton, Kansas	(785) 359-6715
Doniphan County Fire District No. 4	Elwood, Kansas	(913) 365-8697
Doniphan County Fire District No. 5	Troy, Kansas	(785) 985-2145
Union Township	Denton, Kansas	

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EXTERNAL NOTIFICATION REFERENCES
Missouri

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. * Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.		
AGENCY	LOCATION	OFFICE / ALTERNATE
Buchanan		
South Buchanan Fire District, Buchanan County	Faucett, Missouri	(816) 253-9018
Sugar Lake Fire District, Buchanan County	Rushville, Missouri	(913) 367-2655
Maxwell Heights Fire District, Buchanan County	St. Joseph, Missouri	(816) 233-4160
Colony Fire District	St. Joseph, Missouri	(816) 232-5307
Village of Agency Clerk	Agency, Missouri	(816) 253-9176
Village of Dekalb Clerk	Amity, Missouri	(816) 685-3305
Village of Lewis & Clark Clerk	Lewis & Clark, Missouri	(816) 579-5737
City of St Joseph Council	St Joseph, Missouri	(816) 271-4640
City of St Joseph LEPC	St Joseph, Missouri	(816) 271-4603
Rushville Fire District, Buchanan County	Rushville, Missouri	(816) 688-7900
San Antonio Fire District, Buchanan County	San Antonio, Missouri	(816) 232-1664
Buchanan County LEPC	St. Joseph, Missouri	(816) 271-1574
Easton Fire District, Buchanan County	Easton, Missouri	(816) 262-7057
Edgerton Fire District, Buchanan County	Edgerton, Missouri	(816) 790-3362
Dearborn Fire District, Buchanan County	Dearborn, Missouri	(816) 992-8919
City of Gower Clerk	Gower, Missouri	
Clinton		
Osborne Fire District	Osborne, Missouri	(816) 675-2549
Plattsburg City Hall	Plattsburg, Missouri	(816) 539-2148
Plattsburg Fire District	Plattsburg, Missouri	(816) 539-3017

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Stewartsville Fire District	Stewartsville, Missouri	(816) 669-3387
City of Cameron	Cameron, Missouri	(816) 632-2177
City of Cameron Fire Department	Cameron, Missouri	(816) 632-2345
City of Cameron Police Department / First Responde	Cameron, Missouri	(816) 632-6521
City of Cameron Public Works Department	Cameron, Missouri	(816) 632-2177
City of Cameron Water and Electric Department	Cameron, Missouri	(816) 632-2177
Clinton County PWSD No 1	Plattsburg, Missouri	(816) 370-2528
Clinton County PWSD No 4	Plattsburg, Missouri	(816) 580-7211
Village of Turney	Turney, Missouri	(816) 664-2009
City of Lathrop	Lathrop, Missouri	(816) 740-4251
Lathrop Fire District	Lathrop, Missouri	(816) 740-3218
Caldwell		
Cowgill No 1 Water District	Cowgill, Missouri	(660) 255-4421
Caldwell County	Kingston, Missouri	(816) 586-2571
Grant Township	Livonia, Missouri	(660) 354-2337
Rockford Township	Polo, Missouri	
Carroll		
Norborne Fire Protection District	Norborne, Missouri	(660) 594-3505
North Central Fire Protection District	Bogard, Missouri	(660) 731-5371
Stet Fire Protection District	Norborne, Missouri	(660) 484-3179
City of Carrollton	Carrollton, Missouri	(660) 542-1414
Carroll County	Carrollton, Missouri	(660) 542-0615
Carroll County Fire Protection District No. 1	Carrollton, Missouri	(660) 542-2178
Hale Fire Protection District	Hale, Missouri	(660) 565-2212
Chariton		
Chariton County, Missouri LEPC/First Responder	Keytesville, Missouri	(660) 288-3277

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Chariton County, Missouri	Keytesville, Missouri	(660) 288-3200
City of Keytesville, Missouri	Keytesville, Missouri	(660) 288-3745
City of Salisbury, Missouri	Salisbury, Missouri	(660) 388-6197
Randolph		
Randolph County County Government	Huntsville, Missouri	(660) 277-4714
City of Huntsville, Missouri	Huntsville, Missouri	(660) 277-3110
City of Moberly, Missouri Public Works	Moberly, Missouri	(660) 269-8705
Randolph County LEPC	Huntsville, Missouri	(573) 564-2283
Audrain		
Audrain County, Missouri	Mexico, Missouri	(573) 473-5822
Audrain County, Missouri LEPC	Mexico, Missouri	(660) 582-8183
City of Mexico, Missouri	Mexico, Missouri	(573) 581-2100
Montgomery		
Montgomery County	Montgomery City, Missouri	(573) 564-8084
Montgomery County LEPC	Montgomery City, Missouri	(573) 564-2283
City of Montgomery, Missouri	Montgomery City, Missouri	(573) 564-3160
Lincoln		
Lincoln County Fire Protection District	Troy, Missouri	(636) 528-8567
Lincoln County, Missouri	Troy, Missouri	(636) 528-6300
Lincoln County, Missouri LEPC	Troy, Missouri	(636) 528-6182
St. Charles		
O'Fallon Fire Protection District	O'Fallon, Missouri	(636) 272-3493
O'Fallon Township	O'Fallon, Missouri	(636) 978-4144
Dardenne Prairie Township	O'Fallon, Missouri	(636) 300-0014
Central County Fire & Rescue	St. Peters, Missouri	(636) 970-9700
Wentzville Fire Protection District	Wentzville, Missouri	(636) 327-6239
Wentzville Township	Wentzville, Missouri	(636) 332-5101
City of O'Fallon, Missouri	O'Fallon, Missouri	(636) 379-5500

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City of St. Charles City/Municipal Government	St. Charles City, Missouri	(636) 949-3260
City of St. Charles Fire Department	St. Charles, Missouri	(636) 949-3250
City of St. Peters, Missouri	St. Peters, Missouri	(636) 477-9920
St. Charles County Government	St. Charles, Missouri	(636) 949-7455
St. Charles County First Responder	St. Charles, Missouri	(636) 949-1818
St. Charles County LEPC	St. Charles, Missouri	(636) 949-3023

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Tactical Control Plans

TransCanada Keystone Limited Partnership
TC Oil Pipeline Operations Inc.
Keystone Pipeline System
Emergency Response Plan
Tactical Control Plans

October 2008

Response Management Associates, Inc.
6620 Cypresswood Drive,
Suite 200
Spring, TX 77379
281-320-9796
www.rmaworld.com

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OCT 0 2 2014
Dept. of Environment &
Natural Resources
GROUND WATER QUALITY

October 1, 2014

South Dakota Department of Environment and Natural Resources
Groundwater Quality Program
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3182
(605)773-6477

Attn: Mr. Brian Walsh

Dear Mr. Walsh:

At the request of TransCanada, we are providing you the accompanying copy of the Emergency Response Plan (ERP). Additionally, you will find one (1) CD containing Tactical Plans and one (1) CD containing the ESMs.

If you have any questions, please feel free to contact me at (314) 563-1068 or cking@wittobriens.com.

Thank you,

Caleb T. King
Sr. Compliance Consultant
Witt O'Brien's

014526

EMERGENCY RESPONSE PLAN

Keystone Pipeline System

Prepared for:

TransCanada
450 - 1st Street
Calgary, Alberta T2P 5H1
(403) 920-2033

RECEIVED
OCT 0 2 2014
Dept. of Environment &
Natural Resources
GROUND WATER QUALITY

Prepared by:

Witt O'Brien's
818 Town & Country Blvd., Suite 200
Houston, TX 77024-4564
Phone: (281) 320-9796 I Fax: (281) 320-9700
www.wittobriens.com

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014527

Executive Summary

The Keystone Pipeline is a 2,637 miles (4,235 km) pipeline that transports crude oil from Hardisty, Alberta to markets in the American Midwest at Wood River and Patoka in Illinois, Cushing, Oklahoma, and at Nederland, Texas. The Canadian portion of the pipeline runs from Hardisty, Alberta east into Manitoba where it turns south and crosses the border into North Dakota. From North Dakota, the pipeline runs south through South Dakota and Nebraska. At Steele City, Nebraska, one arm of the pipeline runs east through Missouri for deliveries into Wood River and Patoka, Illinois; another arm runs south through Kansas and Oklahoma for deliveries into Cushing, Oklahoma. In 2013 the Gulf Coast Project was added which extended the pipeline from Cushing to Nederland Texas.

Deliveries to Wood River and Patoka began in the summer of 2010, deliveries to Cushing began in February of 2011. The pipeline system currently has the capacity to deliver up to 700,000 bpd of Canadian crude oil into these important North American refining markets.

A critical aspect of operating the Keystone Pipeline system is to have a comprehensive Emergency Management System. A key component of the system includes having an Emergency Response Plan. The Keystone Emergency Response Plan (ERP or Plan) was prepared to achieve a number of goals: ensure regulatory compliance, appropriate for all key stakeholders including field operations, include all emergencies and response measures, timely internal and external notification procedures, and training requirements. In addition, the plan contains information related to worst case discharge, company owned equipment, environmental sensitivities, contract resources, public officials, and tactical control plans.

The Plan is distributed to key internal and external stakeholders and delivered to TransCanada personnel through a secure internet portal hosted by one of TransCanada's emergency response providers and co-preparer of the plan. The plan has been submitted to the National Energy Board (NEB) in Canada and the United States Department of Transportation's;(DOT) Pipeline and Hazardous Material Safety Administration (PHMSA) office. The plan will be updated annually and when substantial changes are made or when deemed necessary by either of the agencies.

The Keystone ERP is combined with a rigorous training program; retention of and access to the industry's most known response experts; and a state of the art pipeline integrity and maintenance program making emergency response for the Keystone pipeline system a priority fully endorsed at all levels within TransCanada.

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ACKNOWLEDGMENT AND PLAN APPROVAL

The information and procedures in this Plan must be treated as guidelines only. The user should determine to what extent it is practical and advisable to follow them. This decision may involve considerations not discussed in this Plan.

The information and procedures contained herein are considered to be accurate as of this date and are consistent with the National Contingency Plan (NCP) and applicable Area Contingency Plans (ACP) as detailed in Section 1.5.

CERTIFICATION OF QUALIFIED INDIVIDUAL AND ALTERNATE QUALIFIED INDIVIDUAL

TransCanada hereby certifies that the individuals identified as Qualified Individual (QI) and Alternate Qualified Individual (AQI in this Plan have the full authority in accordance with the applicable United States Federal and State regulations and as detailed in this Plan to:

1. Activate and engage in contracting with oil spill removal organizations.

2. Act as a liaison with the pre-designated Federal On-Scene Coordinate (FOSC), and

3. Obligate funds required to carry out response activities.

Plan Approved:

Vice President - Pipeline Safety and Compliance

Signature	Title
Vern Meier	08/20/2013
Name (please type or print)	Date

NOTE: Witt O'Brien's, LLC provided consulting and plan development services in the preparation of this Plan utilizing data provided by the owner/operator. Witt O'Brien's assumes no liability for injury, loss, or damage of any kind resulting directly or indirectly from the use of the regulatory interpretation, response planning, or information contained in this Plan.

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OPERATOR'S STATEMENT - SIGNIFICANT AND SUBSTANTIAL HARM AND CERTIFICATION OF RESPONSE RESOURCES

FACILITY NAME: Keystone Pipeline System

CORPORATE ADDRESS: 450 - 1st Street
Calgary, Alberta T2P 5H1

1.	Is the pipeline greater than 6 and 5/8 inches (168 mm) in outside nominal diameter, greater than 10 miles (16.1 km) in length? and	Yes✓ No
2.	Has any line section experienced a release greater than 1,000 barrels (159 cubic meters) within the previous five years? or	Yes No✓
3.	Has any line section experienced two or more reportable releases, as defined in 49 CFR 195.50, within the previous five years? or	Yes✓ No
4.	Does any line section contain any electric resistance welded pipe, manufactured prior to 1970 and operates at a maximum operating pressure established under 49 CFR 195.406 that corresponds to a stress level greater than 50 percent of the specified minimum yield strength of the pipe? or	Yes No✓
5.	Is any line located within a 5-mile (8 km) radius of potentially affected public drinking water intakes and could reasonably be expected to reach public drinking water intakes? or	Yes✓ No
6.	Is any line located within a 1-mile (1.6 km) radius of potentially affected environmentally sensitive areas and could reasonably be expected to reach these areas?	Yes✓ No

Based on the U.S. DOT PHMSA criteria above, the Keystone Pipeline System is considered "Significant and Substantial Harm".

TransCanada hereby certifies to the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation that we have identified and ensured, by contract or by other means, the availability of personnel and equipment to respond, to the maximum extent practicable, to a worst case discharge.

Vice President - Pipeline Safety and Compliance

Signature — Title

Vern Meier — 08/20/2013

Name (please type or print) — Date

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U.S. Department
Of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

1200 New Jersey Ave., S.E.
Washington, DC 20590-0001

May 15, 2009

Mr. Robert Jones
TransCanada Keystone LP/TC
Oil Pipeline Operations, Inc.
717 Texas Street
Houston, Texas 77002

Dear Mr. Jones:

I approved the Facility Response Plan for Sequence Number TC59, TransCanada Keystone LP/TC Oil Pipeline Operations, Inc., on November 5, 2008.

Sincerely,

Melanie M. C. Barber
Environmental Planning Officer
Office of Pipeline Safety
Room E22-210
Office: 202-366-4560

U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety Administration**

1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

December 12, 2013

Niki Affleck
Senior Emergency Management Specialist
TransCanada
450 – 1st Street S.W.
Calgary, AB
Canada T2P 5H1

RE: LETTER OF APPROVAL: Keystone Pipeline System, Sequence Number: 2285 August 2013

Dear Ms. Affleck:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) has received and reviewed TransCanada's updated oil spill response plan for Keystone Pipeline System dated August 2013. We conclude that the Plan complies with PHMSA's regulations concerning onshore oil pipelines found at 49 Code of Federal Regulations (CFR) Part 194. Your Response Plan has been approved.

This approval is valid for five years from the date of this letter. You must revise and resubmit a Response Plan for approval by **December 12, 2018**. If discrepancies are found during PHMSA inspections, or if new or different operating conditions or information would substantially affect the implementation of this plan, you will be required to resubmit a revised plan. See 49 CFR § 194.121(b).

Should you have any questions or concerns, please contact me at (202) 366-4595 or by email at PHMSA.OPA90@dot.gov. Please include the sequence number and your PHMSA Operator Identification Number on any future correspondence.

Sincerely,

David K. Lehman

David K. Lehman, Acting Director
Emergency Support and Security Division
Office of Pipeline Safety

cc: PHMSA Central, Southwest and Western Regions
John McHugh, Vice President, Witt O'Brien's, 818 Town & Country Blvd., Suite 200
Houston, TX 77024- 4564

NOTE: It is the responsibility of the holder of this Plan to ensure that all changes and updates are made. The Plan Holder must:

- Remove and discard obsolete pages.
- Replace obsolete pages with the updated pages.

REVISION RECORD		
CHANGE DATE	AFFECTED PAGE NUMBER(S)	DESCRIPTION OF CHANGE(S)
December 2009	Appendix F	Updated Air Operations Checklist
March 2010	Appendix A	Added Location description to A.1
April 2010	FWD	Distribution List updated TSB contact
October 2011	Section 6	Added Drain Tile
December 2011	Entire Plan	Qualified Individual Updated, Drain Tile Information Added, Air Monitoring Guideleins Updated, OSRO Updated, Activation Flowchart Updated, Emergency Response Contractors Updated, MSDS Updated,Misc. Forms Updated
March 2012		Pipeline has been updated.
March 2012	Section 3	Added Range of Reported thicknesses table to Section 3
April 2012	Section 2, Glossary and Acronyms	Updated External Notifications and Glossary
December 2012	Foreword, Sections 1 - 4, Section 6, Apps. C & D, App. G, App. I, Glossary, and Response Zones	Updated Approver, QI(s), other contacts & Distrib. List, Revised Notification Procedures and Response Actions, Revised and added new MSDS, Updated Environmental/Socio Economic Sensitivities, Updated Media Information, Updated Glossary, Updated 24-Hour Emergency Contact Number in all Response Zones, minor typo changes, Uploaded Guidelines for Creating and Maintaining Privilege US and Canada documents and the Oil Properties Composition List into "Other Documents" section

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REVISION RECORD (Cont'd)		
CHANGE DATE	AFFECTED PAGE NUMBER(S)	DESCRIPTION OF CHANGE(S)
August 2013	Entire Plan	Updated Executive Summary, new signature page, change to external and internal contacts, addition of Tank Farm to Cushing Response Zone, change in Worst Case Discharge in all Response Zones, addition of NTSB recommendations, addition of Hurricane Plan, and Hurricane Checklist, addition of TGLO and SD DENR Cross References, addition of Figure 6.7, updated contracts with NRC and WCSS, addition of Environmental Sensitivity Maps and ACPs
August 2013		Added HSE Integrated to plan
August 2013		Added Role of Incident Commander to Patrick Kelly
August 2013		Added Role of Incident Commander to Stephen Bachorcik
August 2013	App A	Added Agreement letter for Quantum Murray LP
October 2013	FWD, Sec 2, Resp Zone Annexes	Change to Executive Summary; Changes to Titles
December 2013	Foreword, Section 1, Section 2, Appendix B	Response to PHMSA Letter of Correction: Added Cushing breakout tank to WCD amount, added bbls, removed column titled Planning Volume and changed PHMSA Sequence number in Figure 1.1; added list of QIs to Section 2; added more detail to WCD calculations for US Response Zones in Appendix B.
February 2014	FWD-8, 2-2	Updated National Response Corporation phone number

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DISTRIBUTION LIST	
COPY NUMBER	PLAN HOLDER[1]
1	Copy removed from circulation
2	TransCanada Senior Emergency Management Specialist 450-1st Street SW Calgary, Alberta T2P 5H1
3	TransCanada Corporate Emergency Operations Center 450-1st Street SW Calgary, Alberta T2P 5H1
4	TransCanada Alternate Corporate EOC 450-1st Street SW Calgary, Alberta T2P 5H1
5	TransCanada Emergency Response Analyst 450-1st Str. SW Calgary, T2P 5H1
6	TransCanada Emergency Preparedness Coordinator, CA 34 Terracon Place Winnipeg, Manitoba R2J 4G7
7	TransCanada Central Region Emergency Operations Center 34 Terracon Place Winnipeg, Manitoba R2J 4G7
8, 9, 10	National Energy Board Secretary 444 Seventh Avenue SW Calgary, Alberta T2P 0X8
11, 12 (electronic)	Office of Pipeline Safety - PHMSA John Hess U.S. Department of Transportation 1200 New Jersey Avenue, SE-E-22-311 Washington, District Of Columbia 20590
13	Witt O'Brien's ePlanPro Manager 818 Town & Country Blvd., Suite 200 Houston, Texas 77024

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DISTRIBUTION LIST (Cont'd)	
COPY NUMBER	PLAN HOLDER
14	TransCanada US Oil Pipeline Operations Emergency Operations Ce 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
15	TransCanada Incident Response Specialist, US 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
16	TransCanada Oil Control Center 450 1st Street SW Calgary, Alberta T2P 5H1
17	TransCanada Alternate Oil Control Center 450 - 1st Street SW Airdrie, Alberta T2P 5H1
18	Transportation Safety Board Transportation Safety Board of Canada Place du Cen 4th Floor - Suite 481 200 Promenade du Portag Gatineau (Hull), Quebec K1A 1K8
19	TransCanada Director of Canadian Oil Pipeline Operations 450 - 1st Street SW Calgary, Alberta T2P 5H1
20	TransCanada Director of Northern US Oil Pipeline Operations 13710 FNB Parkway; Suite 300 Omaha, Nebraska 68154
21	TransCanada Incident Management Specialist, CA 34 Terracon Place Winnipeg, Manitoba R2J 4G7
22	TransCanada Vice President of Pipeline Safety and Compliance 717 Texas Street Houston, Texas 77002-2761
23	TransCanada - Keystone Ken Jones 425 Diamond Avenue Spruce Grove, Alberta T7X 3B3

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DISTRIBUTION LIST (Cont'd)	
COPY NUMBER	PLAN HOLDER
24	TransCanada Director of Southern US Oil Pipeline Operations 2029 Capital Drive, Suite 100 Tyler, Texas 75703
25	TransCanada Vice President of Oil Operations 450-1st Street SW Calgary, Alberta T2P 5H1
NOTE[1]: The Distribution of this Plan is controlled by the Copy Number located on the front cover or Compact Disk (CD) label. The Plan Distribution Procedures provided in Section 1.3 and the Plan Review and Update Procedures provided in Section 1.4 should be followed when making any and all changes.	

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1.0 INTRODUCTION AND PLAN CONTENT

1.1 Plan Purpose/Objectives

1.2 Scope of Plan

1.3 Controlled Plan Distribution Procedures

1.4 Plan Review and Update Procedures

1.5 Regulatory Compliance

Figure 1.1 Facility Information

Figure 1.2 Piping System Overview

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1.1 PLAN PURPOSE/OBJECTIVES

The purpose of this Emergency Response Plan (ERP or Plan) is to assist TransCanada personnel in preparing for and responding quickly and safely to emergencies originating from the pipelines and associated facilities. The Plan provides techniques and guidelines for achieving an efficient, coordinated, and effective response to emergencies which may occur along the pipeline.

The specific objectives of the Plan are to:

- Establish Response Teams, assign individuals to fill the positions on the teams, and define the roles and responsibilities of team members.
- Define notification, activation, and mobilization procedures to be followed when a discharge occurs.
- Define organizational lines of responsibility to be adhered to during a response operation.
- Document equipment, manpower, and other resources available to assist with the response.
- Ensure compliance with Canadian Onshore Pipeline Regulations and the U.S. National Oil and Hazardous Substances Contingency Plan and associated Area Contingency Plan(s) for the area of operation.

1.2 SCOPE OF PLAN

This Plan has been developed in accordance with the regulation published in the Statutory Orders and Onshore Pipeline Regulations (OPR) (SOR)/99-294, S. 32-34 – Emergency Procedures Manual and Title 49 Code of Federal Regulations (CFR) Part 194 - Response Plans for Onshore Oil Pipelines.

This Plan is meant to comply with all applicable state regulations.

This Plan contains prioritized procedures for Company personnel to prevent and mitigate emergencies resulting from the operation of the pipeline. A description of the Pipeline's details is presented in Figure 1.1 with additional information provided in the sections, appendices and annexes.

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1.3 CONTROLLED PLAN DISTRIBUTION PROCEDURES

The Senior Emergency Response Specialist is responsible for maintenance and distribution of the Plan. Distribution will be handled in the following manner:

- Distribution of controlled Plans is determined by the copy number assigned to agency and designated corporate Plan Holders. A distribution list is included in the Foreword.
- Company personnel who may be called upon to provide assistance during discharge response activities will have access to a copy of the Plan for their use and training.
- Any person holding a controlled copy of the Plan shall ensure that the copy is transferred to their replacement in the event of reassignment or change in responsibility.
- Various regulatory agencies will also be distributed a controlled copy of the Plan. The list of agencies is detailed in the Distribution List located in the Foreword.

1.4 PLAN REVIEW AND UPDATE PROCEDURES

Review/Update

The Plan resides as a web-based document, which permits authorized Corporate and field staff access to make:

- Appropriate revisions as required by operational or organizational changes.
- Appropriate revisions as required by changes in the names and phone numbers detailed in Section 2.0.
- Appropriate revisions as required by improved procedures or deficiencies identified during response team tabletop exercises or actual emergency responses.

Incorporation of Plan Revisions

Email notification allows Authorized Plan Holders to update hard copy Plans as changes occur.

The Individual Plan Holder shall:

- Review and insert the revised pages into the Plan.
- Discard or archive the obsolete pages.

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Agency Revision Requirements

Company shall revise and resubmit changes to the Canadian National Energy Board (CA NEB) and the U.S. DOT/PHMSA Pipeline Response Plans Officer within 30 days of each change that would substantially affect the implementation of the Response Plan. Additionally, the South Dakota Department of Environment and Natural Resources shall be notified within 30 days of any change. Examples of changes in operating conditions that would cause a significant change to the Plan include:

Requiring Changes

- An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved Plan.
- Relocation or replacement of portions of the pipeline, which in any way substantially affect the information included in this Plan, such as a change in the Worst Case Discharge (WCD) volume.
- A change in the type of oil handled, stored, or transferred that materially alters the required response resources.
- A change in the name of the Oil Spill Removal Organization (OSRO).
- A material change in capabilities of the OSRO that provides equipment and personnel.
- A change in emergency response procedures.
- A change in the Qualified Individual (QI).
- A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities.
- Any other changes that materially affect the implementation of the Plan.
- As a result of post incident or drill evaluations.

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1.5 REGULATORY COMPLIANCE

CA NEB and U.S. DOT/PHMSA must be provided such revisions. The Company must submit the U.S. DOT/PHMSA issued Facility Control Number with the changes (the PHMSA Control Number is listed in Figure 1.1). In addition to periodic updates, when applicable, the Facility will resubmit the Emergency Response Plan to U.S. DOT/PHMSA every five years from the last approval date of the Plan.

Except as provided above, amendments to the following do not require approval by U.S. DOT/PHMSA:

- Personnel and telephone number lists included in the Plan.
- Oil Spill Removal Organization(s) (OSRO) change which does not result in a material change in support capabilities.

The development, maintenance, and use of this Plan implements Company policy and addresses the following regulatory requirements and guidelines:

The response zones have been reviewed for consistency with the following plans:

- Canada - NEB Onshore Pipeline Regulations SOR/94-294
- Canada - United States Joint Inland Pollution Contingency Plan - Annex II CANUSCENT
- CA Environment Canada National Environmental Emergencies Contingency Plan
- Greater St. Louis Sub-Area Plan
- U.S. Environmental Protection Agency (EPA) Region 5 Oil and Hazardous Substances Integrated Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 6, Regional Integrated Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 7 Regional Contingency Plan
- U.S. Environmental Protection Agency (EPA) Region 8 Regional Contingency Plan
- U.S. National Oil and Hazardous Substances Pollution Contingency Plan (NCP)

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FIGURE 1.1

FACILITY INFORMATION

GENERAL INFORMATION		
Facility Name:	Keystone Pipeline System	
U.S. DOT/PHMSA Control:	2285	
Owner's Name:	TransCanada	
Address:	***Physical Address*** 450 - 1st Street Calgary, Alberta T2P 5H1	***Operator's Address*** 450 - 1st Street S.W. Calgary, Alberta T2P 5H1
Mainline Number:	(800) 447-8066 (24 Hours)	
Contact Person:	Niki Affleck Senior Emergency Management Specialist	
Primary NAICS Code:	486910	
Determination of Significant and Substantial Harm (U.S. DOT PHMSA):	All Response Zones meet the criteria for "Significant and Substantial Harm."	
Operator Statement of (U.S.DOT PHMSA) "Significant and Substantial Harm":	It is the Company's goal to respond as quickly as possible to all uncontrolled releases of crude oil, regardless of the source point location along the system. Based upon this goal, and the overbreadth of the definitions provided in 49 CFR 194.103(c)(4) & (5), the Company is compelled to consider all the active line sections listed below in the Response Zone Annexes as capable of a release potentially causing "significant and substantial harm."	

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PIPELINE LOCATION	
Provinces/States/Counties:	The System covers 6 specific Response Zones covering 3 Provinces, 8 States and 81 Counties specifically detailed in this Figure 1.1.
Provinces Traversed:	Alberta, Saskatchewan, Manitoba
States Traversed:	North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, Oklahoma, Texas
Pipeline System Overview Diagram:	**See Figure 1.2**

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PHYSICAL DESCRIPTION - PIPELINE

Response Zone(s):

- The Keystone Pipeline transports crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River, Patoka, Illinois, Cushing, Oklahoma and Nederland, Texas. The total length of the Keystone Pipeline is 2,637 miles (4,235 km), which is divided into two sections. The Canadian portion includes 769 miles (1,237 km) of pipeline, pump stations and terminal facilities from Hardisty, Alberta to the Canadian (Manitoba)-U.S. Border (North Dakota). Additionally, there is also a Hardisty West Interconnect (HWI) that connects into the Hardisty Terminal. The U.S. portion includes approximately 1,867 miles (3,005 km) of pipeline, pump stations and terminal stations which extend from the Canadian (Manitoba)-U.S. Border (North Dakota), to Patoka, Illinois; Cushing, Oklahoma; and to Nederland Texas.
- The Keystone Pipeline System is divided into 6 specific Pipeline Response Zones. The Response Zones are as follows (Specific information to Response Zones are provided later in the Response Zone Appendices):

Country	Response Zones		Length (Miles)	Length (Km)
Canada	1	Hardisty Pump Station, Alberta/Regina Pump Station, Saskatchewan	417.67	672.03
	2	Regina Pump Station, Saskatchewan/Haskett Pump Station, Manitoba (extending to the Canada (Manitoba) - U.S. Border (North Dakota))	351.24	656.15
		Total	768.91	1237.18
United States	3	North Dakota, South Dakota, Steele City, Nebraska	640.77	1031
	4	Steele City, Nebraska/Kansas/Missouri/Patoka, Illinois	444.24	714.78
	5	*Cushing Extension* Steel City, Nebraska/Kansas/Cushing, Oklahoma	297.84	479.22
	6	*Gulf Coast* Cushing, Oklahoma/Nederland, Texas	484.57	779.67
	Total		1867.42	3004.67
	Total Length		2636.33	4235.13

General:

- This Plan is written in English and understood by personnel responsible for carrying out the Plan.
- The Keystone Pipeline System includes pipeline sections of 30, 34 or 36-inch diameter pipe, as well as pump stations and terminal facilities.

Pipeline Specifications:

- ***Products Type:***

  Crude Oil

- ***Pipe Detail:*** The pipeline system consists of several pipeline sections. The sections are indicated in Mile Post (MP) / Kilometer Post (KP).

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Pipe Diameter (inches)	Mile Post		Kilometer Post		Country	Location
	From	To	From	To		
30"	0	170.4	0	274.2	Canada	Alberta to Saskatchewan Border
34"	174.4	713.7	274.2	1148.3		Western Saskatchewan to Central Manitoba
30"	713.7	770.3	1148.3	1239.4		Central Manitoba to Canadian-U.S. Border
30"	770.3	1854.5	1239.4	2983.9	United States	Canadian-U.S. Border, through North Dakota, South Dakota, Nebraska, Kansas, Missouri, to Illinois
36"	0	298.0	0	479.5		*Cushing Extension* Nebraska, through Kansas, to Oklahoma
36"	0	484.6	0	779.7		*Gulf Coast* Oklahoma to Texas

** Hardisty West Interconnect (HWI) consists of 42" diameter piping, with a 16" recirculation line back to Gibson Tanks. The length of pipe from the HWI Facility to the Hardisty Terminal is approximately 0.78 miles (1.25 km) and is 36" in diameter.

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RESPONSE ZONE INFORMATION

Response Resources:

Facility spill mitigation procedures and response guidelines are provided in Section 3.0 for discharges that could result from any of the following scenarios:

- Pipeline rupture/leak
- Explosion and/or fire
- Failure of facility piping
- Equipment failure (e.g. pumping system failure, relief valve failure, etc.)

Response Zone	Discharge Scenario	Provinces / Counties Traversed
Hardisty Pump Station/ Regina Pump Station	39,723 Bbls	Alberta, Saskatchewan , Eastern Alberta, Western Saskatchewan, Eastern Saskatchewan
Regina Pump Station / Haskett Pump Station	47,782 Bbls	Saskatchewan, Manitoba , Eastern Saskatchewan, Southwestern Manitoba, Western Saskatchewan
North Dakota, South Dakota, Nebraska	33,058 Bbls	Barnes, Beadle, Butler, Cavalier, Cedar, Clark, Colfax, Day, Gage, Hanson, Hutchinson, Jefferson, Kingsbury, Marshall, McCook, Miner, Nelson, Pembina, Platte, Ransom, Saline, Sargent, Seward, Stanton, Steele, Walsh, Wayne, Yankton
Kansas, Missouri, Illinois	28,787 Bbls	Audrain, Bond, Brown, Buchanan, Butler, Caldwell, Carroll, Chariton, Clay, Clinton, Cowley, Dickinson, Doniphan, Fayette, Lincoln, Madison, Marion, Marshall, Montgomery, Nemaha, Randolph, St. Charles, Washington
Cushing Extension	105,000 Bbls	Atoka, Bryan, Butler, Clay, Coal, Cowley, Dickinson, Hughes, Jefferson, Kay, Lincoln, Marion, Noble, Okfuskee, Payne, Seminole, Washington, Marshall, Nemaha, Brown, Doniphan, Cedar, Wayne, Stanton, Platte, Colfax, Seward, Saline, Gage, Creek, Pontotoc, Johnston
Gulf Coast	34,539 Bbls	Angelina, Atoka, Bryan, Cherokee, Coal, Creek, Delta, Fannin, Franklin, Hardin, Hopkins, Hughes, Jefferson, Johnston, Lamar, Liberty, Lincoln, Nacogdoches, Okfuskee, Orange, Payne, Polk, Pontotoc, Rusk, Seminole, Smith, Upshur, Wood, Kay, Noble

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FIGURE 1.2

PIPING SYSTEM OVERVIEW

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Figure 1.2 System Overview Map

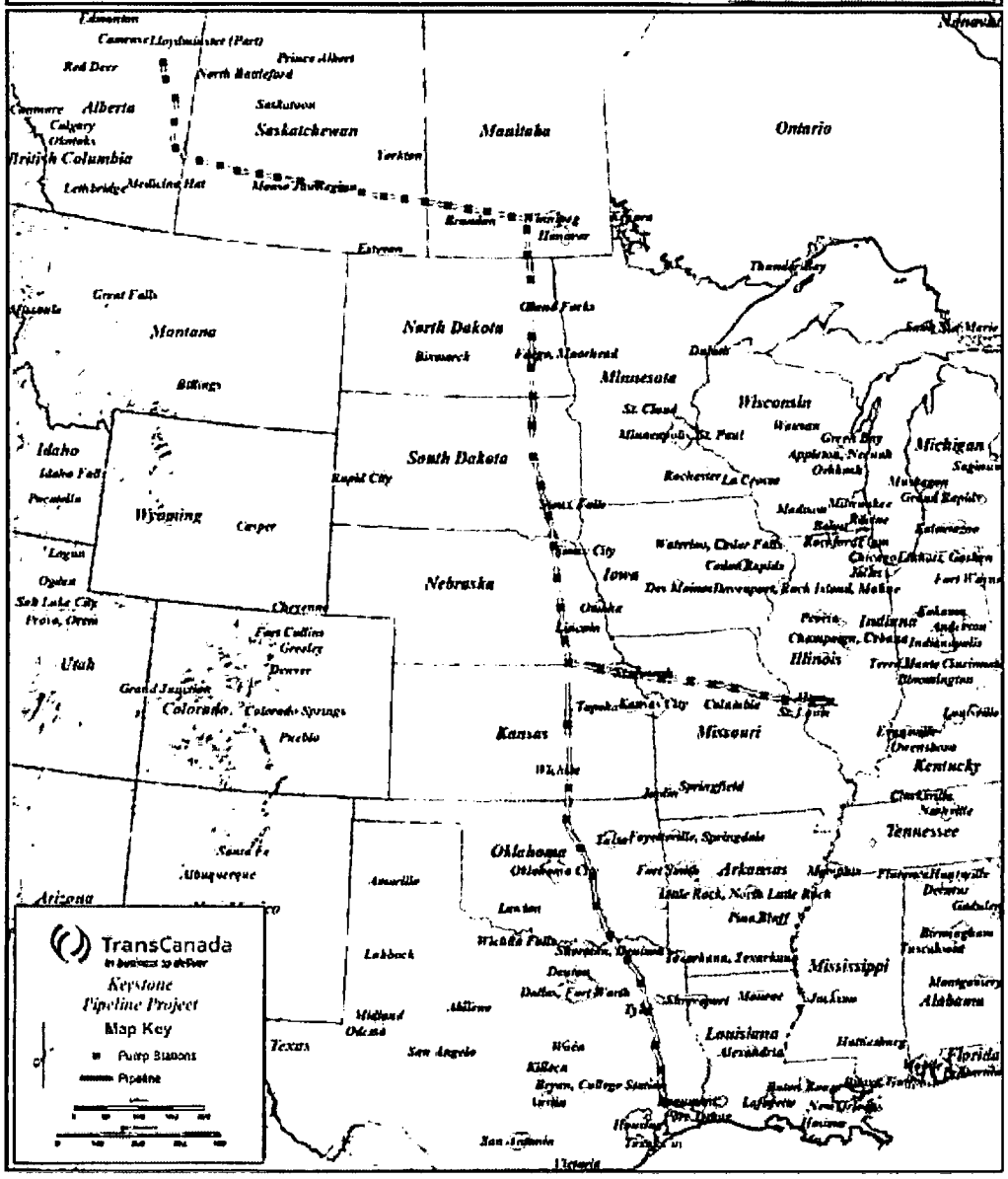

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Figure 1.2 System Overview Map

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT

2.0 NOTIFICATION PROCEDURES

2.1 Internal Notifications

2.2 External Notifications

Figure 2.1 Emergency Activation Flowchart

Figure 2.2 Internal Notification References

Figure 2.3 Notification Data Sheet

Figure 2.4 External Notification Flowchart

Figure 2.5 External Notification References

Figure 2.6 Possible Command Post Locations

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This Section is a guide for notification procedures that should be implemented immediately after discovering a discharge incident and, if possible, securing the source. Internal and external notifications are described separately for clarification purposes only. All notifications are of extreme importance and must be completed in a timely manner.

2.1 INTERNAL NOTIFICATION

The following internal notifications should be made for each emergency incident to the extent that the incident demands (telephone reference is provided in Figure 2.2). In no event shall notification be delayed because the immediate supervisor is inaccessible. Authorization is given to bypass management levels if necessary to provide timely notification to appropriate management. The typical internal notification responsibilities for each person potentially involved in the initial response are as follows:

Employee Discovering Discharge

- Immediately notify the Keystone Oil Control Center (OCC) (403) 920-8080.
- Notify the local fire department, police department, and rescue, as needed.
- Notify the Spill Response Contractor, Quantum Murray at (877) 378-7745 (Canada only).
- Notify the Spill Response Contractor, National Response Corporation at (800) 899-4672 (US only).
- Notify the contracted Spill Management Team, the O'Brien's Group at (985) 781-0804 if required (Canada & US).
- Notify Area Manager or Regional On-Call Manager.

Keystone Oil Control Center (OCC)

- Verify emergency.
- Immediately notify the OCC and Regional On-Call Manager.
- Notify the emergency response contractor if the employee that discovered the discharge has not already made the notification.

Calgary Emergency Operations Center (EOC) Manager

- Once the emergency has been verified by the Oil Control Center (OCC), request contact information for Regional On Call Manager.
- Contact the Regional On Call Manager to confirm activation of Regional EOC and inform that activation of the Corporate EOC will be completed.
- Notify the Corporate Emergency Response Team (CERT) and activate the Corporate EOC.
- Dial into Regional EOC conference line to establish communications with Regional EOC and Incident Management Team on site.
- Once Corporate EOC is activated, determine with Corporate Security whether emergency seems to meet "crisis" criteria.
- If yes, ensure Corporate Security activates TransCanada's Crisis Management Team.
- Continue to provide support to both Regional EOC and Incident Management Team throughout the emergency response phase.

Corporate Security

- Engage in Corporate Emergency Operations Center (EOC)
- Confirm emergency meets "crisis" criteria.
- Notify the Executive VP of Operations and Engineering.

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Regional Emergency Operations Center

- Activate Regional Emergency Operations Center (EOC).
- Set up Regional conference line to establish communications with Incident Management Team and Corporate Emergency Operations Center (EOC).
- Immediately provide support to Incident Management Team.
- Complete all local notifications.
- Facilitate ongoing communication between Incident Management Team and the Corporate EOC.
- Transmit appropriated MSDS to Incident Commander, local officials, and State Environmental Agencies.

Corporate Emergency Response Team (CERT)

- Attend Corporate Emergency Operations Center (EOC).
- Immediately notify senior management to inform about the emergency event.
- Fulfill profile of service and functional plan as required based on the type of emergency event.
- Continue to provide support to Incident Management Team and Regional EOC.
- Notify: U.S. National Response Center, the CA Transportation Safety Board National Occurrence Hot Line, CA National Energy Board, appropriate Federal agencies, County Emergency Management, Province/State Environmental Agency, and the Utilities One-Call, as needed (notification requirements and contact information are listed in Figure 2.5).

Witt O'Brien's Command Center

- Email is received at the Witt O'Brien's Command Center as well as by key Response Services personnel.
  - Primary - response@wittobriens.com
  - Secondary - ccenter@wittobriens.com

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FIGURE 2.1

EMERGENCY ACTIVATION FLOWCHART

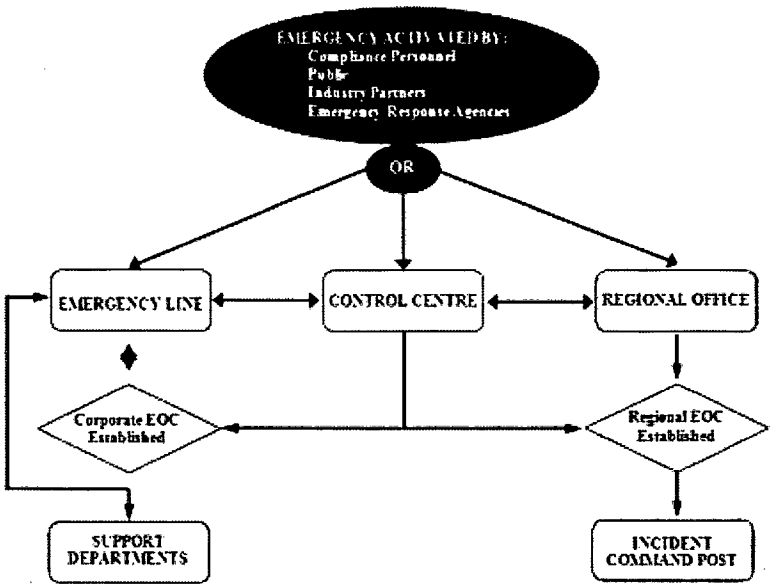

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FIGURE 2.2

INTERNAL NOTIFICATION REFERENCES

CORPORATE RESPONSE PERSONNEL / OTHER COMPANY CONTACTS INTERNAL NOTIFICATIONS				
POSITION/TITLE	NAME	OFFICE	HOME	CELL
	Keystone Oil Control Center	(403) 920-8080		

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INTERNAL NOTIFICATIONS (Cont'd) Hardisty Pump Station/ Regina Pump Station			
TITLE	ICS ROLE	NAME	NUMBERS
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Hardisty Area Manger	Incident Commander	Bryan Templeton	(780) 888-2668 (Office) (780) 842-4023 (Home) (403) 928-1852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
Palliser Area Manager	Incident Commander, Planning Section Chief	Rob Ferguson	(403) 529-4318 (Office) (403) 548-6077 (Home) (204) 233-7109 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)
Heartland Area Manager	Incident Commander	Stephen Bachorcik	(306) 773-7501 (Office) (306) 750-2103 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Regina Pump Station / Haskett Pump Station			
TITLE	ICS ROLE	NAME	NUMBERS
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Agassiz Area Manger	Incident Commander, Operations Section Chief	Barry Adamson	(204) 957-6840 (Office) (204) 878-4473 (Home) (204) 471-7918 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) North Dakota, South Dakota, Nebraska			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
West River Area Manager	Incident Commander	Virgil Pfenning	(402) 492-7469 (Office) (402) 889-7383 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Kansas, Missouri, Illinois			
TITLE	CS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Cushing Extension			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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INTERNAL NOTIFICATIONS (Cont'd) Gulf Coast			
TITLE	ICS ROLE	NAME	NUMBERS
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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QUALIFIED INDIVIDUALS Hardisty Pump Station/ Regina Pump Station			
NAME	OFFICE	HOME	CELL
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Bryan Templeton	(780) 888-2668	(780) 842-4023	(403) 928-1852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416
Rob Ferguson	(403) 529-4318	(403) 548-6077	(204) 233-7109

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QUALIFIED INDIVIDUALS Regina Pump Station / Haskett Pump Station			
NAME	OFFICE	HOME	CELL
Barry Adamson	(204) 957-6840	(204) 878-4473	(204) 471-7918
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416

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QUALIFIED INDIVIDUALS North Dakota, South Dakota, Nebraska			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Virgil Pfenning	(402) 492-7469		(402) 889-7383
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Kansas, Missouri, Illinois			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Cushing Extension			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

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QUALIFIED INDIVIDUALS Gulf Coast			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Jon Wickersham	(402) 492-7406		(402) 672-6386

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2.2 EXTERNAL NOTIFICATIONS

External notifications are those made to entities outside of the Company including Federal, Province/State and local regulatory agencies, as well as railroad and utility companies. These notifications include both verbal and written requirements.

Verbal Notification Requirements

Immediate internal notification is to be made in accordance with the Internal Notification Procedures found in Section 2.1 when a system operational failure or other type of incident occurs. This will allow immediate evaluation and classification of incidents and prompt immediate telephonic notification as detailed in Figure 2.4 and 2.5 to the Transportation Safety Board, National Response Center (NRC), Province/State agencies, local agencies, and other Federal agencies as required. The information found on the Notification Data Sheet, Figure 2.3, should be used to disseminate incident information to the appropriate agencies.

For the purpose of this procedure, immediate reporting means reporting the instant a person has knowledge of an actual or suspected leak, uncontrolled release of product, any unplanned spill or other pipeline system failure. Information that causes any employee to reasonably suspect a leak or uncontrolled release of product must be immediately reported, even when the actual existence or location of a leak or release cannot yet be confirmed.

Written Notification Requirements

In the United States, a written report is to be filed as soon as practical, but not later than 30 days after discovery of the incident to the Information Resources Manager, Office of Pipeline Safety, Pipeline and Hazardous Materials Safety Administration, US Department of Transportation. Information concerning the event shall be reported on Pipeline and Hazardous Materials Safety Administration Form 7000-1 on-line on the Pipeline and Hazardous Materials Safety Administration website via log-in. Paper reports are not required. This report is to be filed for all incidents reported telephonically and other incidents required to be reported in accordance with the criteria listed below.

The information required for completing the 30-day written report will be furnished by the Area Offices to the Department of Transportation Regulatory Compliance Department for submission to the Department of Transportation. Any subsequent or additional information that was not reported on the initial written report must be reported to the Department of Transportation Regulatory Compliance Department by the Area Office. This information will be utilized in filing a supplemental written report to the Department of Transportation as soon as possible, but no later than 30 days after its discovery.

In Canada, a detailed written incident report is required as soon as practicable.

Transportation Safety Board (TSB)

The TSB's role is to advance transportation safety through the investigation of transportation occurrences in the marine, pipeline, rail and aviation modes.

TSB Classification System

The primary criterion for determining if an occurrence in any mode will be investigated is whether or not such analysis is likely to lead to a reduction of risk to persons, property, or the environment.

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Class 1 Occurrences (Public Inquiry)

- The potential for reducing the risk to persons, property, or the environment;
- Whether an inquiry would uncover facts that might not otherwise be made known;
- Whether an inquiry would result in quicker remedial action;
- The actual or potential extent of injuries and/or loss of life;
- The degree of public interest in and concern about public safety; or
- The possible involvement of an arm of government.

Class 2 Occurrence (Individual Occurrence Investigation)

- There is a high probability of advancing Canadian transportation safety in that there is significant potential for reducing the risk to persons, property, or the environment; or
- The Governor in Council so requests (pursuant to Section 14(1) of the CTAISB Act).

Class 3 Occurrences (Individual Occurrence Investigation)

- There is significant public expectation that the TSB should independently make findings as to cause(s) and contributing factors; or
- There is potential for better understanding the latent unsafe conditions contributing to a significant safety issue; or
- A government representative so requests (pursuant to Section 14(2) of the CTAISB Act); or
- The Board must do so to meet its obligations or commitments.

Class 4 Occurrences (Safety Issue Investigation)
Multiple occurrences, which the Board deems to be indicative of significant unsafe situations or conditions, will be subject to a safety issue investigation when:

- There is a high probability of advancing Canadian transportation safety by reducing the risk to persons, property, or the environment; or
- In the Board's opinion, there is widespread public expectation that the TSB should independently analyze a particular safety issue.

Class 5 Occurrences (Data Collection)

Data pertaining to occurrences that do not meet the criteria of classes 1 through 4 will be recorded in suitable scope and detail for possible safety analysis, statistical reporting, or archival purposes.

National Energy Board (NEB)

The NEB's role and responsibilities generally includes:

- The NEB's top priority in any emergency is to make sure that people are safe and secure, and that property and the environment are protected. Any time there is a serious incident, the NEB Inspectors may attend the site to oversee a company's immediate response. The NEB will require that all reasonable actions are taken to protect employees, the public and the environment. Further, the NEB will verify that the regulated company conducts adequate and appropriate clean-up and remediation of any environmental effects caused by the incident.

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And/or

As lead regulatory agency, the NEB:

- Monitors, observes and assesses the overall effectiveness of the company's emergency response in terms of:
  - Emergency Management;
  - Safety;
  - Security;
  - Environment;
  - Integrity of operations and facilities; and
  - Energy Supply.
- Investigates the event, either in cooperation with the Transportation Safety Board of Canada, under the Canada Labour Code, or as per the National Energy Board Act or Canada Oil & Gas Operations Act (whichever is applicable).
- Inspects the pipeline or facility.
- Examines the integrity of the pipeline or facility.
- Requires appropriate repair methods are being used.
- Requires appropriate environmental remediation of contaminated areas is conducted.
- Coordinates stakeholder and Aboriginal community feedback regarding environmental clean-up and remediation.
- Confirms that a company is following its Emergency Procedures Manual(s) commitments, plans, procedures, and NEB regulations and identifies non-compliances.
- Initiates enforcement actions as required.
- Approves the restart of the pipeline.

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Transportation Safety Board of Canada Pipeline Occurrence Reporting	
Citation	**Description**
Extracts from Transportation Safety Board Regulations Sections 5 (1) and 5 (5)	When a reportable pipeline accident or incident takes place, the operator and any employee of the operator having direct knowledge of the accident or incident shall report to the Board as soon as possible and by the quickest means available. Where any person mentioned above makes a report, no other person referred to is required to make such a report.
Transportation Safety Board Regulations Section 2 (1)	A "reportable pipeline accident" is an accident resulting directly from the operation of a pipeline, where (a) a person sustains a serious injury or is killed as a result of being exposed to i. a fire, ignition or explosion, or ii. a commonly released from the pipeline, or (b) the pipeline i. sustains damage affecting the safe operation of the pipeline as a result of being contacted by another object or as a result of a disturbance of its supporting environment, ii. causes or sustains an explosion, or a fire or ignition that is not associated with normal operating circumstances, or iii. sustains damage resulting in the release of any commodity.
Transportation Safety Board Regulations Section 2 (1)	A "reportable pipeline incident" means an incident resulting directly from the operation of a pipeline where (a) an uncontained and uncontrolled release of a commodity occurs, (b) the pipeline is operated beyond design limits, (c) the pipeline causes an obstruction to a ship or to a surface vehicle owing to a disturbance of its supporting environment, (d) any abnormality reduces the structural integrity of the pipeline below design limits, (e) any activity in the immediate vicinity of the pipeline poses a threat to the structural integrity of the pipeline, or (f) the pipeline, or a portion thereof, sustains a precautionary or emergency shut-down for reasons that relate to or create a hazard to the safe transportation of a commodity.

NOTE: Refer to Figure 2.5 for any additional Province/State written reporting requirements.

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FIGURE 2.3

NOTIFICATION DATA SHEET

Date: _____ *Time:* _____

INCIDENT DESCRIPTION

Reporter's Full Name: _____ *Position:* _____

Day Phone Number: _____ *Evening Phone Number:* _____

Company: TransCanada Keystone Limited Partnership / TC Oil Pipeline Operations, Inc. *Organization Type:* _____

Facility Address: 450 - 1st Street S.W. Calgary, Alberta *Owner's Address:* 450 - 1st Street Calgary, Alberta

Facility Latitude: _____ *Facility Longitude:* _____

Spill Location (if not at Facility): _____

Responsible Party's Name: _____ *Phone Number:* _____

Responsible Party's Address: _____

Source and/or cause of discharge: _____

Nearest City: _____

County: _____ *State:* Alberta *Zip Code:* T2P 5H1

Section: _____ *Township:* _____ *Range:* _____

Distance from City: _____ *Direction from City:* _____

Container Type: _____ *Container Storage Capacity:* _____

Facility Oil Storage Capacity: _____

Material: _____

Total Quantity Released	Water Impact (*YES or NO*)	Quantity into Water

RESPONSE ACTION(S)

Action(s) taken to Correct, Control, or Mitigate Incident:

Number of Injuries: _____ *Number of Deaths:* _____

Evacuation(s): _____ *Number Evacuated:* _____

Damage Estimate: _____

More information about impacted medium: _____

Possible hazards to human health or the environment outside of the Facility: _____

CALLER NOTIFICATIONS

National Response Center (NRC): 1-800-424-8802 *Transportation Safety Board:* 819-997-7887

Additional Notifications (Circle all applicable): *USCG* *NEP* *EPA* *Province* *State* *Other*____

NRC Incident Assigned No. _____

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in this report including estimated quantity and disposition of recovered material:

NOTE: DO NOT DELAY NOTIFICATION PENDING COLLECTION OF ALL INFORMATION.

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FIGURE 2.4

EXTERNAL NOTIFICATION FLOWCHART

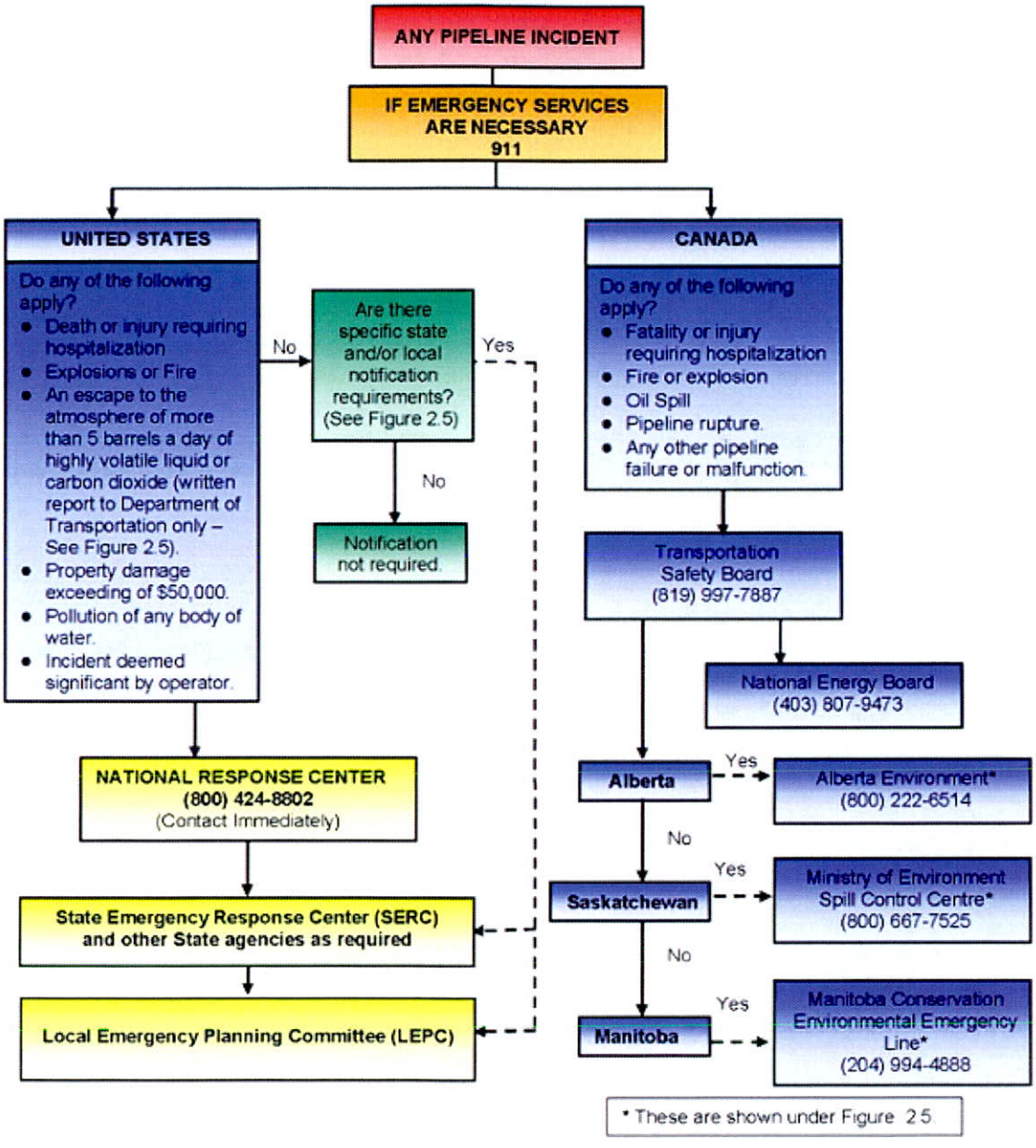

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FIGURE 2.5

EXTERNAL NOTIFICATION REFERENCES

REQUIRED FEDERAL NOTIFICATIONS	
National Response Center (NRC) c/o United States Coast Guard (CG-5335) - Stop 7581, 2100 2nd Street, SW Washington, District Of Columbia 20593-0001	(800) 424-8802 (202) 267-2675
REPORTING REQUIREMENTS TYPE: Any discharge or sighting of oil on navigable waters. VERBAL: Immediate notification required (within 2 hours). WRITTEN: If an RQ limit is reached, refer to state requirements for written report requirements. NOTE: A call to the NRC must also be made for spills or releases of hazardous substances that meet or exceed their Reportable Quantities.	

Office of Pipeline Safety and Hazardous Materials U.S. Department of Transportation 1200 New Jersey Avenue SE-E-22-311 Washington, District Of Columbia 20590	(202) 366-4000
REPORTING REQUIREMENTS TYPE: In addition to the reporting of accidents to the NRC as noted below, a written accident report PHMSA Form 7000-1. VERBAL: Call to the NRC meets the required verbal notification under DOT reporting requirement. WRITTEN: Reported on PHMSA Form 7000-1 no later than 30 days, submit a report resulting from explosion/ fire/ hospitalization, death, property damage greater than $50,000, or above reportable quantity. NOTE:	

PHMSA OPS Central Region Kansas City, Missouri	(816) 329-3800
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

PHMSA OPS Southwest Region Houston, Texas	(713) 272-2859

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

U.S. Environmental Protection Agency, Region 8 999 18th Street Suite 500 Denver, Colorado 80202-246	(303) 312-6312

REPORTING REQUIREMENTS

TYPE: Immediately for spills that impact or threaten navigable water or adjoining shoreline.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav
NOTE: In accordance with the applicable SPCC regulations, within 60 days for a spill in excess of 1,000 gallons (24 Bbls) in a single event or two spill events within a twelve month period into or upon nav

U.S. Environmental Protection Agency, Region 5 77 W. Jackson Blvd., 5th Floor Chicago, Illinois 60604	(312) 353-2318 (312) 353-2000

REPORTING REQUIREMENTS

TYPE: Any oil discharge that has impacted or threatens to impact navigable waters or release of hazardous substances in an amount equal or greater than the reportable quantity.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: For oil discharge within 60 days, in accordance with applicable SPCC RQ.
NOTE:

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

U.S. Environmental Protection Agency, Region 6 1445 Ross Avenue, Suite 1200 Dallas, Texas 75202	(214) 665-6595 (866) 372-7745

REPORTING REQUIREMENTS
TYPE: Immediately for all spills that impact or threaten navigable water or adjoining shoreline.
VERBAL: Notification to the EPA is typically accomplished by the call to the NRC.
WRITTEN: As the agency may request depending on circumstances.
NOTE: N/A

U.S. Army Corps of Engineers, Missouri Office Missouri	(573) 634-5667

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Army Corps of Engineers - St. Louis District Illinois	(314) 331-8583

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED FEDERAL NOTIFICATIONS (Cont'd)

U.S. Corps of Engineers - Illinois Illinois	(309) 794-5351

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Transportation Safety Board (TSB) of Canada 200 Promenade du Portage, Place du Centre, 4th Floor Gatineau, Quebec 1K8	(819) 997-7887 (800) 387-3557

REPORTING REQUIREMENTS
TYPE: All pipeline accidents with fatality or serious injury, fire or explosion, oil spill, pipeline rupture or any other pipeline failure or malfunction.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

Canadian National Energy Board (CA NEB) 444 Seventh Avenue SW Calgary, Alberta T2P OX8	(403) 807-9473 (800) 899-1265

REPORTING REQUIREMENTS
TYPE: All pipeline incidents with fatality or serious injury, fire or explosion, oil spill or hydrocarbon release, or any operation beyond the design limits of the pipeline.
VERBAL: Immediately.
WRITTEN: As soon as practical.
NOTE: For further definition of Incident see Glossary.

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REQUIRED STATE/PROVINCE NOTIFICATIONS

Alberta Environment & Sustainable Resource Development 9915 -108 Street 10th Floor, Petroleum Plaza South Tower Edmonton, Alberta T5K 2G8	(800) 222-6514

REPORTING REQUIREMENTS
TYPE: All spills to water or exceeds a reportable quantity or emission level.
VERBAL: Immediately.
WRITTEN: Within 7 days.
NOTE:

Saskatchewan Environment and Resource Management Box 3003, 800 Central Avenue. Prince Albert, Saskatchewan S5V 6G1	(800) 667-7525

REPORTING REQUIREMENTS
TYPE: Any oil spill to water or oil spill greater than or equal to 50 L. to land.
VERBAL: Immediately
WRITTEN: Within 7 days.
NOTE:

Manitoba Conservation Environmental Emergency Line Winnipeg, Manitoba	(204) 994-4888

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

North Dakota Division of Emergency Management PO Box 5511 Bismarck, North Dakota 58506-5511	(701) 328-8100

REPORTING REQUIREMENTS
TYPE: Any spill or discharge above RQ.
VERBAL: Immediately.
WRITTEN: Within 30 days.
NOTE:

North Dakota Dept. of Health-Environmental Health 918 East Divide Avenue Bismarck, North Dakota 58501-1947	(701) 328-5150 (701) 328-5210

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

North Dakota Industrial Commission State Capitol, 14th Floor, 600 E. Boulevard Ave., Dept 405 Bismarck, North Dakota 58505-0840	(701) 328-8020

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Game & Fish, Conservation and Communication Div North Dakota	(701) 328-6612 (701) 328-6300

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Environmental Health Sect, Div. of Water Quality North Dakota	(701) 328-5210

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Public Service Commission, Public Utilities Divisi North Dakota	(701) 328-4077

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

South Dakota DENR, Div of Environmental Services 523 East Capitol Ave. Pierre, South Dakota 57501-3182	(605) 773-3296 (Day) (605) 773-3231 (Night)

REPORTING REQUIREMENTS

TYPE: Any Spill or discharge greater than reportable quantity.
VERBAL: Immediately.
WRITTEN: Within 30 days if, 1) Is of 5 gals. or more; or 2) Causes an explosion or fire; or 3) Causes the injury or death of any person.
NOTE:

Game, Fish and Parks South Dakota	(605) 223-7660

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

South Dakota Department of Transportation, ROW South Dakota	(605) 773-3710 (605) 773-4249

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

South Dakota Department of Transportation, RR	(605) 773-3046 (605) 773-3921
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

South Dakota Department of Transportation (SDDOT) 700 E. Broadway Ave. Pierre, South Dakota 57501	(605) 773-3265
REPORTING REQUIREMENTS TYPE: All spills or discharges. VERBAL: Immediately. WRITTEN: As requested by the Agency. NOTE: As requested by the Agency.	

South Dakota Public Utilities Commission South Dakota	(605) 773-3201
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Department of Environmental Quality 1200 N Street Suite 400 / PO Box 98922 Lincoln, Nebraska 68509-8922	(402) 471-2186 (402) 471-4545

REPORTING REQUIREMENTS
TYPE: Any Discharge that leaves the Facility or threatens to impact navigable waters.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As Requested by the Agency
NOTE:

Department of Natural Resources Nebraska	(308) 697-3730

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Nebraska Emergency Management Agency Lincoln, Nebraska	(402) 499-1219

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Nebraska Game & Parks Commission Lincoln, Nebraska	(402) 471-5423 (402) 471-0641 (402) 271-5440

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Kansas Department of Health & Environment Curtis State Office Building 1000 SW Jackson Topeka, Kansas 66612	(785) 296-1679

REPORTING REQUIREMENTS
TYPE: All Spills that impact soil, surface water or groundwater.
VERBAL: Immediately, within one hour.
WRITTEN:As requested by Agency.
NOTE:

Kansas Dept. of Transportation Dwight D. Eisenhower State Office Building, 700 S.W. Harrison Street Topeka, Kansas 66603-3754	(785) 296-3566

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN:As requested by the Agency.
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Kansas Dept. of Wildlife and Parks Kansas	(620) 672-5911 (620) 672-0795

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Missouri DNR, Environmental Improvement and Energy PO Box 176 Jefferson City, Missouri 65102	(573) 751-4919

REPORTING REQUIREMENTS
TYPE: Any Spill or discharge that meets or exceeds the Federal reportable quantity.
VERBAL: Immediately, within 30 minutes
WRITTEN: As requested by Agency.
NOTE:

Missouri U.S. Fish and Wildlife Service Columbia, Missouri	(573) 234-2132

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Environmental Protection Agency - IL Office Illinois	(217) 524-3908 (217) 785-9250

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Illinois Department of Natural Resources (IDNR) 1 Natural Resources Way Springfield, Illinois 62702	(618) 462-1181 (Region 4) (217) 782-6302 (State of IL)

REPORTING REQUIREMENTS
TYPE: Wildlife Protection / Rehabilitation
VERBAL: Courtesy Reporting.
WRITTEN: As the agency may request depending on circumstances.
NOTE:

Illinois Department of Transportation (IDOT) 2300 S. Dirksen Parkway Springfield, Illinois 62764	(217) 782-7820 (217) 782-2937

REPORTING REQUIREMENTS
TYPE: All spills or discharges.
VERBAL: Immediately.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

Illinois Emergency Management Agency (SERC) 2200 South Dirksen Parkway Springfield, Illinois 62703	(800) 782-7860 (217) 782-7860

REPORTING REQUIREMENTS

TYPE: Any Discharge or sighting of oil, or hazardous substances exceeding a reportable quantity in Cook County, IL.
VERBAL: Immediately.
WRITTEN: As soon as practicable after the release.
NOTE:

Oklahoma Department of Environmental Quality 707 N Robinson Oklahoma City, Oklahoma 73102	(405) 702-1000

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Railroad Commission of Texas PO Box 12967 Austin, Texas 78711-2967	(512) 463-7288 (512) 463-6788

REPORTING REQUIREMENTS

TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED STATE/PROVINCE NOTIFICATIONS (Cont'd)

State of Texas Spill-Reporting Hotline Austin, Texas	(800) 832-8224
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

TCEQ - Area Director, Kelly Keel Austin, Texas	(512) 239-3607
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Texas Division of Emergency Management (TDEM) Austin, Texas	(512) 424-2208
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS

Manitoba Water Stewardship Manitoba Water Stewardship Box 11 200 Saulteaux Crescent Winnipeg, Manitoba R3J 3W3	1-866-626-4862 1-204-945-6398

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Cavalier County LEPC Langdon, North Dakota	(701) 256-3911

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of Fargo Fargo, North Dakota	(701) 241-1310

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Tri-County Water District North Dakota	(701) 345-8240

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Cedar County (LEPC) Hartington, Nebraska	(402) 254-7411

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of South Sioux Nebraska	(402) 494-7517 (402) 494-7500

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Brown County LEPC Hiawatha, Kansas	(785) 547-3415 (785) 547-3511

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As requested by the Agency.
NOTE: As requested by the Agency.

Butler County (LEPC) Augusta, Kansas	(316) 733-9796

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

City of Axtell Axtell, Kansas	(785) 736-2834 (785) 736-2381

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
City of Beattie Beattie, Kansas	(785) 353-2527
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Fairview Fairview, Kansas	(785) 467-3521 (785) 467-5341
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Hamlin Hamlin, Kansas	(785) 742-2995 (785) 459-2436
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
City of Hiawatha Hiawatha, Kansas	(785) 742-2967 (785) 742-7417
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Robinson Robinson, Kansas	(785) 544-7766 (785) 544-6850
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Summerfield Summerfield, Kansas	(785) 244-6531
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Seneca Seneca, Kansas	(785) 336-2747

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Clay County LEPC Clay Center, Kansas	(785) 632-2166

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Cowley County (LEPC) Winfield, Kansas	(620) 441-4569 (620) 221-0470

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Dickinson County LEPC Abilene, Kansas	(785) 263-3120 (785) 263-1121

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Marion County LEPC Marion, Kansas	(620) 382-2144 (620) 382-3441

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Marshall County LEPC First Responder Marysville, Kansas	(785) 562-3141

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Nemaha Co. Emergency Management / First Responder Seneca, Kansas	(785) 336-2135 (785) 336-8010

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Washington County LEPC Washington, Kansas	(785) 325-2134 (785) 325-2924

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Audrain County, Missouri LEPC Mexico, Missouri	(660) 582-8183

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Buchanan County LEPC St. Joseph, Missouri	(816) 271-1574 (816) 901-1604

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Chariton County, Missouri LEPC/First Responder Keytesville, Missouri	(660) 288-3277

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of St Joseph LEPC St Joseph, Missouri	(816) 271-4603

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Troy Troy, Missouri	(636) 528-4712 x.227 (636) 528-7562

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

DeKalb County PWSD No 1 Missouri	(816) 393-5311

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Douglas County Commission Missouri	(417) 683-4714

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Hickory County Commission Missouri	(417) 745-6450
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

Lincoln County, Missouri LEPC Troy, Missouri	(636) 528-6182
REPORTING REQUIREMENTS TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity VERBAL: Immediately, but not longer than 30 minutes WRITTEN:As requested by the Agency NOTE: As requested by the Agency	

McDonald County Commission Missouri	(417) 223-4717
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Montgomery County LEPC Montgomery City, Missouri	(573) 564-2283

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE:

New Madrid County Commission New Madrid, Missouri	(573) 748-2524

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Nodaway County Commission Maryville, Missouri	(660) 582-2251

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Pike County Commission Missouri	(573) 324-2412

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Polk County Commission Missouri	(417) 326-4031

REPORTING REQUIREMENTS
TYPE:
VERBAL: In cases of emergency requiring immediate maintenance or repair of any pipeline or utility, notice should be given to the County Commissioner as soon as possible.
WRITTEN:
NOTE:

Randolph County LEPC Huntsville, Missouri	(573) 564-2283

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

St. Charles County LEPC St. Charles, Missouri	(636) 949-3023

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the federal reportable quantity.
VERBAL: Immediately, but not longer than 30 minutes.
WRITTEN: As requested by the Agency.
NOTE:

Taney County Missouri	(417) 546-7200

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

Vernon County Commission Missouri	(417) 448-2500

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Bond County (LEPC) Greenville, Illinois	(618) 644-1442

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

City of Edwardsville Edwardsville, Illinois	(618) 692-7520 (618) 692-7513

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting
WRITTEN:
NOTE:

City of Greenville Greenville, Illinois	(618) 664-1644

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

City of Salem Marion County Salem, Illinois	(618) 548-2222 (618) 548-3400
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Patoka Patoka, Illinois	(618) 432-5855
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

City of Vandalia, Illinois Vandalia, Illinois	(618) 283-1196
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Fayette County Vandalia, Illinois	(618) 283-5000 (618) 283-1198

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Fayette County (LEPC) Vandalia, Illinois	(618) 283-4292

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Madison Co. IL Emergency Svcs. and Disaster Agency Edwardsville, Illinois	(618) 692-0537

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Madison County (LEPC) Edwardsville, Illinois	(618) 296-4482 (618) 692-8903

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Marion County (LEPC) Salem, Illinois	(618) 548-2600

REPORTING REQUIREMENTS
TYPE: Any spill or discharge that meets or exceeds the Federal Reportable Quantity
VERBAL: Immediately, but not longer than 30 minutes
WRITTEN: As requested by the Agency
NOTE: As requested by the Agency

Atoka County LEPC Atoka, Oklahoma	(580) 889-2221

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Bryan County LEPC Durant, Oklahoma	(580) 924-3737
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Coal County LEPC Coalgate, Oklahoma	(580) 927-0107
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Creek County LEPC Bristow, Oklahoma	(918) 367-2252
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Hughes County LEPC Holdenville, Oklahoma	911 / (405) 379-7740

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Johnston County LEPC Tishomingo, Oklahoma	911 / (580) 371-2691

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Kay County (LEPC) Ponca City, Oklahoma	(580) 362-2517

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Lincoln LEPC Chandler, Oklahoma	911
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Noble County (LEPC) Perry, Oklahoma	(580) 336-3517
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Okfuskee County LEPC Okemah, Oklahoma	(918) 623-1234 / (918) 623-1122
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Payne County LEPC Stillwater, Oklahoma	(405) 372-4522 (405) 533-6875

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Pontotoc County LEPC Ada, Oklahoma	911 (580) 436-8055

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Seminole County LEPC Wewoka, Oklahoma	911 / (405) 382-9342

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Angelina County LEPC Lufkin, Texas	(936) 634-5413
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Cherokee County LEPC Rusk, Texas	(903) 683-2324
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Delta County LEPC Linden, Texas	(903) 756-5181
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Fannin County LEPC Bonham, Texas	(903) 640-8484

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Fannin Emergency Management Fannin County, Texas	(706) 632-2011

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Franklin County LEPC Mt. Vernon, Texas	(903) 537-4539

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Hardin County LEPC Kountze, Texas	(409) 246-5119
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Hopkins County LEPC Sulphur Springs, Texas	(903) 439-6217 op. 1
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Jefferson County Engineer Beaumont, Texas	(409) 835-8584
REPORTING REQUIREMENTS TYPE: VERBAL: In any emergency, contact the County Engineer by phone and inform him of the proposed emergency repairs. WRITTEN: As soon as practical, but no later than 48 hours after the start of emergency repairs, notify the County Engineer in writing of the emergency repairs effected, detailing the repairs and the reasons immediate action was required. NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Jefferson County LEPC Beaumont, Texas	(409) 835-8757

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Lamar County LEPC Paris, Texas	(903) 737-2400

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Liberty County LEPC Liberty, Texas	(936) 334-3129

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Nacogdoches County LEPC Nacogdoches, Texas	(936) 560-7755

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Orange County LEPC Orange, Texas	(409) 882-7895

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

Polk County LEPC Livingston, Texas	(936) 327-6826

REPORTING REQUIREMENTS
TYPE:
VERBAL: Courtesy Reporting.
WRITTEN:
NOTE:

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)

Rusk County LEPC Henderson, Texas	(903) 657-0326
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Smith County LEPC Tyler, Texas	(903) 590-2653
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

Upshur County LEPC Gilmer, Texas	(903) 843-4003
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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REQUIRED LOCAL NOTIFICATIONS (Cont'd)	
Wood County LEPC Quitman, Texas	(903) 763-2356
REPORTING REQUIREMENTS TYPE: VERBAL: Courtesy Reporting. WRITTEN: NOTE:	

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ADDITIONAL RESPONSE RESOURCES		
Planning and Incident Support		
COMPANY	**LOCATION**	**TELEPHONE**
National Response Corporation	3500 Sunrise Hwy Ste. T103 Great River, New York 11739	(800) 899-4672
Witt O'Brien's	Slidell, Louisiana	(985) 781-0804
ENSR	Fort Collins, Colorado	(800) 722-2440
Western Canadian Spill Services	Calgary, Alberta	(866) 541-8888
Saskatchewan Co-op Area 1 Chairman	Saskatchewan	(780) 573-7350
Saskatchewan Co-op Area 1 Alt. Chairman	Saskatchewan	(306) 387-6449
Saskatchewan Co-op Area 2 Chairman	Box 1132 Kindersley, Saskatchewan S0L 1S0	(306) 968-2503
Saskatchewan Co-op Area 2 Co-Chairman	Box 5 Coleville, Saskatchewan S0L 0K0	(306) 965-2731
Saskatchewan Co-op Area 2 Custodian	Saskatchewan	(306) 834-7898
Saskatchewan Co-op Area 3 Chairperson	Saskatchewan	(306) 773-0234
Saskatchewan Co-op Area 3 Secretary	Saskatchewan	(306) 773-9381
Saskatchewan Co-op Area 3 Custodian	Saskatchewan	(306) 672-3723
Saskatchewan Co-op Area 4&5 Chair	Saskatchewan	(306) 842-1818
Saskatchewan Co-op Area 4&5 Vice-Chair	Saskatchewan	(306) 842-3088
Saskatchewan Co-op Area 6 Call-out	Saskatchewan	(306) 791-5058
Aberdeen Flying Service	Aberdeen, South Dakota	(605) 225-1384
Advantage Flight Solutions	Reno, Nevada	(775) 852-3512
Aero Air, LLC	Hillsboro, Oregon	(503) 640-3711
Air Services Inc	Traverse City, Michigan	(888) 922-0406
Airwest Helicopters,	Glendale, Arizona	(623) 516-2790
American Jet Charter	Oklahoma City, Oklahoma	(405) 495-5453
Aviation Charter Inc	Duluth, Michigan	(800) 486-5387
Bemidji Aviation	Bimidji, Minnesota	(218) 751-1880
Blatti Aviation, Elwood, IL	Elwood, Illinois	(815) 423-5659
Brainerd Helicopter Service	Brainard, Minnesota	(218) 829-5484
Charter First	Marshall, Minnesota	(866) 776-6261
Concrod Helicopter Charters	Concord, New Hampshire	(800) 615-1655
Crow Executive Air	Millbury, Ohio	(800) 972-2769
Custom Air Charter	Greenville, Mississippi	(662) 334-6444
Duncan Aviation	Lincoln, Nebraska	(402) 475-2611
Elliott Aviation - Des Moines	Des Moines, Iowa	(800) 447-6711
Elliott Aviation - Moline	Moline, Illinois	(800) 447-6711

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ADDITIONAL RESPONSE RESOURCES (Cont'd)		
Planning and Incident Support		
COMPANY	**LOCATION**	**TELEPHONE**
Encore FBO, Sioux Falls, SD	Sioux Falls, South Dakota	(800) 888-1646
Executive Air	Bismark, North Dakota	(701) 258-5024
Executive Aircraft Charter	Lafayette, Louisiana	(866) 343-9940
Fargo Jet Center	Fargo, North Dakota	(701) 235-3600
Felts Field Aviation	Spokane, Washington	(509) 535-9011
First Wing Executive Air	Indianapolis, Indiana	(317) 293-6935
Frontline Aviation	Green Bay, Wisconsin	(800) 379-3359
Helimotion, LLC	Joliet, Illinois	(815) 725-9300
Hillsboro Aviation	Hillsboro, Oregon	(503) 648-2831
HSE Integrated	Brooks, Alberta	(888) 346-8260
JBI Helicopter Service	Pembroke, New Hampshire	(603) 225-3134
Jet Linx	Omaha, Nebraska	(402) 422-0393
Leading Edge Aviation	Bend, Oregon	(541) 383-8825
MaxAir Inc	Appleton, Wisconsin	(800) 833-1544
Midwest Corporate Aviation	Wichita, Kansas	(316) 636-9738
North Country Aviation	Gaylord, Michigan	(800) 959-1829
North Country Heliflite	North Clarendon, Vermont	(518) 361-1380
PHI Helicopters	Lafayette, Louisiana	(337) 235-2452
Rhinelander Flying Service	Wausau, Wisconsin	(715) 365-3456
Sharkeys Helicopters	West Lebanon, New Hampshire	(603) 298-8728
Silver Hawk Aviation	Lincoln, Nebraska	(800) 479-5851
Tri State Aero	Evansville, Indiana	(800) 473-2904
Tulip City Air Service	Holland, Michigan	(800) 748-0515
Ultra Air, LLC	Omaha, Nebraska	(402) 345-7372
Vermont Helicopter Charters	Burlington, Vermont	(866) 224-8830
Worcester Helicopter Charters	Worcester, Massachusetts	(800) 226-1116
Quantum Murray	100-3600 Viking Way Richmond, B.C., V6V1N6	(877) 378-7745
Alberta Coop Area 2U Custodian	Hardisty, Alberta	(780) 888-3845
Albert Coop Area 1S Regional Custodian	Lethbridge, Alberta	(403) 329-0427
Alberta Coop Area 1S Equip. Custodian	Brooks, Alberta	(403) 362-6551
Euroway Industrial Svc Co. Ltd	Winnipeg, Manitoba	(204) 661-0500
Titus Regional Medical Center Ambulance Service	Titus County, Texas	(903) 577-6079

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FIGURE 2.6

POSSIBLE COMMAND POST LOCATIONS

TRANSCANADA COMMAND POSTS			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Hardisty PS/Lakesend PS	R&R Hotel 4744-49th Street Hardisty, Alberta Canada Box 251 Hardisty AB TOB 1VO	(780) 888-0004	Meeting Room accommodates 40 people
Lakesend PS/Monitor PS	La Biche Inn PO Box 321 Lac La Biche, AB T0A 2C0, Canada	(780) 623-4427	Meeting Room accommodates 30 people
Monitor PS/Oyen PS	Super 8 - Provost 3611 57th Avenue Provost, AB T0B 3S0, Canada	(780) 753-2255	Meeting Room accommodates 55 people
Monitor PS/Oyen PS	Lucky Lake Hotel Main St Lucky Lake, SK S0L 1Z0, Canada	(306) 858-2008	Meeting Room accommodates 40 people
Oyen PS/Bindloss PS	None Available		
Blindloss PS/Cabri PS	Super 8 Motel Junction of Hwy 9 & 41 Oyen, AB T0J 2J0, Canada	(403) 664-3010	Meeting Room accommodates 65 people
Blindloss PS/Cabri PS	Swift Current Travelodge 605 North Service Road, East Swift Current, SK S9H 3T8, Canada	(306) 773-3101	Meeting Room accommodates 20 people
Cabri PS/Herbert PS	Super 8 Motel 405n Service Rd E Swift Current, SK S9H 0A1, Canada	(306) 778-6088	Meeting Room accommodates 20 people
Cabri PS/Herbert PS	Best Western Inn 105 George St W Swift Current, SK S9H 0K4, Canada	(306) 773-4660	Meeting Room accommodates 35 people
Herbert PS/Caron PS	Howard Johnson Inn - Swift Current 1150 South Service Road East Swift Current, SK S9H 3X6, Canada	(306) 773-2033	Meeting Room accommodates 55 people
Herbert PS/Caron PS	Days Inn Hwy 1 E Swift Current, SK S9H 3X6, Canada	(306) 773-4643	Meeting Room accommodates 250 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Caron PS/Regina PS	Comfort Inn & Suites 155 Thatcher Drive W. Moose Jaw, SK S6J 1M1, Canada	(306) 692-2100	Meeting Room accommodates 40 people
Caron PS/Regina PS	Hotel Saskatchewan Radisson Plaza 2125 Victoria Avenue Regina, SK S4P 0S3, Canada	(306) 522-7691	Meeting Room accommodates 100-800 people
Regina PS/Kendal PS	Best Western 7 Oaks Inn 777 Albert St Regina, SK S4R 2P6, Canada"	(306) 757-0121	Meeting Room accommodates 150 people
Regina PS/Kendal PS	Holiday Inn Express Hotel & Suites Regina 1907 11th Avenue Regina, SK S4P 0J2, Canada"	(877) 863-4780	Meeting Room accommodates 50 people
Kendal PS/Grenfell PS	The Prince William Suites Hotel Box 1030 21 Mall Road, Melville, SK S0A 2P0, Canada	(306) 728-4546	Meeting Room accommodates 300 people
Kendal PS/Grenfell PS	Holiday Inn Hotel & Suites Regina 1800 Prince Of Wales Drive Regina, SK S4Z 1A4, Canada	(877) 863-4780	Meeting Room accommodates 80 people
Grenfell PS/Moosomin PS	Katepwa Beach Resort Hotel Lebret, SK S0G 2Y0 Canada	(306) 332-4696	Meeting Room accommodates 30 people
Grenfell PS/Moosomin PS	Whitewood Inn Hwy 1 & 9 Whitewood, SK S0G 5C0, Canada	(306) 735-2651	Meeting Room accommodates 250 people
Moosomin PS/Rapid City PS	The Russell Inn Hwy 16 & 83 MB R0J 1W0, Canada	(204) 773-2186	Meeting Room accommodates 150 people
Moosomin PS/Rapid City PS	Royal Oak Inn & Suites Brandon 3130 Victoria Avenue Brandon, MB R7B 0N2, Canada	(204) 728-5775	Meeting Room accommodates 50 people
Rapid PS/Portage La Prairie PS	Canadian Inn 150 5th Street Brandon, MB R7A 3K4, Canada	(204) 727-6404	Meeting Room accommodates 200 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Rapid PS/Portage La Prairie PS	Super 8 Portage La Prairie MB Saskatchewan Avenue West Portage la Prairie, MB R1N, Canada	(204) 857-8883	Meeting Room accommodates 20 people
Portage La Prairie PS/Carman PS	Days Inn Highway 1 Quill Trail Portage la Prairie, MB R1N 3C3, Canada	(204) 857-9791	Meeting Room accommodates 50 people
Portage La Prairie PS/Carman PS	Days Inn & Suites-Winkler 395 Boundary Trail Winkler, MB R6W 4B1, Canada	(204) 325-8888	Meeting Room accommodates 40 people
Carman PS/Haskett PS	Super 8 Motel 400 Main St S MB R0G 1K0, Canada	(204) 746-6879	Meeting Room accommodates 30 people
Carman PS/Haskett PS	Heartland Inn 851 Main St Winkler, MB R6W 2L8, Canada	(204) 325-4381	Meeting Room accommodates 300 people
Haskett PS/Edinburg PS	Holiday Mountain Ski Resort & Golf Course Holiday Mountain La Riviere, MB R0G 1A0, Canada	(204) 242-2172	Meeting Room accommodates 70 people
Haskett PS/Edinburg PS	Cedar Inn Steak House & Motel 502 Division Ave S Cavalier, ND 58220	(701) 265-8341	Meeting Room accommodates 50 people
Edinburg PS/Niagara PS	Forestwood Inn 504 Sunset Ave Walhalla, ND 58282	(701) 549-2651	Meeting Room accommodates 30 people
Niagara PS/Luverne PS	Holiday Inn Express Hotel & Suites Grand Forks 4051 32nd Ave South Grand Forks, ND 58201	(877) 863-4780/ (701) 772-7700	Meeting Room accommodates 30 people
Niagara PS/Luverne PS	Quality Inn & Suites 507 25th St. SW Jamestown, ND 58401	(701) 252-3611	Meeting Room accommodates 325 people
Luverne PS/Fort Ransom PS	Governors Inn & Conference Center 2050 Governors Dr Casselton, ND 58012	(701) 347-4524	Meeting Room accommodates 450 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Luverne PS/Fort Ransom PS	America Inn 280 Wintershow Rd SW Valley City, ND 58072	(701) 845-5551	Meeting Room accommodates 60 people
Fort Ransom PS/Ludden PS	Holiday Inn Express Jamestown 803 20th St. S.W. Jamestown, ND 58401	(701) 251-2131	Meeting Room accommodates 25 people
Fort Ransom PS/Ludden PS	Ramada Aberdeen 2727 6th Avenue SE Aberdeen, SD 57401	(605) 225-3600	Meeting Room accommodates 25 people
Ludden PS/Ferney PS	Best Western-Ramkota Hotel 1400 8th Ave NW Aberdeen, SD 57401-2602	(605) 229-4040	Meeting Room accommodates 150 people
Ludden PS/Ferney PS	Ramada 2727 6th Ave SE Aberdeen, SD 57401 US	(605) 225-3600	Meeting Room accommodates 400 people
Ferney PS/Carpenter PS	Holiday Inn Express Hotel & Suites Aberdeen 1330-1399 7th Ave SE Aberdeen, SD 57401	(877) 863-4780/ (605) 725-4000	Meeting Room accommodates 100 people
Ferney PS/Carpenter PS	Country Inn Suites Watertown Reviews 100 S Maple Watertown, SD 57201	(605) 886-8900	Meeting Room accommodates 70 people
Carpenter PS/Roswell PS	Best Western Of Huron 2000 Dakota Ave S Huron, SD 57350-4027	(605) 352-2000	Meeting Room accommodates 50 people
Carpenter PS/Roswell PS	Super Deluxe Inn & Suites 288 US Highway 14 W De Smet, SD 57231	(605) 854-9388	Meeting Room accommodates 100 people
Roswell PS/Freeman PS	Days Inn Mitchell 1506 South Burr St. Mitchell, SD 57301	(605) 996-6208	Meeting Room accommodates 50 people
Roswell PS/Freeman PS	Best Western Ramkota Hotel Sioux Falls 3200 West Maple Street Sioux Falls, SD 57107	(605) 336-0650	Meeting Room accommodates 700-1500 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Freeman PS/Hartington PS	Cameron Inn 131 E Main St Canistota, SD 57012	(605) 296-3555	Meeting Room accommodates 25 people
Freeman PS/Hartington PS	Best Western Kelly Inn 1607 East Highway 50 Route Yankton, SD 57078	(605) 665-2906	Meeting Room accommodates 125 people
Hartington PS/Stanton PS	Holiday Inn Express Hotel & Suites Vermillion 1200 N. Dakota St. Vermillion, SD 57069	(877) 863-4780/ (605) 624-7600	Meeting Room accommodates 100 people
Hartington PS/Stanton PS	Holiday Inn Express Hotel & Suites Norfolk 920 South 20th Street Norfolk, NE 68701	(877) 863-4780/ (402) 379-1524	Meeting Room accommodates 200 people
Stanton PS/David City PS	New World Inn & Conference Center 265 33rd Ave Columbus, NE 68601	(402) 564-1492	Meeting Room accommodates 1000 people
Stanton PS/David City PS	Holiday Inn Express Hotel & Suites Columbus 524 E 23rd St Columbus, NE 68601	(877) 863-4780/ (402) 564-2566	Meeting Room accommodates 200 people
David City PS/Wilber PS	Sleep Inn & Suites 303 23rd St Columbus, NE 68601	(402) 562-5200	Meeting Room accommodates 35 people
David City PS/Wilber PS	Holiday Inn Lincoln-Downtown 141 N. 9th St. Lincoln, NE 68508	(877) 863-4780/ (402) 475-4011	Meeting Room accommodates 500-1000 people
Wilbur PS/Steele City PS	Embassy Suites Hotel Lincoln 1040 P Street Lincoln, NE 68508	(402) 474-1111	Meeting Room accommodates 500-1000 people
Wilbur PS/Steele City PS	Hotel Wilber 203 S Wilson St Wilber, NE 68465	(402) 821-2020	Meeting Room accommodates 30 people
Steele City (to State Line)	Travelers Lodge 3500 North 6th Street Beatrice, NE 68310	(402) 223-4074	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Steele City (to State Line)	Holiday Inn Express Hotel & Suites Beatrice 4005 N 6th Street Beatrice, NE 68310	(402) 228-7000	Meeting Room accommodates 350 people
State Line to Seneca	Hiawatha Lodge 101 Lodge Rd Hiawatha, KS 66434	(785) 742-7401	Meeting Room accommodates 50 people
State Line to Seneca	Oak Tree Inn 1127 Pony Express Hwy # A Marysville, KS 66508	(785) 562-1234	Meeting Room accommodates 40 people
Seneca PS/Severance PS	Marysville Surf Motel 2105 Center Street Marysville, KS 66508	(785) 562-2354	Meeting Room accommodates 30 people
Seneca PS/Severance PS	Big Lake Resort Big Lake State Park 200 Lake Shore Drive Big Lake, MO 64437-4477	(660) 442-5432	Meeting Room accommodates 35, can use dining hall which adds an additional 100 people
Severance PS/Turney PS	Days Inn - St. Joseph 4312 Frederick Ave. Saint Joseph, MO 64506	(816) 279-1671	Meeting Room accommodates 40 people
Severance PS/Turney PS	Crowne Plaza Hotel Kansas City Downtown 1301 Wyandotte St. Kansas City, MO 64105	(888) 444-0401/ (816) 474-6664	Meeting Room accommodates 200-250 people
Turney PS/Tina PS	Radisson Hotel Kansas City Airport 11828 NW Plaza Cir Kansas City, MO 64153	(816) 464-2423	Meeting Rooms accommodates 200 people
Turney PS/Tina PS	Comfort Inn 1803 Comfort Lane Cameron, MO 64429	(816) 632-5655	Meeting Room accommodates 30 people
Tina PS/Salisbury PS	Comfort Inn Marshall Station 1356 W. College Ave. Marshall, MO 65340	(660) 886-8080	Meeting Room accommodates 25 people
Tina PS/Salisbury PS	Holiday Inn Express Hotel & Suites 1801 West Outer Road Moberly, MO 65270	(877) 863-4780/ (660) 269-9700	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Salisbury PS/Centralia PS	Country Inns & Suites 817 N Keene St Columbia, MO 65201	(573) 445-8585	Meeting Room accommodates 50 people
Centralia PS/Middletown PS	Holiday Inn - Wentzville 1175 Technology Drive O'Fallon, MO 63368	(636) 300-4844	5 Meeting Rooms accommodates 10-250 people
Centralia PS/Middletown PS	Days Inn Conference Center Columbia 1900 I-70 Drive SW Columbia, MO 65203	(573) 445-8511	Accommodates 400 people
Middletown PS/Saint Paul PS	Comfort Inn 425 E. Veterans Memorial Pkw Warrenton, MO 63383	(636) 456-6000	Meeting Room accommodates 25 people
Middletown PS/Saint Paul PS	Comfort Inn & Suites - O'Fallon/St Charles 100 Comfort Inn Court O'Fallon, MO 63366	(636) 696-8000	Meeting Room accommodates 35 people
Saint Paul PS/Hartford PS	Holiday Inn Express St. Louis Airport - Riverport 13735 Riverport Drive St. Louis, MO 63043	(314) 298 3400	Meeting 120 Classroom Style
Saint Paul PS/Hartford PS	Best Western Airport Plaza Inn & Conf. Center 4530 N. Lindbergh Blvd. Bridgeton, MO 63044	(314) 731-3800	Accommodates 300 people
Hartford PS/Pierron PS	Mariners Village Resort 1 Resort Dr Carlyle, IL 62231	(618) 594-7666	TBD
Hartford PS/Pierron PS	Holiday Inn Express Highland 20 Central Blvd. Highland, IL 62249	(877) 786-9480/ (618) 651-1100	TBD
Pierron PS/Patoka Terminal	Holiday Inn Express Hotel & Suites 21 Mattes Ave Vandalia, IL 62471	(618) 283-0010	Meeting Room
Pierron PS/Patoka Terminal	Ramada 2707 Veterans Ave. Vandalia, IL, 62471	(618) 283-1400	Meeting Room accommodates 30 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Steel City PS/ Hope PS	Herington Inn & Suites 565 Highway 77 Herington, KS 67449	(785) 258-3300	Meeting Room accommodates 20 people
Steel City PS/ Hope PS	Holiday Inn Express Hotel & Suites 110 E. Lafayette Abilene, KS 67410	(877) 863 4780/ (325) 675-9800	Meeting Room accommodates 20 people
Hope PS/ Rock PS	Hampton Inn Derby 1701 Cambridge Street Derby, KS 67037	(316) 425-7900	Meeting Room accommodates 30 people
Hope PS/ Rock PS	Holiday Inn Express Hotel & Suites Andover East 54 Wichita 600 S Allen St. Andover, KS 67002	(877) 863-4780/ (316) 733-8833	Meeting Room accommodates 40 people
Rock PS/ Ponca City PS	Comfort Inn & Suites 3101 N. 14th Street Ponca City, OK 74604	(580) 765-2322	Meeting Room accommodates 30 people
Rock PS/ Ponca City PS	Holiday Inn Express Hotel & Suites Ponca City 2809 North 14th St. Ponca City, OK 74601	(877) 863-4780/ (580) 762-3700	Meeting Room accommodates 100 people
Moosomin PS/Rapid City PS	Canalta Hotel 405 Mtn. Street Moosomin, SK Canada	(306) 435-3044	Meeting Room accommodates 40 ppl
Severence PS/Turney PS	Stoney Creek Inn 1201 North Woodbine Road St. Joseph, MO 64506	(816) 901-9600	TBD
Cushing South PS/Cromwell PS	Holiday Inn Express Hotel & Suites Okmulgee 2780 N Woods Dr, Okmulgee, OK 74447	(918) 756-0100	Meeting Room accommodates 30-40 people
Cromwell PS/Tupelo PS	Comfort Suites McAlester 650 S George Nigh Expy, Mcalester, OK 74501	(918) 302-0001	Meeting Room accommodates 150 people
Tupelo PS/Bryan PS	Hampton Inn and Suites 3199 Shamrock Lane Durant, OK 74701	(580) 924-0300	Meeting Room accommodates 25-35 people

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TRANSCANADA COMMAND POSTS (Cont'd)			
Pump Station to Pump Station	**Hotel Name**	**Contact Numbers**	**Accommodations**
Bryan PS/Delta PS	Hampton Inn Paris 3563 NE Loop 286 Paris, Texas 75460	(903) 784-6536	Meeting Room accommodates 20 people
Delta PS/Winnsboro PS	Holiday Inn Express & Suites Sulphur 421 Industrial Dr E Sulphur Springs, TX 75482	(903) 885-6851	Meeting Room accommodates 75 people
Winnsboro PS/Lake Tayler PS	Hampton Inn Kilgore 3109 N Highway 259 N Kilgore, TX 75662	(903) 983-3300	Meeting Room accommodates 55 people
Lake Tayler PS/Lufkin PS	Quality Inn & Suites Nacogdoches 3400 South Street Nacogdoches, TX 75964	(936) 564-2800	Meeting Room accommodates 150 people
Lufkin PS/Corrigan PS	Courtyard Lufkin 2130 South 1st Street Lufkin, TX 75901	(936) 632-0777	Meeting Room accommodates 75 people
Corrigan PS/Liberty PS	Hampton Inn Livingston 1510 Us Highway 59 South Loop Livingston, TX 77351	(936) 327-2300	Meeting Room accommodates 10-12 people
Liberty PS/End of Pipeline	Holiday Inn Hotel & Suites Beaumont Plaza 3950 I-10 South & Walden Rd Beaumont, TX 77705	(409) 842-5995	Meeting Room accommodates 150 people

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3.0 RESPONSE ACTIONS

3.1 Initial Response Actions

- Initial Response
- Line Rupture Or Leak (Piping, Valve Or Manifold)
- Fire (Minor, Major, Explosion)
- Severe Thunderstorm (Flash Flood/Landslide)
- Tornado/Straight Line Winds
- Earthquake
- Severe Winter Storm
- Volcanic Eruptions
- Security Incidents
- Abnormal Pipeline Operations
- Entrained Oil In Soil
- Release To Groundwater
- Hurricane

3.2 Documentation of initial Response Actions

3.3 Oil Containment, Recovery and Disposal/Waste Management

3.4 Storage/Disposal

3.5 Sampling and Waste Analysis Procedures

3.6 Safety Awareness

3.7 Emergency Medical Treatment and First Aid

Figure 3.1 Spill Classification

Figure 3.2 Product Specific Response Considerations

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3.1 INITIAL RESPONSE ACTIONS

Initial response actions are those taken by local personnel immediately upon becoming aware of a discharge or emergency incident, before the Initial Response Team (described in Section 4.0) is formed and functioning. Timely implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

The pages that follow discuss initial response actions for a variety of emergencies that have the possibility of occurring. These emergencies are discussed in the order listed below:

- Initial Response
- Line Rupture Or Leak (Piping, Valve Or Manifold)
- Fire (Minor, Major, Explosion)
- Severe Thunderstorm (Flash Flood/Landslide)
- Tornado/Straight Line Winds
- Earthquake
- Severe Winter Storm
- Volcanic Eruptions
- Security Incidents
- Abnormal Pipeline Operations
- Entrained Oil In Soil
- Release To Groundwater
- Hurricane

It is important to note that **these actions are intended only as guidelines** . The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note, that **without exception, employees and public safety is first priority.**

The first Company person on scene will function as the Incident Commander (IC) until relieved by an authorized supervisor who will assume the IC position. Transfer of command will take place as more senior management respond to the incident. The role of IC will typically be assumed and retained by area management.

The person functioning as **Incident Commander** during the initial response period **has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.**

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INITIAL RESPONSE ACTIONS - SUMMARY PERSONNEL AND PUBLIC SAFETY IS FIRST PRIORITY			
RESPONSE TIMES*			
US DOT Tier	1	2	3
High Volume Area	6 HR	30 HR	54 HR
All Other Areas	12 HR	36 HR	60 HR

CONTROL

- Eliminate sources of ignition
- Isolate the source of the discharge, minimize further flow

NOTIFY

- Make internal and external notifications
- Activate local Company personnel as necessary
- Activate response contractors and other external resources as necessary

CONTAIN

- Begin spill mitigation and response activities
- Monitor and control the containment and clean-up effort
- Protect the public and environmental sensitive areas

* Response resources and personnel available to respond within time specified after discovery of a worst case discharge per US DOT 49 CFR Part 194.115

In addition to the potential emergency events outlined in this Section, the Company has identified several "abnormal operations" that could be expected in the pipeline facilities. The Company has defined the events and established procedures to identify, eliminate or mitigate the threat of a worst case discharge due to these events. In compliance with 49 CFR 195.402(d), these procedures are defined in the Company's Operations Manual.

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Company First Responder / On Scene

- Verify emergency exists.
- Follow the appropriate steps outlined in the "Specific Incident Response Checklist" (Figure 3.1) and the "Product Specific Response Considerations" (Figure 3.2).
- Notify the Keystone Oil Control Center of the incident.
- Contact / Utilize local emergency services, as necessary (police, fire, medical).
- Follow TransCanada's Working Alone Procedures (EDMS No. 003743627).

Regional Emergency Operation Center

- Ensure local emergency agencies have been contacted (police, fire, medical).
- Assign personnel immediately to the discharge site to assist with emergency response (QI) and spill containment.
- Activate additional company and response contractors to site as situation demands.
- Confirm safety aspects at site, including need for Personal Protective Equipment (PPE), removal of sources of ignition, and potential need for evacuation.
- Evaluate the severity, potential impact, safety concerns and response requirements based on the initial data provided by the First Person On-scene. Refer to the spill response evaluation flowchart in this section.
- Establish communications with the Corporate Emergency Operations Center.
- Perform notifications using Figure 2.1, as appropriate.

Area Management

- Proceed to spill site and coordinate response and clean-up operations.
- Assume the role of Incident Commander.
- Coordinate/perform activation of additional spill response contractors, as the situation demands (telephone reference is provided in Figure 2.5).
- Direct containment, dispersion, and/or clean-up operations in accordance with the "Product Specific Response Considerations" provided in Figure 3.2.
- Complete the "Product Release Report" provided in Appendix F.

Local Company Personnel

- Assigned personnel will immediately respond to a discharge from the Pipeline or Facility, as the situation demands.
- Assist as directed at the spill site.
- Assume Incident Management Team roles as deemed by Incident Commander

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Range of Reported Oil Thicknesses Tool

	Barely Discernible	Silvery Sheen	Rainbow Colors	Darkening Bands of Color	Dull Colors	Light Brown
Reported average threshold, Microns	0.09	0.1	0.6	0.9	2.7	8
Range, microns	0.04 - .016	0.05 - 0.18	0.1 - 1.0	0.1 - 2.5	1.0 - 5.5	2.0 - 15.0

Source ExxonMobil Research and Engineering Company, Oil Spill Response Field Manual. Revised 2008

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FIGURE 3.1

SPILL CLASSIFICATION

Spills/Releases to Environment:

Minor

- A spill/release, onsite, that poses no adverse affect to the environment nor impact neither to a water body nor to groundwater. The spill may or may not be reportable to a regulatory agency.

Serious

- A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment but no impact to a water body nor to groundwater.

Major

- A spill/release, onsite or off-site/off-right-of-way, that has the potential to pose an adverse affect to the environment including an impact to a water body (water sources or otherwise) or rual water groundwater system.

Critical

- Emergency response for containment or clean up is required. A spill/release, onsite or off-site/off-right-of-way, that poses an adverse affect to the environment including an impact to a water body (drinking water source or otherwise) or rural groundwater systems.

Complaints - Health & Safety:

Minor

- Unverified community complaint from a landowner, police, fire, municipality, or a ministry.
- Verified employee complaint where an investigation is required to obtain resolution.

Serious

- Verified community complaint likely to cause danger/risk to the public, employees or TransCanada facilities.

Major

- Employee work refusal based on belief of unhealthy or unsafe work conditions.

Critical

- Regulatory body notified of employee complaint (by employee) and investigates employee work refusal.

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SPECIFIC INCIDENT RESPONSE CHECKLIST

Remember, without exception, personnel safety is the first priority, excessive exposure to the vapor and liquid stages of the spilled product should be avoided.

The following figures describe initial response activity for specific types of incidents. They are intended as guidelines. Each individual responsible for a response action must evaluate each action to ensure Personal Safety prior to conducting that action.

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Initial Response

All Roles

- Take appropriate personal protective measures.
- Conduct vapour monitoring.
- Complete hazard assessment.
- Secure site.
- Call for medical assistance if an injury has occurred.
- Notify Keystone Oil Control Center and area management of the incident.
- Eliminate possible sources of ignition in the near vicinity of the spill.
- Advise personnel or public in the area of any potential threat and/or initiate evacuation procedures.
- Identify/isolate the source and minimize the loss of product.
- Restrict access to the spill site and adjacent area as the situation demands. Take additional steps necessary to minimize any threat to health and safety.
- Verify the type of product and quantity released. (Material Safety Data Sheet(s) are provided in Appendix G).

All personnel are reminded that outsiders other than emergency services will not be allowed in the area during the time of an emergency and that statements issued to the media or other interested parties should be given by designated Company Management. Be courteous with media representatives and direct them to the designated spokesperson.

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Line Rupture or Leak (Piping, Valve or Manifold)

Oil Control Center

- Shut down pipeline.
- Close upstream and downstream block valves.
- Notify On-call regional designate to attend site as a First Responder.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
    - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
    - (403) 920-7859
    - (800) 608-7859

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Fire (Minor, Major, Explosion)

Oil Control Procedures

Be aware of Fire Weather conditions.

- Watch - Critical fire weather conditions are forecast to occur.
- Red Flag Warning - Critical Fire weather conditions are either occurring or will shortly.

Individual Discovering the Fire (All Employees)

- Call the Local Emergency Response Agency (911).
- Notify Oil Control Center (this should be the 1st notification completed in the event that it is a remote location with no immediate impacts to life safety).
- Notify Area Management.
- Complete all First Responder responsibilities and initially assume the role of TransCanada's Incident Commander.
- Ensure ongoing communications with Keystone Oil Control Center.
- Follow the instructions outlined in section 3.1 Initial Response and the Responsibilities outlined in TransCanada's First Responder checklist.

Note: Pipeline right-of-way are used by Firefighters as a fire break (barrier) to isolate fires and prevent them from growing in size. Right-of-ways are commonly used to access to fire areas. Many times Firefighters will need to increase the size of the cleared space over the Pipeline right-of-way to prevent the fire from leaping from tree top to tree top. To do this, heavy equipment may be used to quickly increase the amount of cleared space between the fire area and unignited forest. The following are steps to consider when working with the local authority on creating these fire breaks.

- Use your best judgment to ensure the safety of staff, fire ground workers and the public when determining if this activity is safe to perform;
- Call and confirm with Asset Reliability if this activity is safe and implement any instructions provided by Asset Reliability. Asset Reliability's role is to provide directions to protect the health and safety of those involved as well as pipeline integrity;
- Be physically on site to coordinate the activities related to any pipeline crossings;
- Stake the pipeline to identify the location of the pipe(s) in the right-of-way.
- First preference is to use already existing pipeline crossing areas;
- Gather the appropriate information to complete a formal pipeline crossing agreement. In Canada, send required information to the Land Department in Calgary.
- Notify the Oil Central Center and area management.
- Shut off pumps.
- Coordinate with the Keystone Oil Control Center to close appropriate valves to isolate in the vicinity of the fire, if necessary.
- Isolate Pump Station from Mainline.
- Evacuate site as safety considerations dictates.
- Notify the Oil Central Center of evacuation route and final destination.
- Notify the Oil Central Center of safe arrival.
- Inspect pump station, equipment and controls after the fire is extinguished and safe to return.
- Evaluate pipeline, monitoring or control systems for evidence of heat damage.
- Notify engineering to conduct further investigation if damage is found.
- Make appropriate repairs and return Pipeline to service.

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Third Party Call In Confirmation of Fire

This procedure applies to a pipeline facility integrity threat identified received via third party thru TransCanada Emergency Line (PDL 800-447-8066) or direct call to Keystone Oil Control Center reporting a fire at or adjacent to Keystone Pipeline Facilities or ROW.

If the third party indicates a pipeline facility (Pump Station/QMU Building/ESB Building etc.) is on fire or in jeopardy of catching fire the controller will do the following:

- Should the call come from PDL, confirm receipt of third party call-in contact information. If third party call-in comes direct to Oil Control Center please fill out third party call-in form Third Party Template.
- Once confirming all information with the caller and it is clear that the pipeline facilities are at risk, implement the following steps:
  - Shutdown and Isolate the affected pump station OR
  - Confirm, checking with leak triggers and discussion with third party, that the fire is not due to a pipeline failure.
- Once confirmed that the source is not us, keep the pipeline running.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

Aerial Pipeline Patrol Confirmation of Fire

If the Oil Control Center receives a call from the Aerial Pipeline Patrol indicating a fire on or adjacent to Keystone Pipeline ROW/Facilities, the controller's response will be as follows:

If the pilot/observer indicates a pipeline facility (Pump Station/QMU Building/ESB Building etc.) is on fire or in jeopardy of catching fire the controller will do the following:

- Once confirming all information from the pilot/observer is clear that the pipeline facilities are at risk.
- Shutdown and Isolate the affected pump station.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database

If the pilot/observer indicates a fire on or adjacent to our Pipeline ROW, the controller will do the following:

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- Confirm, checking with leak triggers and discussion with third party, that the fire is not due to a pipeline failure.
- Once confirmed that the source is not us keep the pipeline running.
- Notify On-call regional designate to investigate as a First Responder and provide further guidance.
- Initiate Regional EOC Manager Notification once incident is confirmed by First Responder.
- Initiate Calgary EOC Manager Notification and pass on Regional EOC contact Information.
- Notify Oil Control Center On-call designate.

Company Employee Confirmation of Fire

If the integrity threat is confirmed by a TransCanada Employee that has been dispatched as a First Responder to a third party call-in of a fire, at or adjacent to Keystone Pipeline Facilities or ROW, the controller's response will be as follows:

- Confirm isolation of affected area, including valve positions with Regional personnel and commence further isolation or pipeline shutdown strategy with Regional personnel as required.
- Should the recommendation from the field be to shutdown the pipeline, the controller is to do a controlled shutdown and isolate as per Pipeline Isolation and Segmentation Standards
- Confirm EMS has been initiated and Calgary EOC is active. Continue Monitoring pressure profiles using Supervisory Control and Data Acquisition (SCADA) / Leak Detection System (LDS).
- Ensure all receipt and delivery interconnects are notified and updated as required.
- Notify Oil Control Center On-call designate.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

TransCanada Gas Conversion Pipe ROW Rupture/Fire

This procedure applies to a Keystone Pipeline integrity threat from an adjacent TransCanada Gas Pipeline rupture/fire in the conversion Pipeline ROW. The Conversion Pipeline ROW extends from Burstall Pigging Station to Elm Creek Pigging Station.

In the Event that the controller receives a suspected or a confirmed notification of a TransCanada Gas Pipeline rupture/fire adjacent to Keystone Oil Pipeline, the controller is to do the following:

- Confirm thru SCADA/LDS that pressures and flow rates are steady and that no other leak triggers are present.
- If no other leak triggers are present, the controller is to drive Keystone Pipeline to safe discharge limits and continue running.
- Notify On-call designate/first responder that the Keystone Pipeline is still running and we will await their direction once they arrive on scene.
- First responder will instruct the controller to shutdown or continue running once on scene and the integrity of Keystone Pipeline has been assessed.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.

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- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

If one or more leak triggers exist, the controller is to initiate an Emergency Pipeline Shutdown and isolate as per Pipeline Isolation and Segmentation Standards

- Notify On-call designate/first responder that the Keystone Pipeline has been shutdown and we will await their direction once they arrive on scene.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Notify Oil Movements Scheduling.
  - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

TransCanada Gas Conversion Pipe Shared Pump Stat

This procedure applies to a Keystone Pipeline integrity threat from an adjacent TransCanada Gas Pipeline rupture/fire at a shared pump station . The Shared Pump Stations include Cabri, Herbert, Caron, Regina, Kendall, Grenfell, Moosomin, Rapid City and Portage La Prairie.

In the event that the suspected or confirmed TransCanada Gas Pipeline rupture/fire occurs at a shared pump station facility, the controller is to do the following:

- Confirm thru SCADA/LDS that pressures and flow rates are steady and that no other leak triggers are present.
- If no other leak triggers are present, the controller is to isolate the pump station from the mainline and drive Keystone Pipeline to safe discharge limits and continue running.
- Notify On-call designate/first responder that the Keystone Pipeline is still running and we will await their direction once they arrive on scene.
- First responder will instruct Keystone Pipeline Operator to shutdown or continue running once on scene and the integrity of Keystone Pipeline has been assessed.
- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
  - (403) 920-7859
  - (800) 608-7859

If one or more leak triggers exist, the controller is to initiate an Emergency Pipeline Shutdown and isolate as per Pipeline Isolation and Segmentation Standards

- Notify On-call designate/first responder that the Keystone Pipeline has been shutdown and the pump station has been isolated and we will await their direction once they arrive on scene.

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- Notify Oil Control Center On-call designate.
- Confirm EMS has been initiated and Regional/Calgary EOC is active. Continue monitoring pressure profiles using SCADA/LDS.
- Notify Oil Movements Scheduling.
    - During Business /After hours - Callout Database
- Should media inquiries be received directly in the Oil Control Center, inform callers that all media inquiries are to be referred to our Media Relations Representative at the following Phone Numbers:
    - (403) 920-7859
    - (800) 608-7859

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Severe Thunderstorm (Flash Flood/Landslide)

Severe Thunderstorm (Flash Flood/Landslide)

Thunderstorms are a year round occurrence with lightning a major threat. The potential of flash flooding is also possible when one area is affected for an extended period.

- Be aware of changing weather conditions.
  - Severe Thunderstorm Watch - Conditions are favorable to the development of thunderstorms.
  - Severe Thunderstorm Warning - A severe thunderstorm has been observed or is imminent.
  - Flash Flood Watch- Flash flooding is possible within 6 hours after heavy rains have ended.
  - Flash Flood Warning - Flash flooding is occurring or imminent.
- Terminate outdoor work when lightning is occurring and move to shelter.
- Avoid areas subject to sudden flooding until the thunderstorm passes.
- Evaluate the situation after weather event.
  - Does standing water prevent visual inspection?
  - Have flood waters damaged the Pipeline?
  - Have flood waters exposed buried piping?
  - Has soil shifted that could lead to a landslide?
- Evaluate the accessibility of pipeline facilities that may be in jeopardy, such as valve settings, which are needed to isolate water crossings or other sections of a pipeline.
- Extend regulator vents and relief stacks above the level of anticipated flooding, as appropriate.
- Coordinate with emergency and spill responders on pipeline location and condition. Provide maps and other relevant information to such responders.
- Coordinate with other pipeline operators in the flood area and establish emergency response centers to act as a liaison for pipeline problems and solutions.
- Deploy personnel so that they will be in position to take emergency actions, such as shut down, isolation, or containment.
- Determine if facilities that are normally above ground (e.g., valves, regulators, relief sets, etc.) have become submerged and are in danger of being struck by debris.
- Perform frequent patrols, including appropriate overflights, to evaluate right-of-way conditions at water crossings during flooding and after waters subside. Determine if flooding has exposed or undermined pipelines as a result of new river channels cut by the flooding or by erosion or scouring.
- Perform surveys to determine the depth of cover over pipelines and the condition of any exposed pipelines, such as those crossing scour holes. Where appropriate, surveys of underwater pipe should include the use of visual inspection by divers or instrumented detection. Information gathered by these surveys should be shared with affected landowners. Agricultural agencies may help to inform farmers of the potential hazard from reduced cover over pipelines.
- Ensure that line markers are still in place or replaced in a timely manner. Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover. If a pipeline has suffered damage, is shut-in, or is being operated at a reduced pressure as a precautionary measure as a result of flooding.

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- Advise the appropriate PHMSA Regional Office or State pipeline safety authority before returning the line to service, increasing its operating pressure, or otherwise changing its operating status. PHMSA or the State will review all available information and advise the operator, on a case-by-case basis, whether and to what extent a line can safely be returned to full service.
- Make all necessary repairs.

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Tornado/Straight Line Winds

Tornado/Straight Line Winds

Although many disasters cannot be prevented or predicted, preparation can significantly reduce losses. In the event of a severe weather condition or a natural disaster, the Area Manager or assigned designee will be the Emergency Coordinator.

- **Be Aware of Changing Weather Conditions**
  - Tornado watch - Conditions are right for the formation of a tornado.
  - Tornado warning - A tornado has been sighted but is not in the area at this time.
  - Tornado alert - A tornado has been sighted in the immediate area, take cover immediately.

- **If Severe Weather Conditions Threaten**
  - Carry a battery operated portable radio and monitor conditions.
  - If a tornado is observed and time permits, evacuate the area.
  - If the tornado is approaching a pump station, notify the Oil Central Center to remotely isolate the station.
  - In vehicle, drive away from tornado at right angle. Get out of car and seek shelter if tornado cannot be avoided.
  - If outdoors, shelter in ditch, excavation or other low spot and lie flat, face down.
  - Make certain that all personnel are aware of the condition.
  - Stay in shelter until conditions are safe.

- **Immediately After the Storm**
  - Account for all personnel.
  - Survey for damages.
  - Initiate team for any repairs.
  - Refer to this Plan for additional response guidance regarding fires, spills, etc., as needed.

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Earthquake

Earthquake

The actual movement of the ground in an earthquake is rarely the direct cause of death or injury. Most casualties result from falling objects and debris because the shocks can shake, damage or demolish buildings and other structures.

- **Stay calm. Don't panic.**
- If you are indoors, stay there. Do not run outside.
- If you are in a building, take cover under a heavy furniture or stand in an inside doorway away from windows. (A door frame or the inner core of a building is its strongest point and least likely to collapse.)
- Exit building as situation determines.
- If you are outside, stay there. Move away from buildings to avoid falling debris. Avoid damaged utility lines.
- If you are driving, stop quickly and stay in your car. If possible, do not stop on a bridge, overpass or where buildings can fall on you. Your car can provide protection from falling debris.
- Do not reenter damaged buildings. Walls may collapse after the original shaking has ceased.
- Evaluate the situation and initiate appropriate pipeline patrol by the most expedient means possible to determine extent of damage.
- Make all necessary repairs as resources and conditions allow.

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Severe Winter Storm

Winter Storm

- Be aware of Changing Weather Conditions
  - Winter Storm Watch - Conditions are expected but not imminent.
  - Winter Storm Warning - A significant winter storm is occurring, imminent, or likely.
  - Blizzard Warning - Winds at least 35 mph (56.3km), blowing snow frequently reducing visibility to 0.25 miles or less, and dangerous wind chills are expected.
- Listen to local radio stations for weather advisory and road condition reports, carry a survival kit, and start the trip with a full tank of gasoline.
- Inspect pump station, equipment, and controls after storm for damage.
- Make any repairs as necessary.

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Volcanic Eruptions

Volcanic Eruptions

If a volcanic eruption ejects a large ash plume and the wind carries the ash to the pipeline facilities, this may cause a disruption of operations by making travel difficult or impossible due to reduced visibility.

- Begin gathering information from news media, field personnel, etc. to assess any ash cloud size, location, heading and speed as soon as news of an eruption breaks.
- Consider recalling crews prior to the expected arrival of the ash cloud while it is still clear to travel. If a crew is at a station when an ash fall begins, they should probably stay there for the duration and not travel until it is determined to be safe after the event.
- Advise contract aerial patrol service of the situation if contacted for the beginning of a pipeline patrol or if an aerial patrol is in progress.
- Inspect pump station, equipment and controls after eruption for damage.
- Make any repairs as necessary.

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Security Incidents

Bomb Threat

The following pages provide guidelines for actions to be taken in the event a bomb threat is received. A bomb threat to the pipeline system or personnel may present itself in any of several ways:

- Phone
- E-mail
- Fax
- Radio
- Mail
- Word-of-mouth
- Increase in the Homeland Defense Status

Other threats to pipeline system or personnel are often treated in the same manner as bomb threats. These may include:

- Terrorist threats
- Workplace violence threats
- General threat to an industry
- Civil disturbances

The following steps should be used as guidance when responding to the above situations. Actions during a real event will vary based on differences in circumstances, response activities, good judgment, etc.

Phone / Written (Fax, Letter, Telegram) Threats

Person Receiving the Call

- Immediately open the Bomb Threat form, (this should be kept next to the phone), so you can use it during the conversation with the individual making the bomb threat call. If possible, complete the form during the call.
- Remain calm and be engaging when talking to the caller.
- Keep the caller on the line as long as possible in order to obtain as much information as possible. Ask him/her to repeat the message. Try to write down every word spoken by the person. If you have a small hand-held tape recorder available, try to tape the conversation.
- If the caller does not indicate the location of the bomb or the time of detonation/attack, ask for this information.
- Inform the caller that the incident could result in death or serious injury to innocent people.
- Pay particular attention to background noises, such as motors, music, and any other noise that may give a clue as to the location of the caller.
- Listen closely to the voice (male, female), voice quality (calm, excited), accents, and speech impediments.

After the Caller Hangs Up and Written Threats

- Immediately report the threat call to the Oil Central Center or the Company person designated by management to receive such information.

Pipelines and Pump Stations - Additional Guidance

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- If the caller does not indicate the location of the bomb / substance or the time of possible detonation/attack, ask him / her for this information. Try to determine the Province / State, pipeline system, and specific location involved if possible.
- For offices and control center, inform the caller that the building/facility is occupied and the incident could result in death or serious injury to innocent people.
- For pipeline and pump stations, inform the caller that an incident could result in death of the innocent general public or significant environmental impact.

Area Manager/Designee

- Based upon discussion with Corporate Security, determine if the threat is credible. Then decide what actions to take, which can include:
  - Do Nothing
  - Attempt to determine which facility(s) are at risk
  - Stay and Search
  - Partial Evacuation or Internal Evacuation (offices or control center)
  - External Evacuation to an offsite Command Post (offices or control center)
- If a full or partial facility evacuation is necessary, activate Building Evacuation Plan immediately. When in doubt, evacuate. Encourage personnel to be vigilant for suspicious or out-of-place objects as they evacuate and leave their workstations.
- Initiate operations "shut down" procedures, as necessary.
- Secure the location and limit access to essential personnel only.
- Call the appropriate local and/or government agencies (fire, police, etc.) listed in Figure 2.5 and inform them of the threat and your Command Post location.
- Set up a Command Post at a pre-determined offsite location. Ensure you have:
  - Emergency Response Plan
  - Facility maps
  - Access keys
  - Cell Phones, Pagers & Radios
- Direct all members of the press to the designated spokesperson.

Pipeline Incidents

- Additional actions to consider taking upon credible threats against pipelines and pump stations:
  - Which if any system(s) should be shutdown
  - When any system(s) should be shutdown
- Survey from a distance with the aid of binoculars:
  - valves
  - station piping
- Due to the expanse of Pipeline facilities, aircraft should be considered to aid in the surveying pipeline ROW.
- Notify the appropriate local and/or government agencies listed in Figure 2.5 upon discovery of suspicious or out-of-place object(s).

Suspicious Mail / Delivered Package

- Frequently seen explosive devices have been incorporated, hidden, or camouflaged in letters, soft cover pocketbooks, hard cover books, manila envelopes, and cardboard boxes. While many are delivered by Canadian or U.S. mail, they may arrive by private courier or express service. Be alert to recognize suspicious-looking or unexpected items especially those that have:
  - Special handling marks (special delivery, air mail, registered, certified)

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- Restrictive markings (personal, confidential, addressee only)
- Excessive postage
- Handwritten or poorly typed address
- Incorrect title, or title but no names
- Misspelling of common words
- Oily stains, discolorations, or odor
- No return address
- Excessive weight
- Lopsided, uneven, or ridged envelope
- Protruding wires or tin foil
- Excessive securing material (tape, string, etc.)
- Any evidence that the envelope has been opened and re-glued
- Mail item from a new or strange source

- If you receive or find a suspicious-looking letter or package:
  - DO NOT TRY TO OPEN IT.
  - Isolate the area around the letter or package to the degree possible, and make emergency notifications as previously outlined, and evacuate personnel to a safe distance, as directed.
  - DO NOT MOVE NOR HANDLE unless absolutely necessary.
  - If opened, preserve, BUT DO NOT TOUCH FURTHER all original envelopes, twine, shipping documents, or packaging materials for evidence and release to the police as requested.
  - Report the call to the Regional Manager or their designee.

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Abnormal Pipeline Operations

Abnormal Pipeline Operations

- If operating design limits have been exceeded (increase or decrease pressure or flow) and no emergency condition exists, document the incident in IIT, immediately investigate the pipeline, and run the event to resolution.
- Verify whether a true safety problem, equipment malfunction, or operator error is present. Note: In all cases, safety to operations, the general public, and property will govern actions taken.
- Make appropriate repairs before continuing operations. Note: Corrective action will only be done by qualified personnel to perform the type of work involved.
- Monitor affected systems until normal operations are resumed.
- Complete follow-up and written reporting, as the situation demands.

Note: It is the responsibility of the pipeline operator to carry out the response procedures for abnormal pipeline operations as outlined in their respective O&M Manual (EDMS ID: 005713585). If Abnormal Operations occur in the US, refer to O&M manual, procedure 195.402d.

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Entrained Oil in Soil

All Roles

Response Operations area:

1. Bioremediation is not a first response option but can be effective when indigenous microbial populations, present in the substrate, are high enough to degrade the contaminants when the oil is entrained in the soil. For more details, see "*Annex IX - Guidance for Using Bioremediation in Response to Oil Spills in Region 8*" located in Appendix F, Miscellaneous Forms.
    - A number of microorganisms can utilize oil as a source of food. In some cases, natural populations adapt to the contaminant conditions and are able to convert the contaminants to non-hazardous end products rapidly enough to prevent impact downstream.
    - Biostimulation - Where natural populations can be stimulated to degrade contaminants by adding nutrients to the soil. Anaerobic respiration is a process by which organisms degrade containments, and the amendments are often the electron donors or electron acceptors needed by the organism to complete the decontaminating reaction.
    - Bioaugmentation - Adding microbial organisms that are capable of degrading the contaminant.
2. Encapsulation - Containment of soil on site with a properly designed barrier.
3. Disposal of affected soil to an approved landfill.

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Release to Groundwater

All Roles

The following procedure has been prepared in the event of a release of crude oil from the pipeline into a hydraulically sensitive groundwater resource area, but may not be currently identified as a high consequence area by PHMSA. Specific areas of concern have been evaluated for their sensitivity and plans to effect cleanup have been discussed. These specific areas include:

- The Winkler Aquifer
- The Wellhead Protection Areas near Seward, NE
- The Middle James Aquifer in Marshall County, SD

RESPONSE PROCEDURE

- Evaluate the topography and evidence of surface contamination.
- Establish containment, accounting for public safety, spill volume, terrain, and presence of surface water.
- Notify landowner and appropriate public agencies of potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.
- Consult with appropriate agencies regarding remediation, including water and soil cleanup levels, and need for groundwater monitoring.
- Notify and procure additional response equipment and personnel as necessary to address site-specific conditions.
- Dig intercept trench downgradient of release point.
- Line trench and stage vacuum truck to remove contaminated oil/water mixture.
- Excavate surface catchment upgradient of the intercept trench and near leading edge of visible contamination.
- Excavate until contaminated soil is completely removed and clean soil is encountered or conditions prohibit continued digging.
- Line the catchment to limit or prohibit further groundwater contamination.
- Move vacuum truck from intercept trench to catchment to recover oil and/or oily water.
- Line drop down area to stage contaminated soil as excavated.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.

  Options for Long term Remediation:

  - Air sparging
  - Vacuum extraction
  - Conventional pump and treat
  - Bioslurping
  - Excavation
  - Enhanced biodegradation/bioremediation
  - Chemical addition/oxidation
  - Natural Attenuation
- Enlist additional experts, as appropriate, for continuing remediation and coordination with appropriate agencies.

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Hurricane

Action Plan

The hurricane action plan is based on the following main points:

1. The Pipeline will be shut down if hurricane conditions are forecast (predicted winds in excess of 74 mph (119.1km).
2. Every attempt will be made to accomplish shutdowns in time for personnel to return home and evacuate safely. The phase criteria and timelines are different for Category 1, 2 and Category 3, 4, 5 storms.
3. They provide a proper sequence and timing for hurricane preparation, a four phase planning approach has been developed. The phase criteria and timeline follow.

Employee Action Plan

Employees should take the following actions when given instructions to evacuate:

1. Obtain directs for how to get information when the Pipeline will restart and for special instructions.
2. Contact your immediate supervisor for further instructions after departing site and hurricane conditions have passed.
3. Perform the following actions before leaving a closure location:
    - Remove any loose papers from the top of your desks.
    - Relocate or protect critical records to avoid damage.
    - Back-up and secure computer data files, shut down personal computers.
    - Close exterior doors prior to leaving Office.

NOTE: "For damage to pipeline facilities caused by hurricane and not otherwise required to report, report to John Hess, Director for Emergency Support and Security, 202-366-4595 or by email at PHMSA.OPA90@dot.gov."

Phased Criteria and Timeline

Phase 1 - Initiated when a storm presents a credible threat to the facility. The storm may or may not be in the gulf of Mexico, the key towards initiation, is the threat that it is likely to pose on the Pipeline. Phase 1 consists primarily of preparatory measures. The decision to implement Phase 1 rests with Corporate.

Topics of discussions should include:

- Notifications - Internal / External
- Current status and forecast of storm track and intensity.
- Selection and notification of volunteers for the hurricane crew members.
- Area industry preparation.
- Management updates to personnel on status of hurricane preparedness.
- Course of actions for the Pipeline.
- Timing and frequency of subsequent updates.

Phase 2 - Initiated 58 hours prior to 74 mph (119.1km) winds for Category 1, 2 storms, 84 hours prior to 74 mph (119.1km) winds Category 3, 4, or 5 storms.

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Upon entering Phase 2, the Pipeline is positioned for several response options:

- Continue to operate when best available information predicts a storm with winds less than 74 mph (119.1km).
- Begin taking steps to be positioned to move quickly to Phase 3.
- Move directly to Phase 3.

Phase 3 - Initiated 40 hour prior to 74 mph (119.1km) winds for Category 1, or 2 storms and 72 hours prior to 74 mph (119.1km) winds for Category 3, 4, or 5 storms. It calls for orderly shutdown. Shutdown procedures should establish a prompt safe off process conditions that will secure and protect equipment from damage.

The decision to implement Phase 3 rests with Corporate Management when the storm ETL is 40/72 hours. The timing of the decision will vary from storm to storm, based on the most accurate available information for forecast strength and path.

Phase 4 - After the storm passes, Management will determine when it is safe to do the initial hazard/damage assessment of the pipeline system following the storm.

Qualified Individual (QI)

Qualified Individual:

- Fulfills normal responsibilities and duties per normal operations.
- Keeps the Corporate informed of operating activities.
- Develops the list of shutdown crew members.
- Coordinates shutdown and securing of all assets.
- Responsible for accountability for all shutdown crew members.
- Maintains contact with the Corporate to inform them of issues and status of the shutdown crew and receive updates on response plans going forward.
- Conducts information meetings with the shutdown crew twice per day for updates on the storm and the response plans going forward.

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3.2 DOCUMENTATION OF INITIAL RESPONSE ACTIONS

It is difficult, particularly during the first few minutes of an initial response operation, to think about the importance of documentation. A log should be maintained which documents the history of the events and communications that occur during the response. When recording this information, it is important to remember that the log may become instrumental in legal proceedings, therefore:

- Record only facts, do not speculate.
- Do not criticize the efforts and/or methods of other people/operations.
- Do not speculate on the cause of the spill.
- Do not skip lines between entries or make erasures. If an error is made, draw a line through it, add the correct entry above or below it, and initial the change.
- Record the recommendations, instructions, and actions taken by government/regulatory officials.
- Document conversations (telephone or in person) with government/regulatory officials.
- **Request that government/regulatory officials document and sign their recommendations or orders (especially if company personnel do not agree with the suggestions, instructions, or actions).**

3.3 OIL CONTAINMENT, RECOVERY AND DISPOSAL/WASTE MANAGEMENT

After initial response has been taken to stop further spillage and notifications made to the required agencies, the Company will begin spill containment, recovery, and disposal operations.

The Incident Commander will assess the size and hazards of the spill (see Figure 3.2). The type of product, the location of the spill, and the predicted movement of the spill will be considered.

See Appendix H, Basics of Oil Spill Response, for additional information on oil containment removal.

Based on this assessment, additional clean-up personnel and equipment will be dispatched to the site and deployed to control and contain the spill. Boom may be deployed in waterways to contain the spill and to protect socio-economic and environmentally sensitive areas. Booms may also be used in waterways to deflect or guide the spill to locations where it can more effectively be cleaned up using skimmers, vacuum trucks, or sorbent material. Clean-up equipment and material will be used in the manner most effective for rapid and complete clean-up of all spilled product.

Response and clean-up will continue until all recoverable product is removed, the environment is returned to its pre-spill state, and the Unified Command of the Company Incident Commander and the Federal and/or State On-Scene Coordinators determine that further response and cleanup is no longer necessary.

See Appendix H, Basics of Oil Spill Response, for additional information on oil containment recovery.

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FIGURE 3.2

FLAMMABLE LIQUIDS (Non-Polar/Water-Immiscible)	
The following information provides the initial responder(s) with data that may be useful in making quick decisions and executing prompt response actions. The information is intended for guideline purposes only.	
HEALTH	
GUIDE NO. 128	• Inhalation or contact with material may irritate or burn skin and eyes. • Fire may produce irritating, corrosive and/or toxic gases. • Vapors may cause dizziness or suffocation. • Runoff from fire control or dilution water may cause pollution.
FIRST AID	
• Move victim to fresh air. • Call 911 or emergency medical service. • Give artificial respiration if victim is not breathing. • Administer oxygen if breathing is difficult. • Remove and isolate contaminated clothing and shoes. • In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. • Wash skin with soap and water. • In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. • Keep victim warm and quiet. • Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. • Ensure medical personnel are aware of materials involved and take precautions to protect themselves.	
PUBLIC SAFETY	
• **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.** • Isolate spill or leak area immediately for at least 50 meters (150 feet) in all directions. • Keep unauthorized personnel away. • Stay upwind. • Keep out of low areas. • Ventilate closed spaces before entering.	
EVACUATION	**Large Spill** • Consider initial downwind evacuation for at least 300 meters (1,000 feet). **Fire** • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
Information provided by the Emergency Response Guidebook 2012.	

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3.4 STORAGE/DISPOSAL

Strict rules designed to ensure safe and secure handling of waste materials govern the Company waste disposal activities. To ensure proper disposal of recovered oil and associated debris, the following guidelines should be considered:

- In the event of a product spill, Facilities have limited capacity to store recovered product and water. Separated product is pumped to frac tanks or to trucks to be carried to the Facility for processing.
- Oily debris will be segregated on site and containerized for temporary storage prior to disposal in accordance with hazardous waste regulations.
- Transportation of waste material will be performed in accordance with all applicable Federal and State Regulations.
- Waste associated with the spill will be disposed at sites that have the necessary permits to accept the type of waste to be discharged.

The Company's Community, Safety and Health Administration Dept. will coordinate activities and secure the permits to ensure proper disposal or recycling of recovered product and debris.

3.5 SAMPLING AND WASTE ANALYSIS PROCEDURE

The Company's sampling and waste analysis practices are governed by the regulations for the applicable Province/State and Federal agency. These regulations outline methods and procedures for determining the chemical and physical characteristics of wastes generated by the Facility, including waste associated with spills, so that they may be properly stored, treated, or disposed.

3.6 SAFETY AWARENESS

It is the corporate policy of the Company to provide a safe workplace for all workers. All employees and contractors are responsible for maintaining the safety and health of all workers on the pipeline and the response operations.

Prior to engaging in any spill response activity:

- All employees/contractors must have received orientation from the Company Safety Plan.
- All U.S. contractor response personnel must be in compliance with Occupational Safety and Health Administration training requirements.
- All other personnel will have completed appropriate training for their position as outlined in Section 4.0.
- No employee/contractor shall engage in activities without the appropriate protective equipment and training.

Response Safety

All Company and contractor personnel are expected to comply with the Site Safety Plan for each spill incident.

- Any concern regarding health or safety issues should be immediately addressed.
- The First Responder must consider the spill site as dangerous and the local atmosphere explosive until air monitoring procedures prove that the area is safe.

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- The First Responder must exit the area against or across the wind, if possible, and must also evacuate others who are working in the area.
- All injuries, no matter how minor, must be reported to the Incident Commander in a timely manner.
- Prior to entering a spill area, a qualified person must perform an initial safety and health evaluation of the site.

Air Monitoring

A Safety Monitor shall be designated who is trained in the operation of air monitoring equipment. The Incident Commander must ensure that Safety Monitors are trained and that their equipment is maintained and ready for use.

- The air monitoring equipment shall be activated and checked at the location in which it is stored.
- Calibration of instruments should be performed before use.
- Air monitoring measurements which are to be made prior to entry into the spill area include:
  - Oxygen content
  - Lower Explosive Limit (LEL) with a pentane calibrated instrument
  - Benzene level

H2S

- Lower Explosive Limit readings above 10% require immediate evacuation of the area and elimination of ignition sources.
- Oxygen readings below 19.5% require the use of air supplied respiratory protection.
- After assuring that there are no hazards relating to explosion or oxygen depletion, sampling for benzene or total petroleum hydrocarbons shall dictate the appropriate respiratory devices to be used by persons entering the area.
- Benzene levels must be below 0.5 ppm to work without respiratory protection. At a level of greater the 0.5 but less than 5 ppm a half face respirator may be used. When the level is between 5.0 and 25 ppm a full face respirator must be used. Anything readings higher than 25 ppm, a supplied air or Self Contained Breathing Apparatus must be used.

If H2S is present in low concentrations respiratory protective equipment may be used following the following criteria based on approved protection factors. Using the approved protection factors of 10 for ½ face respirators and 50 for full face and the most stringent OEL which is 1 ppm (Canadian Federal COHSR) the corresponding maximum use concentrations would be 10 ppm for ½ face and 50 ppm for full face. The use of respirators however should be limited to areas with concentrations less than 10 ppm. If concentrations are higher workers should immediately leave the area.

- Hydrogen Sulfide is an extremely hazardous toxic compound that is present in most crude oils that are transported through the pipeline.
- Air monitoring for Hydrogen Sulfide will be done by all personnel working on or near the pipeline and during any cleanup operation.

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- Hydrogen Sulfide is characterized by a rotten egg smell at low level concentrations.
- The gas causes rapid temporary paralysis of the olfactory system leading to the loss of the sense of smell.
- Permissible exposure limits in many countries is 10 ppm. In Canada the occupational exposure level is 1 ppm.

Symptoms of exposure to Hydrogen Sulfide are:

- 0-10 ppm no known health effects for most people
- 10-100 ppm can cause headache, dizziness, nausea (100 ppm is the immediately dangerous to life and health level)
- 100-500 ppm above mentioned effects within a short time and more severe. Loss of breathing and death is possible within minutes.
- 500-700 ppm affects the central nervous system. Symptoms could include a loss of balance and a loss of reasoning. You could become unconscious and stop breathing within seconds
- 700 and greater would result in immediate loss of consciousness and permanent brain damage due to hypoxia or death if not rescued immediately
- The Incident Commander is responsible for arranging industrial hygiene monitoring in the post discovery period.

Decontamination

Through training programs, response personnel know and understand the importance of the removal of hazardous substances from their person if they are contaminated. Eyewash stations and safety showers provide a means to quickly remove gross contamination of harmful agents, including gasoline. Personnel must immediately shower and remove any clothing which is wet or otherwise contaminated. Showers in the change room are to be used for thorough cleansing. Persons should inspect themselves thoroughly before donning a fresh change of clothing.

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Contaminated clothing should be properly disposed. Contaminated personal protective equipment must be washed and sanitized before re-using. The washing of contaminated equipment is performed in a "contained area" to assure that the disposal of the wash water can be handled properly.

Establishing "Exclusion - Hot", "Decontamination - Decon", (warm) and "Support - Safe" (cold) Zones are required to prevent the removal of contaminants from the contaminated area as well as unauthorized entry into contaminated areas.

- Regardless of the decontamination facilities available, all efforts to minimize personnel exposure should be taken.
- Decontamination facilities should be positioned prior to employee/ contractor entrance to areas where the potential for exposure to contamination exists. The appropriate Material Safety Data Sheets (MSDS) are available to aid health professionals treating the injured parties. Material Safety Data Sheets are located in Appendix G.
- Decontamination facilities should be designed to prevent further contamination of the environment and should have a temporary storage area for items that will be reused in the contaminated area.
- Particular attention should be paid to personal hygiene prior to eating, drinking, or smoking.

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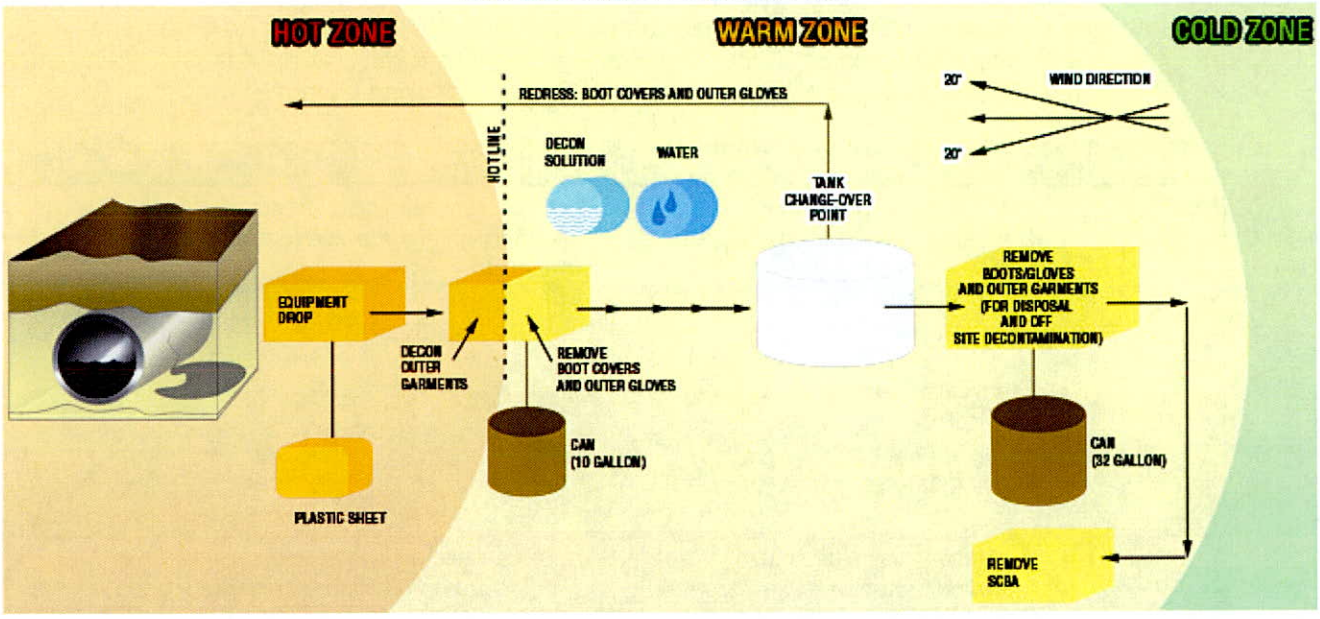
MINIMUM DECONTAMINATION LAYOUT
LEVELS A & B PROTECTION



Personal Protective Equipment (PPE)

The following represents OSHA/USEPA designated PPE levels for responding to emergencies, post emergency cleanup sites, and/or Temporary Storage and Disposal (TSD) sites. The responder's PPE should be chosen based on his/her level of training and assigned job duties.

Personal Protective Equipment (PPE)		
LEVEL A	• Self Contained Breathing Apparatus (SCBA) (worn inside suit) • Encapsulated chemical protective suit • Chemical protective gloves • Chemical protective boots • Hard hat • Safety toe footwear • Safety glasses	To be selected when the greatest level of skin, respiratory, and eye protection is required.
LEVEL B	• SCBA (worn outside suit) • Chemical protective suit w/hood • Chemical protective boots • Chemical protective gloves • Hard hat • Safety toe footwear • Safety glasses	To be selected when the highest level of respiratory protection is necessary but a lesser level of skin protection is needed.
LEVEL C	• Air Purifying Respirator (APR) • APR ½ Face or Full Face • Hard hat • Glasses (worn with ½ face APR) • Chemical protective boots • Chemical protective gloves • Chemical protective suit/Tyvek • Safety toe footwear • Safety glasses	To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are met.
MODIFIED LEVEL C Same as level C except no APR requirements.		To be selected when the concentration and type of airborne substances is known and the criteria for using air purifying respirators are not met.
LEVEL D	• Hard hat • Safety glasses • Work uniform / clothes • Leather gloves • Safety boots • Nomex (if required by the Company)	The atmosphere contains no known hazard and work functions preclude the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

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3.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Call 911 immediately. On-site emergency medical response requires the same rapid assessment of the patient as any other situation, but requires the responders to be aware of other considerations that may affect the way they handle the patient. These considerations include the following:

- The potential for contamination of the patient, responders, and equipment should be addressed. Responders should arrange to treat all patients AFTER the injured party has been decontaminated according to the Site Safety Plan.
- Site personnel should make the initial assessment of the patient and determine the severity of the injury/illness.
- If the treatment needed is critical care or "life saving" treatment, rapid decontamination of the injured/ill party should be started. Refer to the Site Safety Plan for steps to be taken in an "abbreviated" decontamination for medical treatment.
- The need for full decontamination should be carefully weighed against the need for prompt medical treatment.
- The ambulance responding to medical emergencies shall be contacted as soon as possible and instructed exactly where to respond when needed and the nature of the contaminant. Telephone reference is provided in Annexes.
- Material Safety Data Sheet information will be available from the Incident Commander and should be provided to medical personnel to alert them of decontamination requirements.
- Report all injuries, incidents or close calls.
- If emergency medical treatment is needed, the Incident Commander or Safety Officer, or his designated representatives, will request assistance from trained medical personnel.

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4.0 RESPONSE TEAMS

4.1 Introduction

4.2 Qualified Individual

4.3 Initial Response Team (IRT)

4.4 Regional Emergency Preparedness Team (REPT)

4.5 Incident Command System (ICS)

4.6 Unified Command

4.7 ICS Roles and Responsibilities

Figure 4.1 Incident Command System

Figure 4.2 Operational Period Planning Cycle

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4.1 INTRODUCTION

This Section describes organizational features and duties of the local responders, the Regional Emergency Preparedness Team (EPT), and the broader Emergency Management Team (EMT) as defined in TransCanada's Incident Management System (IMS). The Incident Management System integrates Incident Management, Emergency Management and Crisis Management and is maintained separately.

The key to an effective emergency response is a rapid, coordinated, tiered response by the affected Facility, the Regional Emergency Operations Center, and the Corporate Emergency Operations Center, consistent with the magnitude of an incident.

First response to an incident at the Facility will be provided by the local responders. The Regional EOC will respond, to the degree necessary, to incidents exceeding local capability.

Our response teams will use the National Incident Management System (NIMS) Incident Command System (ICS) to manage the emergency response activities. Because Incident Commander System is a management tool that is readily adaptable to incidents of varying magnitude, it will typically be used for all emergency incidents. Staffing levels will be adjusted to meet specific response team needs based on incident size, severity, and type of emergency.

An explanation of Incident Commander System and the roles and responsibilities for primary members of the response teams are provided in Section 4.7 per Canadian Standards Association (CSA)-2731-03. The United States Coast Guard (USCG) Incident Management Handbook (IMH) contains an in-depth description of all Incident Commander System positions, Incident Commander System development, response objectives and strategies, command responsibilities, Incident Commander System specific glossary/acronyms, resource typing, the Incident Action Plan process, and meetings. The IMH can be located on the USCG's Homeport Website.

4.2 QUALIFIED INDIVIDUAL

It is the responsibility of the Qualified Individual (QI) or his/her designee to coordinate with the Federal On-Scene Coordinator (FOSC) and State On-Scene Coordinator (SOSC) throughout the response, if applicable.

Vital duties of the Qualified Individual (QI) include:

- Notify all response personnel, as needed.
- Identify the character, exact source, amount, and extent of the release, as well as the other items needed for notification.
- Assess the interaction of the spilled substance with water and/or other substances stored at the Facility and notify response personnel at the scene of that assessment.
- Assess the possible hazards to human health and the environment due to the release. This assessment must consider both the direct and indirect effects of the release (i.e., the effects of any toxic, irritating, or asphyxiating gases that may be generated, or the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosion).
- Assess and implement prompt removal actions to contain and remove the substance released.

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- Coordinate rescue and response actions as previously arranged with all response personnel.
- Activate and engage in contracting with oil spill removal organizations.
- Use authority to immediately access Company funding to initiate cleanup activities.
- Direct cleanup activities until properly relieved of this responsibility.
- Arrangements will be made to ensure that the Qualified Individual (QI) or the Alternate Qualified Individual (AQI) is available on a 24-hour basis and is able to arrive at the Facility in a reasonable time.
- The AQI shall replace the QI in the event of his/her absence and have the same responsibilities and authority.

4.3 INITIAL RESPONSE TEAM (IRT)

The first Company person on scene (First Responder) will function as the Incident Commander and person-in-charge until relieved by an authorized supervisor who will then assume the position of Incident Commander (IC). Transfer of command will take place as more senior management contract support respond to the incident. For response operations within the control of the Initial Response Team, the role of IC will typically be assumed and retained by the Qualified Individual.

The number of positions/personnel required to staff the Incident Management Team will depend on the size and complexity of the incident. The duties of each position may be performed by the IC directly or delegated as the situation demands. The IC is always responsible for directing the response activities and will assume the duties of all the primary positions until the duties can be delegated to other qualified personnel.

A complete functional ICS organization is shown in Figure 4.1. The Incident Commander should try to fill the necessary positions within the Incident Management Team and request additional support from both the Regional and Corporate Emergency Operations Centers to fill/back up all the positions as the incident may dictate. Detailed job descriptions of the primary response team positions are provided in Section 4.7.

4.4 REGIONAL EMERGENCY PREPAREDNESS TEAM (EPT)

The Emergency Preparedness Team (EPT) will activate a Regional Emergency Operations Center (EOC) to support the Initial Response Team/Incident Management Team. The number of positions/personnel required to staff the Regional EOC will depend on the size and complexity of the incident.

The Regional EOC is staffed by personnel from various Regional locations. The Regional EOC provides necessary information to the appropriate Federal, State/Province, and Local authorities with designated response roles, including the National Response Center (NRC), the Canadian National Energy Board (NEB), if necessary, State Emergency Response Commission (SERC) Provincial Ministry, and local response agencies.

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4.5 INCIDENT COMMAND SYSTEM (ICS)

The Incident Command System is intended to be used as an emergency management tool to aid in mitigating all types of emergency incidents. This system is readily adaptable to very small emergency incidents as well as more significant or complex emergencies. The Incident Command System utilizes the following criteria as key operational factors:

- Assigns overall authority to one individual..
- Provides structured authority, roles and responsibilities during emergencies.
- The system is simple and familiar, and is used routinely at a variety of incidents.
- Communications are structured.
- There is a structured system for response and assignment of resources.
- The system provides for expansion, escalation, and transfer/transition of roles and responsibilities.
- The system allows for "Unified Command" where agency involvement at the command level is required.

Effective establishment and utilization of the Incident Command System during response to all types of emergencies can:

- Provide for increased safety.
- Shorten emergency mitigation time by providing more effective and organized mitigation.
- Cause increased confidence and support from local, State, Federal, and public sector emergency response personnel.
- Provide a solid cornerstone for emergency planning efforts.

Section 4.7 provides a comprehensive list of every response team member's duty assignment.

4.6 UNIFIED COMMAND

As a component of an Incident Commander System, the Unified Command (UC) is a structure that brings together the Incident Commanders of all major organizations involved in the incident to coordinate an effective response while still meeting their own responsibilities. The Unified Command links the organizations responding to the incident and provides a forum for the Responsible Party and responding agencies to make consensus decisions. Under the Unified Command, the various jurisdictions and/or agencies and responders may blend together throughout the organization to create an integrated response team. The Incident Commander System process requires the Unified Command to set clear objectives to guide the on-scene response resources.

Multiple jurisdictions may be involved in a response effort utilizing Unified Command. These jurisdictions could be represented by any combination of:

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- Geographic boundaries;
- Government levels;
- Functional responsibilities; and
- Statutory responsibilities.

The participants of Unified Command for a specific incident will be determined taking into account the specifics of the incident and existing response plans and/or decisions reached during the initial meeting of the Unified Command. The Unified Command may change as an incident progresses, in order to account for changes in the situation.

The Unified Command is responsible for overall management of an incident. The Unified Command directs incident activities and approves and releases resources. The Unified Command structure is a vehicle for coordination, cooperation and communication which is essential to an effective response.

Unified Command representatives must be able to:

- Agree on common incident objectives and priorities.
- Have the capability to sustain a 24-hour-7-day-per-week commitment to the incident.
- Have the authority to commit agency or Company resources to the incident.
- Have the authority to spend agency or Company funds.
- Agree on an incident response organization.
- Agree on the appropriate Command and General Staff assignments.
- Commit to speak with "one voice" through the Public Information Officer or Joint Information Center.
- Agree on logistical support procedures.
- Agree on cost-sharing procedures.

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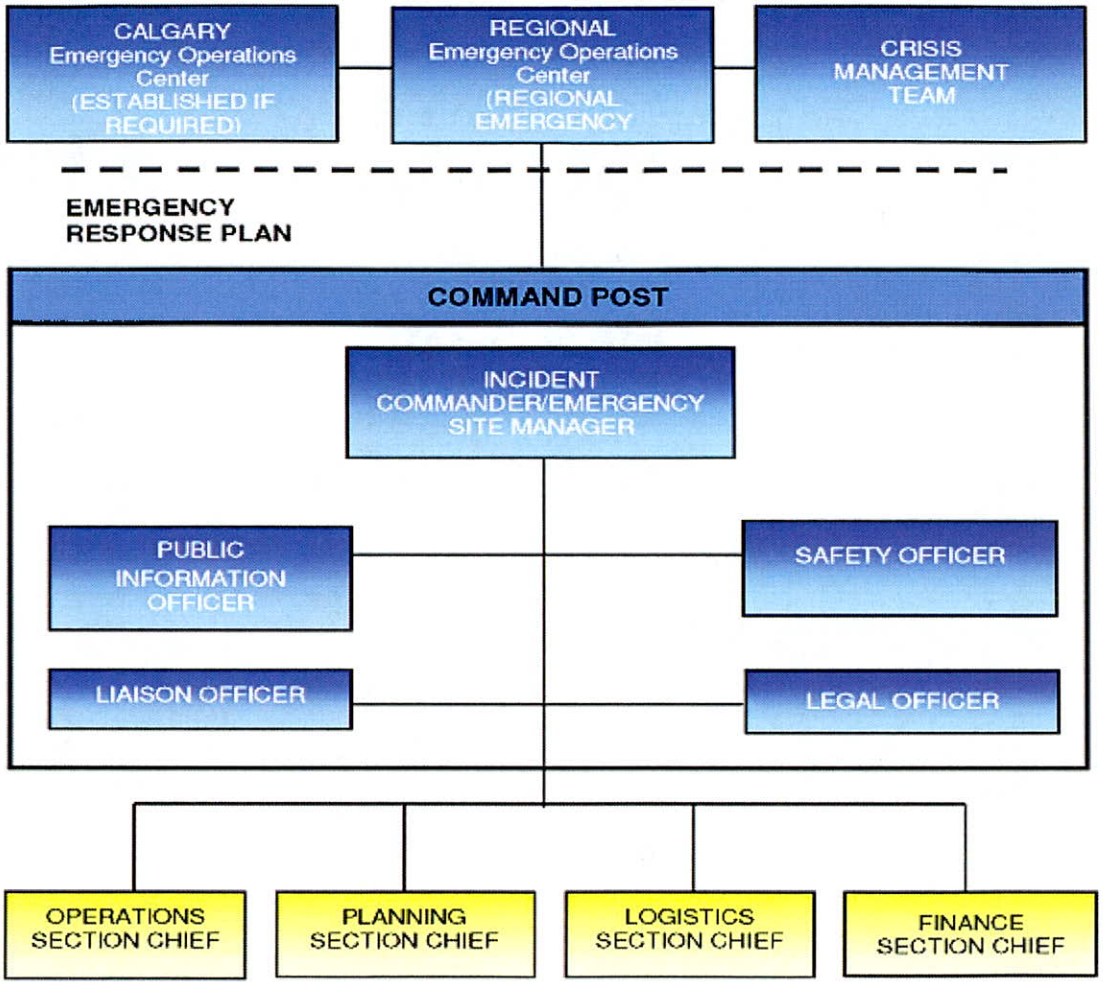
FIGURE 4.1

INCIDENT COMMAND SYSTEM
INCIDENT MANAGEMENT SYSTEM



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4.7 ICS ROLES AND RESPONSIBILITIES

COMMON RESPONSIBILITIES

The following is a checklist applicable to all personnel in an Incident Commander System organization:

- Receive assignment, including:
  - Job assignment
  - Resource order number and request number
  - Reporting location
  - Reporting time
  - Travel instructions
  - Special communications instructions
- Upon arrival, check-in at designated check-in location.
- Receive briefing from immediate supervisor.
- Acquire work materials.
- Supervisors maintain accountability for assigned personnel.
- Organize and brief subordinates.
- Know your assigned radio frequency(s) and ensure communications equipment is operating properly.
- Use clear text and Incident Commander System terminology (no codes) in all communications.
- Complete forms and reports required of the assigned position and send to Documentation Unit.
- Maintain unit records, including Unit Log (ICS Form 214).
- Respond to demobilization orders and brief subordinates regarding demobilization.

UNIT LEADER RESPONSIBILITIES

In Incident Commander System, a Unit Leader's responsibilities are common to all units in all parts of the organization. Common responsibilities of Unit Leaders are listed below.

- Review common responsibilities.
- Receive briefing from Incident Commander, Section Chief or Branch Director (as appropriate).
- Participate in incident planning meetings, as required.
- Determine current status of unit activities.
- Order additional unit staff, as appropriate.
- Determine resource needs.
- Confirm dispatch and estimated time of arrival of staff and supplies.
- Assign specific duties to staff; supervise staff.
- Develop and implement accountability, safety and security measures for personnel and resources.
- Supervise demobilization of unit, including storage of supplies.
- Provide Supply Unit Leader with a list of supplies to be replenished.
- Maintain unit records, including Unit Log (ICS Form 214).

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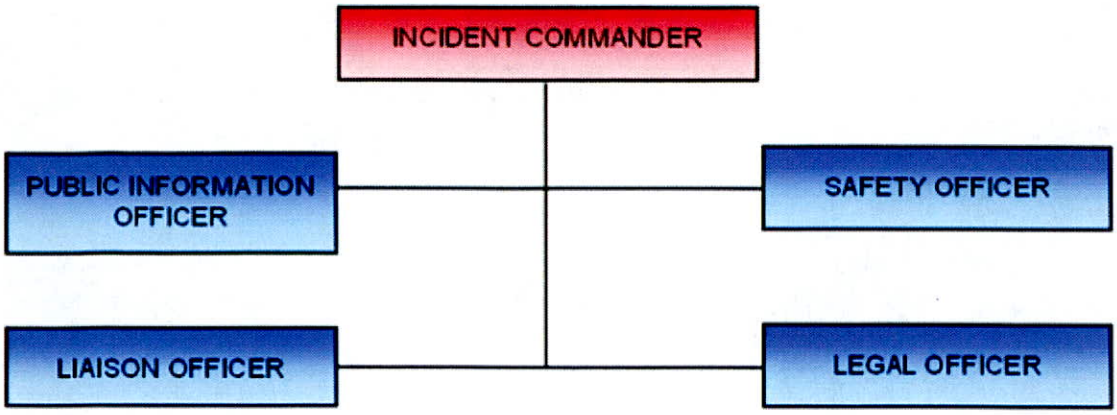
COMMAND



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INCIDENT COMMANDER

- Assess the situation and/or obtain a briefing from the prior Incident Commander.
- Determine Incident Objectives and strategy.
- Establish the immediate priorities.
- Establish an Incident Command Post.
- Brief Command Staff and Section Chiefs.
- Review meetings and briefings.
- Establish an appropriate organization.
- Ensure planning meetings are scheduled as required. (Refer to Figure 4.3 "Operational Period Planning Cycle" for assistance).
- Approve and authorize the implementation of an Incident Action Plan.
- Ensure that adequate safety measures are in place.
- Coordinate activity for all Command and General Staff.
- Coordinate with key people and officials.
- Approve requests for additional resources or for the release of resources.
- Keep agency administrator informed of incident status.
- Approve the use of trainees, volunteers, and auxiliary personnel.
- Authorize release of information to the news media.
- Ensure incident Status Summary (ICS Form 209-CG) is completed and forwarded to appropriate higher authority.
- Order the demobilization of the incident when appropriate.
- Assign any of the Incident Commander roles and responsibilities to a Deputy Incident Commander as needed.

PUBLIC INFORMATION OFFICER

- Determine from the Incident Commander if there are any limits on information release.
- Develop material for use in media briefings.
- Obtain Incident Commander approval of media releases.
- Inform media and conduct media briefings.
- Arrange for tours and other interviews or briefings that may be required.
- Obtain media information that may be useful to incident planning.
- Maintain current information summaries and/or displays on the incident and provide information on the status of the incident to assigned personnel.

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LIAISON OFFICER

- Be a contact point for Agency Representatives.
- Maintain a list of assisting and cooperating agencies and Agency Representatives. Monitor check-in sheets daily to ensure that all Agency Representatives are identified.
- Assist in establishing and coordinating interagency contacts.
- Keep agencies supporting the incident aware of incident status.
- Monitor incident operations to identify current or potential inter-organizational problems.
- Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources.
- Coordinate response resource needs for Natural Resource Damage Assessment and Restoration (NRDAR) activities with the Operations during oil and HAZMAT responses.
- Coordinate response resource needs for incident investigation activities with the Operations.
- Ensure that all required agency forms, reports and documents are completed prior to demobilization.
- Coordinate activities of visiting dignitaries.

SAFETY OFFICER

- Participate in planning meetings.
- Identify hazardous situations associated with the incident.
- Review the Incident Action Plan for safety implications.
- Exercise emergency authority to stop and prevent unsafe acts.
- Investigate accidents that have occurred within the incident area.
- Review and approve the medical plan.
- Develop the Site Safety Plan and publish Site Safety Plan summary (ICS Form 208) as required.

LEGAL OFFICER

- Participate in planning meetings, if requested.
- Advise on legal issues relating to in-situ burning, use of dispersants, and other alternative response technologies.
- Advise on legal issues relating to differences between Natural Resource Damage Assessment Restoration (NRDAR) and response activities.
- Advise on legal issues relating to investigations.
- Advise on legal issues relating to finance and claims.
- Advise on legal issues relating to response.

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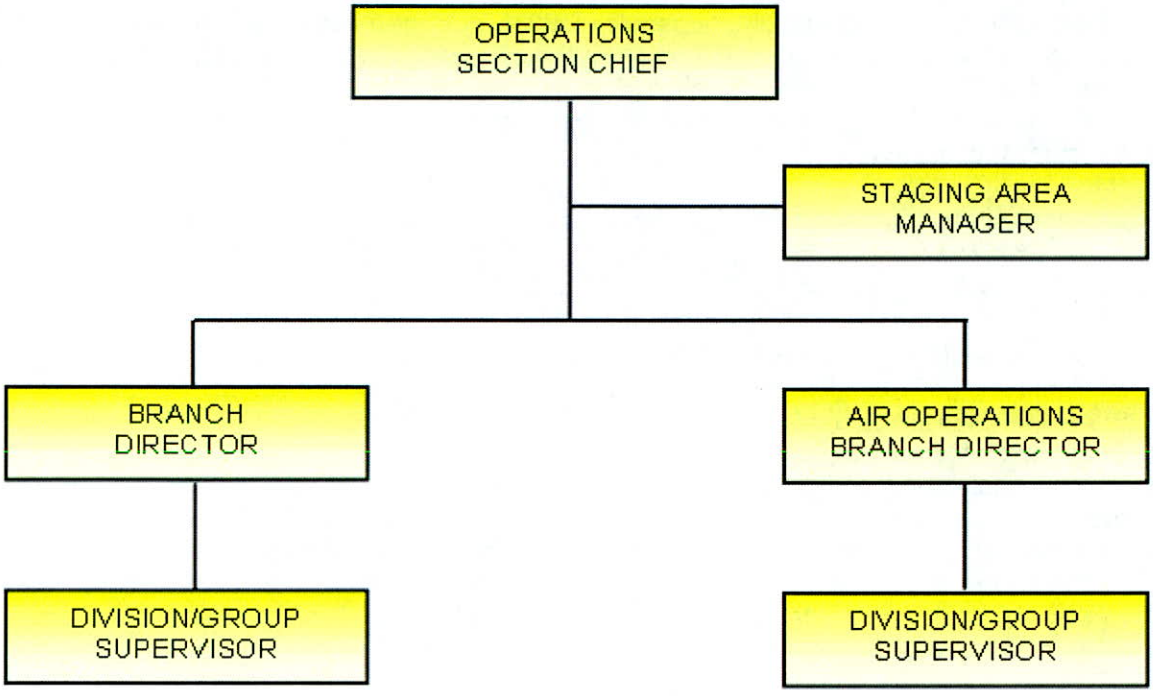
OPERATIONS



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OPERATIONS SECTION GENERAL FUNCTIONS

- Responsible for managing tactical operations at the incident site directed toward reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations.
- Directs and coordinates all incident tactical operations.
- Executes the Incident Action Plan.

OPERATIONS SECTION CHIEF

- Develop operations portion of Incident Action Plan.
- Brief and assign Operations Section personnel in accordance with the Incident Action Plan.
- Supervise Operations Section.
- Determine need and request additional resources.
- Review suggested list of resources to be released and initiate recommendation for release of resources.
- Assemble and disassemble strike teams assigned to the Operations Section.
- Report information about special activities, events, and occurrences to the Incident Commander.
- Respond to resource requests in support of National Resource Damage Assessment and Restoration activities.

BRANCH DIRECTOR

- Develop with subordinates alternatives for Branch control operations.
- Attend planning meetings at the request of the Operations.
- Review Assignment List (ICS Form 204-CG) for Divisions/Groups within the Branch. Modify lists based on effectiveness of current operations.
- Assign specific work tasks to Division/Group Supervisors.
- Supervise Branch operations.
- Resolve logistic problems reported by subordinates.
- Report to Operations when: the Incident Action Plan is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- Approve accident and medical reports originating within the Branch.

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DIVISION/GROUP SUPERVISOR

- Implement Incident Action Plan for Division/Group.
- Provide the Incident Action Plan to Strike Team Leaders, when available.
- Identify increments assigned to the Division/Group.
- Review Division/Group assignments and incident activities with subordinates and assign tasks.
- Ensure that the Incident Commander and/or Resources Unit is advised of all changes in the status of resources assigned to the Division/Group.
- Coordinate activities with adjacent Division/Group.
- Determine need for assistance on assigned tasks.
- Submit situation and resources status information to the Branch Director or the Operations.
- Report hazardous situations, special occurrences, or significant events (e.g., accidents, sickness, discovery of unanticipated sensitive resources) to the immediate supervisor.
- Ensure that assigned personnel and equipment get to and from assignments in a timely and orderly manner.
- Resolve logistics problems within the Division/Group.
- Participate in the development of Branch plans for the next operational period.

STAGING AREA MANAGER

- Establish Staging Area layout.
- Determine any support needs for equipment, feeding, sanitation and security.
- Establish check-in function as appropriate.
- Post areas for identification and traffic control.
- Request maintenance service for equipment at Staging Area as appropriate.
- Respond to request for resource assignments.
- Obtain and issue receipts for radio equipment and other supplies distributed and received at Staging Area.
- Determine required resource levels from the Operations.
- Advise the Operations when reserve levels reach minimums.
- Maintain and provide status to Resource Unit of all resources in Staging Area.
- Demobilize Staging Area in accordance with the Incident Demobilization Plan.

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AIR OPERATIONS BRANCH DIRECTOR

- Organize preliminary air operations.
- Request declaration (or cancellation) of restricted air space.
- Participate in preparation of the Incident Action Plan through the Operations. Insure that the air operations portion of the Incident Action Plan takes into consideration the Air Traffic Control requirements of assigned aircraft.
- Perform operational planning for air operations.
- Prepare and provide Air Operations Summary (ICS Form 220) to the Air Support Group and Fixed-Wing Bases.
- Determine coordination procedures for use by air organization with ground Branches, Divisions, or Groups.
- Coordinate with appropriate Operations Section personnel.
- Supervise all air operations activities associated with the incident.
- Evaluate helibase locations.
- Establish procedures for emergency reassignment of aircraft.
- Schedule approved flights of non-incident aircraft in the restricted air space area.
- Coordinate with the Operations Coordination Center (OCC) through normal channels on incident air operations activities.
- Inform the Air Tactical Group Supervisor of the air traffic situation external to the incident.
- Consider requests for non-tactical use of incident aircraft.
- Resolve conflicts concerning non-incident aircraft.
- Coordinate with Federal Aviation Administration.
- Update air operations plans.
- Report to the Operations on air operations activities.
- Report special incidents/accidents.
- Arrange for an accident investigation team when warranted.

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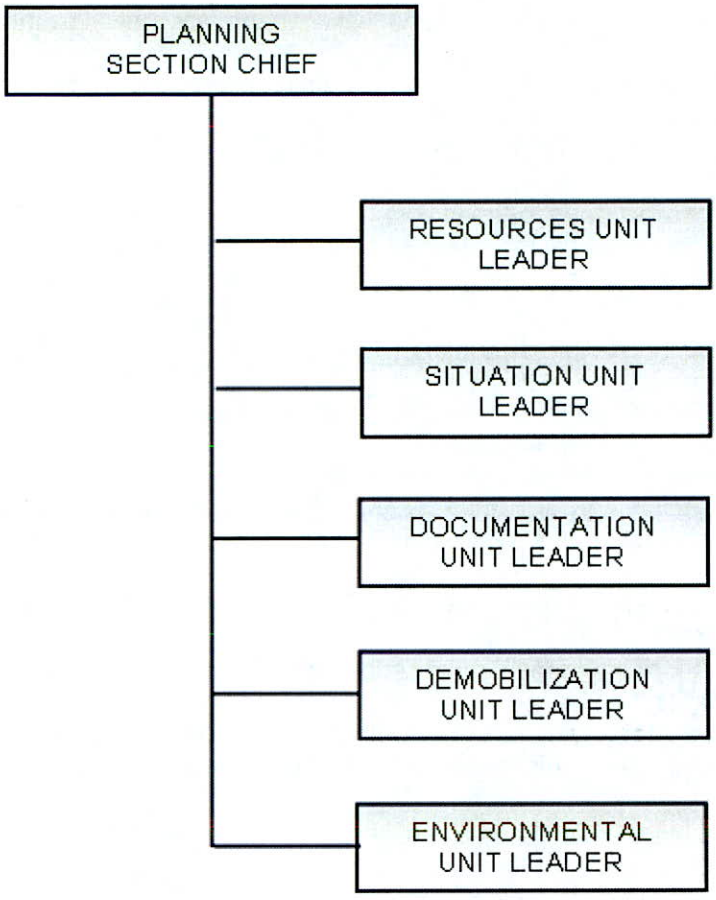
PLANNING



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PLANNING SECTION GENERAL FUNCTIONS

- Responsible for gathering, evaluating, and disseminating tactical information and intelligence critical to the incident.
- Maintaining incident documentation and providing documentation services.
- Preparing and documenting Incident Action Plans.
- Conducting long-range and/or contingency planning.
- Developing alternative strategies.
- Tracking resources assigned to the incident.
- Developing plans for waste disposal.
- Developing plans for demobilization.

PLANNING SECTION CHIEF

- Collect and process situation information about the incident.
- Supervise preparation of the Incident Action Plan.
- Provide input to the Incident Commander and the Operations in preparing the Incident Action Plan.
- Chair planning meetings and participate in other meetings as required. (Refer to Figure 4.2 "Operational Planning P" for assistance).
- Reassign out-of-service personnel already on-site to Incident Commander System organizational positions as appropriate.
- Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation Units).
- Determine the need for any specialized resources in support of the incident.
- If requested, assemble and disassemble Strike Teams and Task Forces not assigned to Operations.
- Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- Assemble information on alternative strategies.
- Provide periodic predictions on incident potential.
- Report any significant changes in incident status.
- Compile and display incident status information.
- Oversee preparation and implementation of the Incident Demobilization Plan.
- Incorporate plans (e.g., Wildlife Rehab., Waste Management, Traffic, Medical, Communications, Site Safety, and Demobilization) into the Incident Action Plan.

RESOURCES UNIT LEADER

- Establish the check-in function at incident locations.
- Prepare Organization Assignment List (ICS Form 203-CG) and Incident Organization (ICS Form 207-CG).
- Prepare appropriate parts of Assignment List (ICS Form 204).
- Prepare and maintain the Incident Command Post display (to include organization chart and resource allocation and deployment).
- Maintain and post the current status and location of all resources.
- Maintain master roster of all resources checked in at the incident.

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SITUATION UNIT LEADER

- Begin collection and analysis of incident data as soon as possible.
- Prepare, post, or disseminate resource and situation status information as required, including special requests.
- Prepare periodic predictions or as requested by the Planning Section Chief.
- Prepare the Incident Status Summary (ICS Form 209-CG).
- Provide photographic services and maps if required.

DOCUMENTATION UNIT LEADER

- Set up work area; begin organization of incident files.
- Establish duplication service; respond to requests.
- File all official forms and reports.
- Review records for accuracy and completeness; inform appropriate units of errors or omissions.
- Provide incident documentation as requested.
- Store files for post-incident use.

DEMOBILIZATION UNIT LEADER

- Participate in planning meetings as required.
- Review incident resource records to determine the likely size and extent of demobilization effort.
- Based on the above analysis, add additional personnel, workspace, and supplies as needed.
- Coordinate demobilization with Agency Representatives.
- Monitor the on-going Operations Section resource needs.
- Identify surplus resources and probable release time.
- Develop incident check-out function for all units.
- Evaluate logistics and transportation capabilities to support demobilization.
- Establish communications with off-incident facilities, as necessary.
- Develop an Incident Demobilization Plan detailing specific responsibilities and release priorities and procedures.
- Prepare appropriate directories (e.g., maps, instructions, etc.) for inclusion in the demobilization plan.
- Distribute demobilization plan (on and off-site).
- Provide status reports to appropriate requestors.
- Ensure that all Sections/Units understand their specific demobilization responsibilities.
- Supervise execution of the Incident Demobilization Plan.
- Brief the Planning Section Chief on demobilization progress.

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ENVIRONMENTAL UNIT LEADER

- Participate in Planning Section meetings.
- Identify sensitive areas and recommend response priorities.
- Following consultation with natural resource trustees, provide input on wildlife protection strategies (e.g., removing oiled carcasses, pre-emptive capture, hazing, and/or capture and treatment).
- Determine the extent, fate and effects of contamination.
- Acquire, distribute and provide analysis of weather forecasts.
- Monitor the environmental consequences of cleanup actions.
- Develop shoreline cleanup and assessment plans. Identify the need for, and prepare any special advisories or orders.
- Identify the need for, and obtain, permits, consultations, and other authorizations including Endangered Species Act (ESA) provisions.
- Following consultation with the Federal OnScene Commander's Historical/Cultural Resources Technical Specialist identify and develop plans for protection of affected historical/cultural resources.
- Evaluate the opportunities to use various response technologies.
- Develop disposal plans.
- Develop a plan for collecting, transporting, and analyzing samples.

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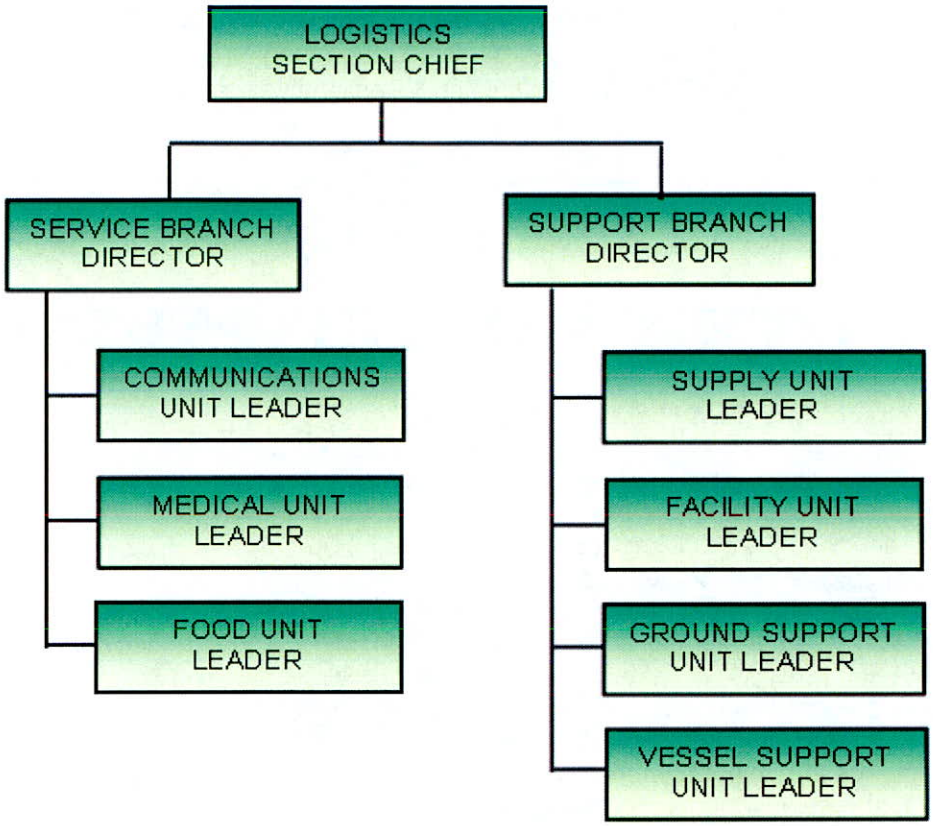
LOGISTICS



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LOGISTICS SECTION GENERAL FUNCTIONS

- Responsible for all support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident locations.
- Ordering, obtaining, maintaining, and accounting for essential personnel, equipment, and supplies.
- Providing communication planning and resources.
- Setting up food services.
- Setting up and maintaining incident facilities.
- Providing support transportation.
- Providing medical services to incident personnel.

LOGISTICS SECTION CHIEF

- Plan the organization of the Logistics Section.
- Assign work locations and preliminary work tasks to Section personnel.
- Notify the Resources Unit of the Logistics Section units activated including names and locations of assigned personnel.
- Assemble and brief Branch Directors and Unit Leaders.
- Participate in preparation of the Incident Action Plan.
- Identify service and support requirements for planned and expected operations.
- Provide input to and review the Communications Plan, Medical Plan and Traffic Plan.
- Coordinate and process requests for additional resources.
- Review the Incident Action Plan and estimate Section needs for the next operational period.
- Advise on current service and support capabilities.
- Prepare service and support elements of the Incident Action Plan.
- Estimate future service and support requirements.
- Receive Incident Demobilization Plan from Planning Section.
- Recommend release of Unit resources in conformity with Incident Demobilization Plan.
- Ensure the general welfare and safety of Logistics Section personnel.

SERVICE BRANCH DIRECTOR

- Determine the level of service required to support operations.
- Confirm dispatch of Branch personnel.
- Participate in planning meetings of Logistics Section personnel.
- Review the Incident Action Plan.
- Organize and prepare assignments for Service Branch personnel.
- Coordinate activities of Branch Units.
- Inform the Logistic Section Chief of Branch activities.
- Resolve Service Branch problems.

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COMMUNICATIONS UNIT LEADER

- Prepare and implement the Incident Radio Communications Plan (ICS Form 205-CG).
- Ensure the Incident Communications Center and the Message Center is established.
- Establish appropriate communications distribution/maintenance locations within the Base/Camp (s).
- Ensure communications systems are installed and tested.
- Ensure an equipment accountability system is established.
- Ensure personal portable radio equipment from cache is distributed per Incident Radio Communications Plan.
- Provide technical information as required on:
    - Adequacy of communications systems currently in operation.
    - Geographic limitation on communications systems.
    - Equipment capabilities/limitations.
    - Amount and types of equipment available.
    - Anticipated problems in the use of communications equipment.
- Supervise Communications Unit activities.
- Maintain records on all communications equipment as appropriate.
- Ensure equipment is tested and repaired.
- Recover equipment from Units being demobilized.

MEDICAL UNIT LEADER

- Participate in Logistics Section/Service Branch planning activities.
- Prepare the Medical Plan (ICS Form 206-CG).
- Prepare procedures for major medical emergency.
- Declare major emergency as appropriate.
- Respond to requests for medical aid, medical transportation, and medical supplies.
- Prepare and submit necessary documentation.

FOOD UNIT LEADER

- Determine food and water requirements.
- Determine the method of feeding to best fit each facility or situation.
- Obtain necessary equipment and supplies and establish cooking facilities.
- Ensure that well-balanced menus are provided.
- Order sufficient food and potable water from the Supply Unit.
- Maintain an inventory of food and water.
- Maintain food service areas, ensuring that all appropriate health and safety measures are being followed.
- Supervise caterers, cooks, and other Food Unit personnel as appropriate.

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SUPPORT BRANCH DIRECTOR

- Determine initial support operations in coordination with the Loigistic Section Chief and Service Branch Director.
- Prepare initial organization and assignments for support operations.
- Assemble and brief Support Branch personnel.
- Determine if assigned Branch resources are sufficient.
- Maintain surveillance of assigned units work progress and inform the Loigistic Section Chief of their activities.
- Resolve problems associated with requests from the Operations Section.

SUPPLY UNIT LEADER

- Participate in Logistics Section/Support Branch planning activities.
- Determine the type and amount of supplies en route.
- Review the Incident Action Plan for information on operations of the Supply Unit.
- Develop and implement safety and security requirements.
- Order, receive, distribute, and store supplies and equipment.
- Receive and respond to requests for personnel, supplies, and equipment.
- Maintain an inventory of supplies and equipment.
- Service reusable equipment.
- Submit reports to the Support Branch Director.

FACILITY UNIT LEADER

- Review the Incident Action Plan.
- Participate in Logistics Section/Support Branch planning activities.
- Determine requirements for each facility, including the Incident Command Post (See Figure 2.6 for list of hotels).
- Prepare layouts of incident facilities.
- Notify Unit Leaders of facility layout.
- Activate incident facilities.
- Provide Base and Camp Managers and personnel to operate facilities.
- Provide sleeping facilities.
- Provide security services.
- Provide facility maintenance services (e.g., sanitation, lighting, clean up).
- Demobilize Base and Camp facilities.
- Maintain facility records.

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GROUND SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Develop and implement the Traffic Plan.
- Support out-of-service resources.
- Notify the Resources Unit of all status changes on support and transportation vehicles.
- Arrange for and activate fueling, maintenance, and repair of ground resources.
- Maintain Support Vehicle Inventory and transportation vehicles (ICS Form 218).
- Provide transportation services, In accoradance with requests from the Loigistic Section Chief or Support Branch Director.
- Collect information on rented equipment.
- Requisition maintenance and repair supplies (e.g., fuel, spare parts).
- Maintain incident roads.
- Submit reports to Support Branch Director as directed.

VESSEL SUPPORT UNIT LEADER

- Participate in Support Branch/Logistics Section planning activities.
- Coordinate development of the Vessel Routing Plan.
- Coordinate vessel transportation assignments with the Protection and Recovery Branch or other sources of vessel transportation.
- Coordinate water-to-land transportation with the Ground Support Unit, as necessary.
- Maintain a prioritized list of transportation requirements that need to be scheduled with the transportation source.
- Support out-of-service vessel resources, as requested.
- Arrange for fueling, dockage, maintenance and repair of vessel resources, as requested.
- Maintain inventory of support and transportation vessels.

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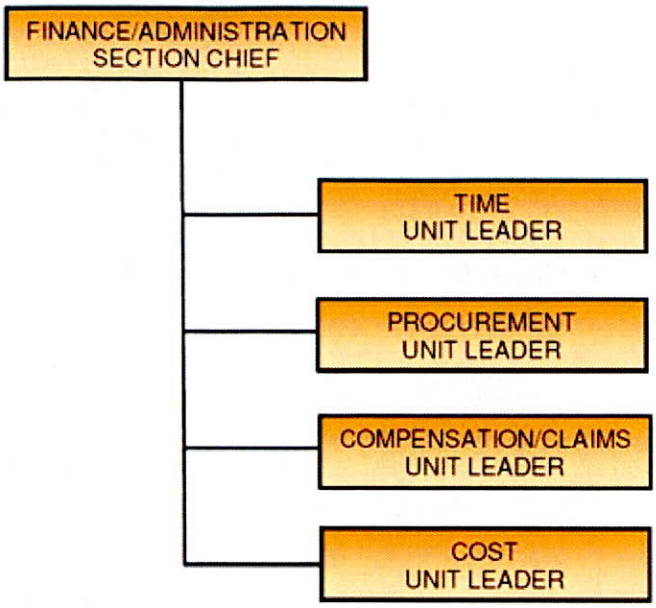
FINANCE/ADMINISTRATION



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FINANCE/ADMINISTRATION SECTION GENERAL FUNCTIONS

- Responsible for all financial and cost analysis aspects of an incident. (Note: Not all incidents will require a separate Finance/Administration Section. In cases that require only one specific function (e.g., cost analysis), this service may be provided by a member of the Planning Section.)
- Administering any contract negotiation.
- Providing cost analysis as it pertains to the Incident Action Plan.
- Maintaining cost associated with the incident.
- Tracking personnel and equipment time.
- Addressing compensation for injury or damage to property issues.

FINANCE/ADMINISTRATION SECTION CHIEF

- Attend planning meetings as required.
- Manage all financial aspects of an incident.
- Provide financial and cost analysis information as requested.
- Gather pertinent information from briefings with responsible agencies.
- Develop an operating plan for the Finance/Administration Section; fill supply and support needs.
- Determine the need to set up and operate an incident commissary.
- Meet with assisting and cooperating agency representatives, as needed.
- Maintain daily contact with agency(s) administrative headquarters on Finance/ Administration matters.
- Ensure that all personnel time records are accurately completed and transmitted, according to policy.
- Provide financial input to demobilization planning.
- Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- Brief administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.

TIME UNIT LEADER

- Determine incident requirements for time recording function.
- Determine resource needs.
- Contact appropriate agency personnel/representatives.
- Ensure that daily personnel time recording documents are prepared and in compliance with policy.
- Establish time unit objectives.
- Maintain separate logs for overtime hours.
- Establish commissary operation on larger or long-term incidents as needed.
- Submit cost estimate data forms to the Cost Unit, as required.
- Maintain records security.
- Ensure that all records are current and complete prior to demobilization.
- Release time reports from assisting agency personnel to the respective Agency Representatives prior to demobilization.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

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PROCUREMENT UNIT LEADER

- Review incident needs and any special procedures with Unit Leaders, as needed.
- Coordinate with local jurisdiction on plans and supply sources.
- Obtain the Incident Procurement Plan.
- Prepare and authorize contracts and land-use agreements.
- Draft memoranda of understanding as necessary.
- Establish contracts and agreements with supply vendors.
- Provide for coordination between the Ordering Manager, agency dispatch, and all other procurement organizations supporting the incident.
- Ensure that a system is in place that meets agency property management requirements. Ensure proper accounting for all new property.
- Interpret contracts and agreements; resolve disputes within delegated authority.
- Coordinate with the Compensation/Claims Unit for processing claims.
- Coordinate use of impress funds, as required.
- Complete final processing of contracts and send documents for payment.
- Coordinate cost data in contracts with the Cost Unit Leader.
- Brief the Finance/Administration Section Chief on current problems and recommendations, outstanding issues, and follow-up requirements.

COMPENSATION/CLAIMS UNIT LEADER

- Establish contact with the incident Security Officer and Liason Officer (or Agency Representatives if no Liason Officer is assigned).
- Determine the need for Compensation for Injury and Claims Specialists and order personnel as needed.
- Establish a Compensation for Injury work area within or as close as possible to the Medical Unit.
- Review Medical Plan (ICS Form 206-CG).
- Ensure that Compensation/Claims Specialists have adequate workspace and supplies.
- Review and coordinate procedures for handling claims with the Procurement Unit.
- Brief the Compensation/Claims Specialists on incident activity.
- Periodically review logs and forms produced by the Compensation/Claims Specialists to ensure that they are complete, entries are timely and accurate and that they are in compliance with agency requirements and policies.
- Ensure that all Compensation for Injury and Claims logs and forms are complete and routed appropriately for post-incident processing prior to demobilization.
- Keep the Finance/Administration Section Chief briefed on Unit status and activity.
- Demobilize unit in accordance with the Incident Demobilization Plan.

COST UNIT LEADER

- Coordinate cost reporting procedures.
- Collect and record all cost data.
- Develop incident cost summaries.
- Prepare resources-use cost estimates for the Planning Section.
- Make cost-saving recommendations to the Finance/Administration Section Chief.
- Ensure all cost documents are accurately prepared.
- Maintain cumulative incident cost records.
- Complete all records prior to demobilization.
- Provide reports to the Finance/Administration Section Chief.

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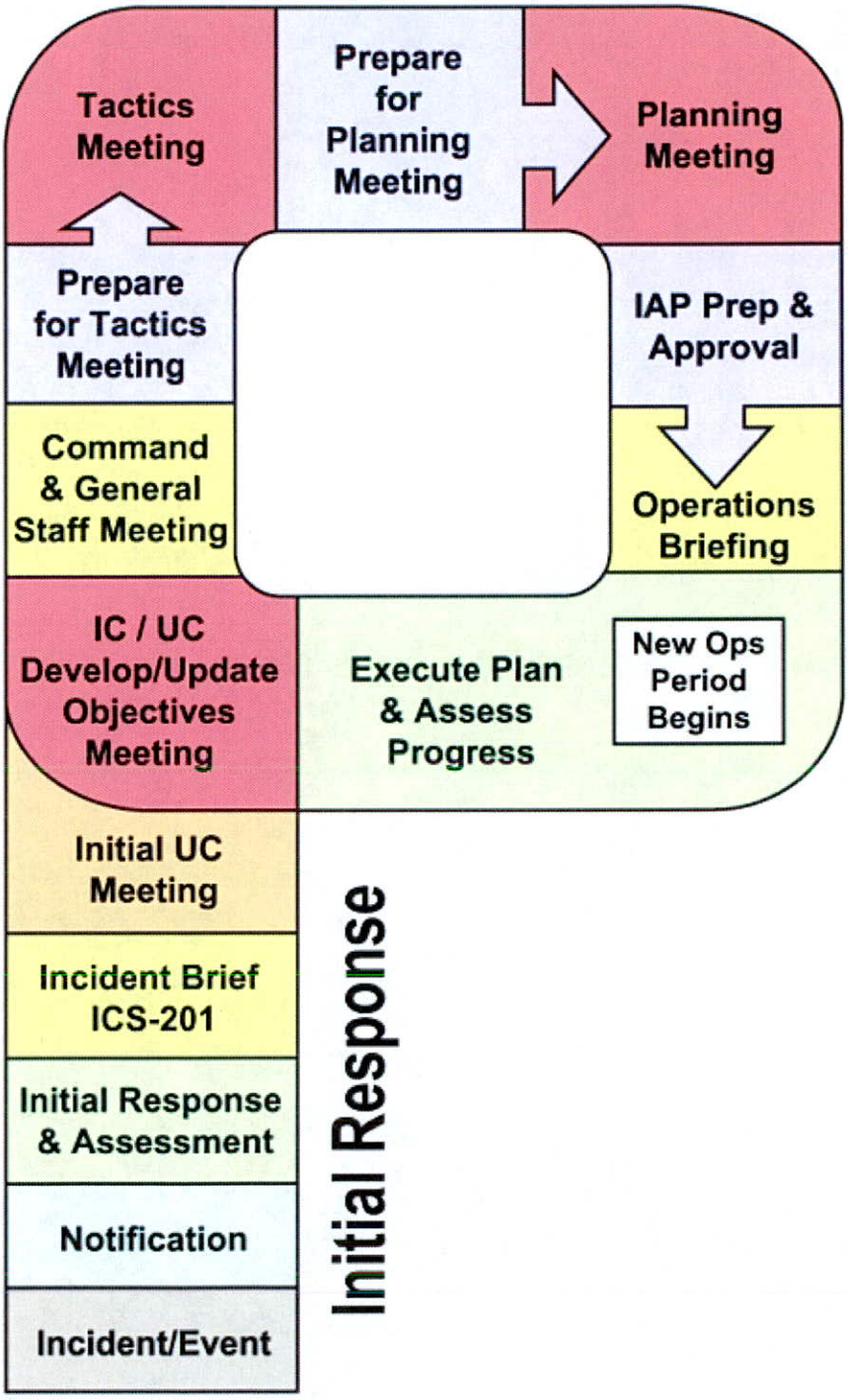
FIGURE 4.2

The Operational Planning P



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5.0 RESPONSE PLANNING

5.1 Incident Action Plan

5. 2 Site Safety Plan

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5.1 INCIDENT ACTION PLAN

Emergency response activities are planned and coordinated through the use of an Incident Action Plan (IAP), which is developed for each Operational Period of a response by the Initial Response Team. For small responses, an ICS 201 may be used as the IAP and, for all incidents, the ICS 201 will serve as the initial IAP.

For larger or more complex incidents, a more complete IAP will be necessary. These IAPs are generally created through the completion and compilation of several standard Incident Command System forms. These forms include, but are not limited to:

ICS FORM NUMBER	FORM TITLE	PREPARED BY
IAP Cover Sheet	ICS IAP Cover Sheet	**Planning Section** - Situation Unit Leader
201-CG	Incident Briefing	**Command Section** - Initial Response Incident Commander
202-CG	Incident Objectives	**Planning Section** - Planning Section Chief
203-CG	Organization Assignment List	**Planning Section** - Resources Unit Leader
204-CG	Assignment List	**Operations Section** - Chief & Resources Unit Leader
204a-CG	Assignment List Attachment	**Operations Section** - Chief & Resources Unit Leader
205-CG	Incident Radio Communication Plan	**Logistics Section** - Communication Unit Leader
205a-CG	Communications List	**Logistics Section** - Communication Unit Leader
206-CG	Medical Plan	**Logistics Section** - Medical Unit Leader
207-CG	Incident Organization	**Planning Section** - Resources Unit Leader
209-CG	Incident Status Summary	**Command Section** - Incident Commander
211-CG	Check-In List	
213-RR CG	Resource Request Message	
214-CG	Unit Log	**Planning Section** - Situation Unit Leader
215-CG	Operational Planning Worksheet	
215A-CG	Incident Action Plan Safety Analysis	
218	Support Vehicle Inventory	**Logistics Section** - Ground Support Unit Leader
220-CG	Air Operations Summary	**Operations Section** - Air Operations Branch Director
230-CG	Daily Meeting Schedule	
232-CG	Resources at Risk Summary	**Planning Section** - Situation Unit Leader
232a-CG	ACP Site Index	
233-CG	Incident Open Action Tracker	
234-CG	Work Analysis Matrix	
235-CG	Facility Needs Assessment Worksheet	
	Site Safety Plan	**Command Section** - Safety Officer
	Employee Certification Page	
	Media Statement	

Depending on the nature and severity of the emergency, additional documents may be included in the Incident Action Plan. These may include:

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- Sensitivity Maps (Provided in Section 6)
- Waste Management and Disposal Plans (Provided in Appendix E)
- Plans for use of Alternative Technologies (Dispersant/In-situ Burning/ Bioremediation)
- Security Plans
- Decontamination Plans
- Traffic Plans

5.2 SITE SAFETY PLAN

Site Safety Plans (SSPs) are required by United States Occupational Safety and Health Administration (29 CFR 1910.120(b)(4)) for all hazardous waste operations. The Site Safety Plan should address all on-site operations and hazardous as well as on-site emergency procedures.

The Site Safety Plan is typically prepared by the Safety Officer and approved by the Incident Commander. All personnel must be familiar with the contents of the Site Safety Plan and the Site Safety Plan must be updated as conditions, operations and hazards associated with the response change.

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1. Incident Name	2. Operational Period to be covered by IAP (Date/Time)	IAP COVER SHEET
	From: To:	

3. Approved by:

FOSC

SOSC

RPIC

INCIDENT ACTION PLAN

The items checked below are included in this Incident Action Plan:

- ☐ ICS 202-OS (Response Objectives)
- ☐ ICS 203-OS (Organization List) – OR – ICS 207-OS (Organization Chart)
- ☐ ICS 204-OSs (Assignment Lists)
  One Copy each of any ICS 204-OS attachments:
  - ☐ Map
  - ☐ Weather forecast
  - ☐ Tides
  - ☐ Shoreline Cleanup Assessment Team Report for location
  - ☐ Previous day's progress, problems for location
- ☐ ICS 205-OS (Communications List)
- ☐ ICS 206-OS (Medical Plan)
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

4. Prepared by: Date/Time

IAP COVER SHEET June 2000

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1. Incident Name	2. Prepared by: (name)	INCIDENT BRIEFING ICS 201-CG
[redacted]	Date: [redacted] Time: [redacted]	

3. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, overflight results, trajectories, impacted shorelines, or other graphics depicting situational and response status)

[redacted]

4. Current Situation: [redacted]

[redacted]

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1. Incident Name	2. Prepared by: (name)	INCIDENT BRIEFING
[redacted]	[redacted] Date: [redacted] Time: [redacted]	ICS 201-CG

5. Initial Response Objectives, Current Actions, Planned Actions

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
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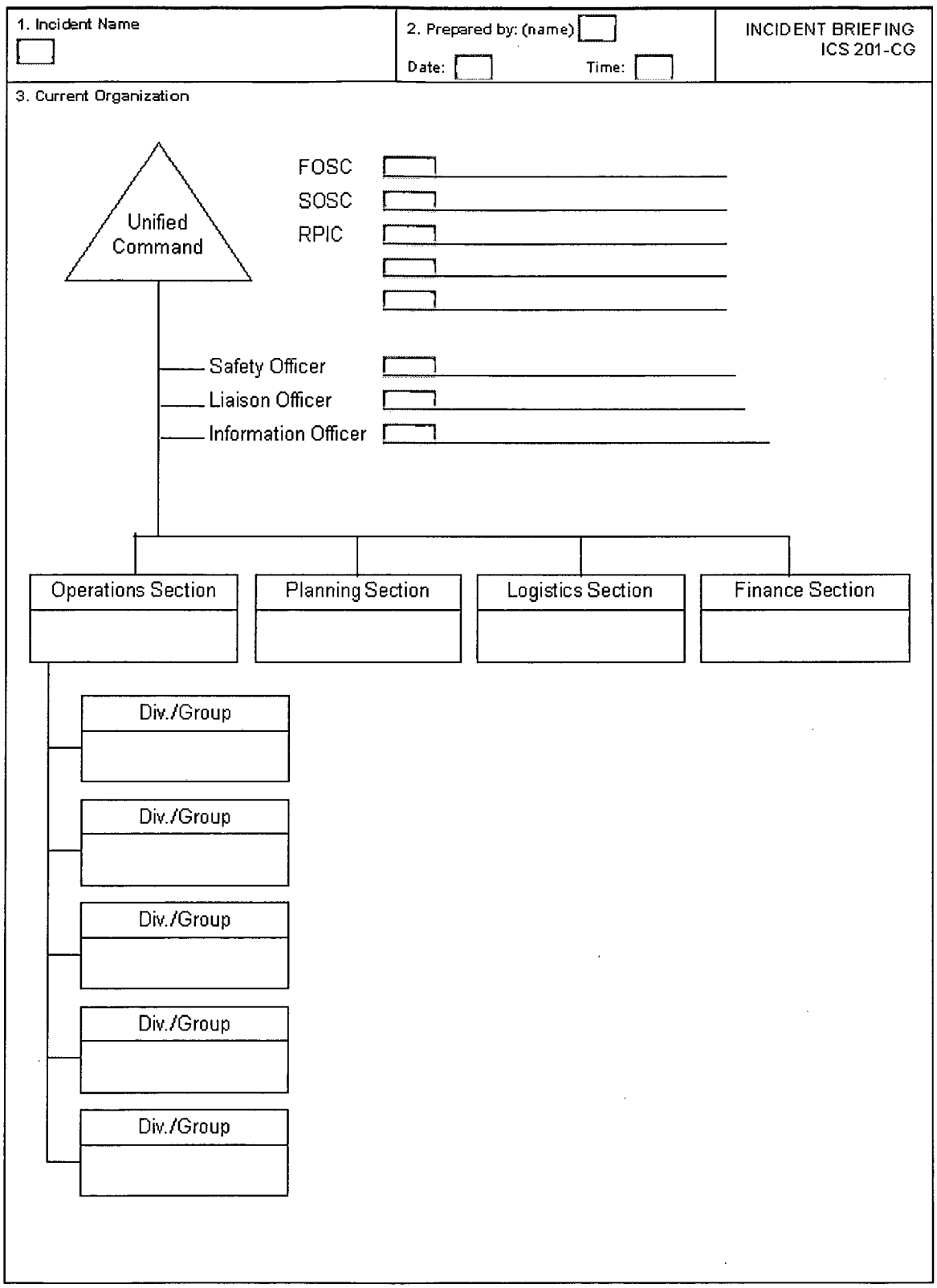

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1. Incident Name	2. Prepared by: (name) Date: Time:	INCIDENT BRIEFING ICS 201-CG

7. Resources Summary Resource	Resource Identifier	Date Time Ordered	ETA	On-Scene (X)	NOTES: (Location/Assignment/Status)

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1. Incident Name	2. Operational Period (Date/Time)	INCIDENT OBJECTIVES ICS 202-CG
	From: To:	

3. Objective(s)

4. Operational Period Command Emphasis (Safety Message, Priorities, Key Decisions/Directions)

Approved Site Safety Plan Located at:

5. Prepared by: (Planning Section Chief)	Date/Time

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1. Incident Name	2. Operational Period (Date/Time) From: To:	ORGANIZATION ASSIGNMENT LIST ICS 203-CG

3. Incident Commander(s) and Staff		
Agency	IC	Deputy
Safety Officer:		
Information Officer:		
Liaison Officer:		

4. Agency Representatives	
Agency	Name

5. PLANNING/INTEL SECTION	
Chief	
Deputy	
Resources Unit	
Situation Unit	
Environmental Unit	
Documentation Unit	
Demobilization Unit	
Technical Specialists	

6. LOGISTICS SECTION	
Chief	
Deputy	
a. Support Branch	
Director	
Supply Unit	
Facilities Unit	
Vessel Support Unit	
Ground Support Unit	
b. Service Branch	
Director	
Communications Unit	
Medical Unit	
Food Unit	

7. OPERATION SECTION	
Chief	
Deputy	
Deputy	
Staging Area Manager	
Staging Area Manager	
Staging Area Manager	
a. Branch – Division Groups	
Branch Director	
Deputy	
Division Group	
Division Group	
Division Group	
Division/Group	
Division/Group	
b. Branch – Division/Groups	
Branch Director	
Deputy	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
c. Branch – Division/Groups	
Branch Director	
Deputy	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
Division/Group	
d. Air Operations Branch	
Air Operations Br. Dir	
Helicopter Coordinator	

8. FINANCE/ADMINISTRATION SECTION	
Chief	
Deputy	
Time Unit	
Procurement Unit	
Compensation/Claims Unit	
Cost Unit	

9. Prepared By: (Resources Unit)	Date/Time

NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date / Time) From: To:	MEDICAL PLAN ICS 206-CG

3. Medical Aid Stations

Name	Location	Contact #	Paramedics On site (Y/N)

4. Transportation

Ambulance Service	Address	Contact #	Paramedics On board (Y/N)

5. Hospitals

Hospital Name	Address	Contact #	Travel Time		Burn Ctr?	Heli-Pad?
			Air	Ground		

6. Special Medical Emergency Procedures

7. Prepared by: (Medical Unit Leader) Date/Time	8. Reviewed by: (Safety Officer) Date/Time

MEDICAL PLAN ICS 206-CG (Rev.07/04)

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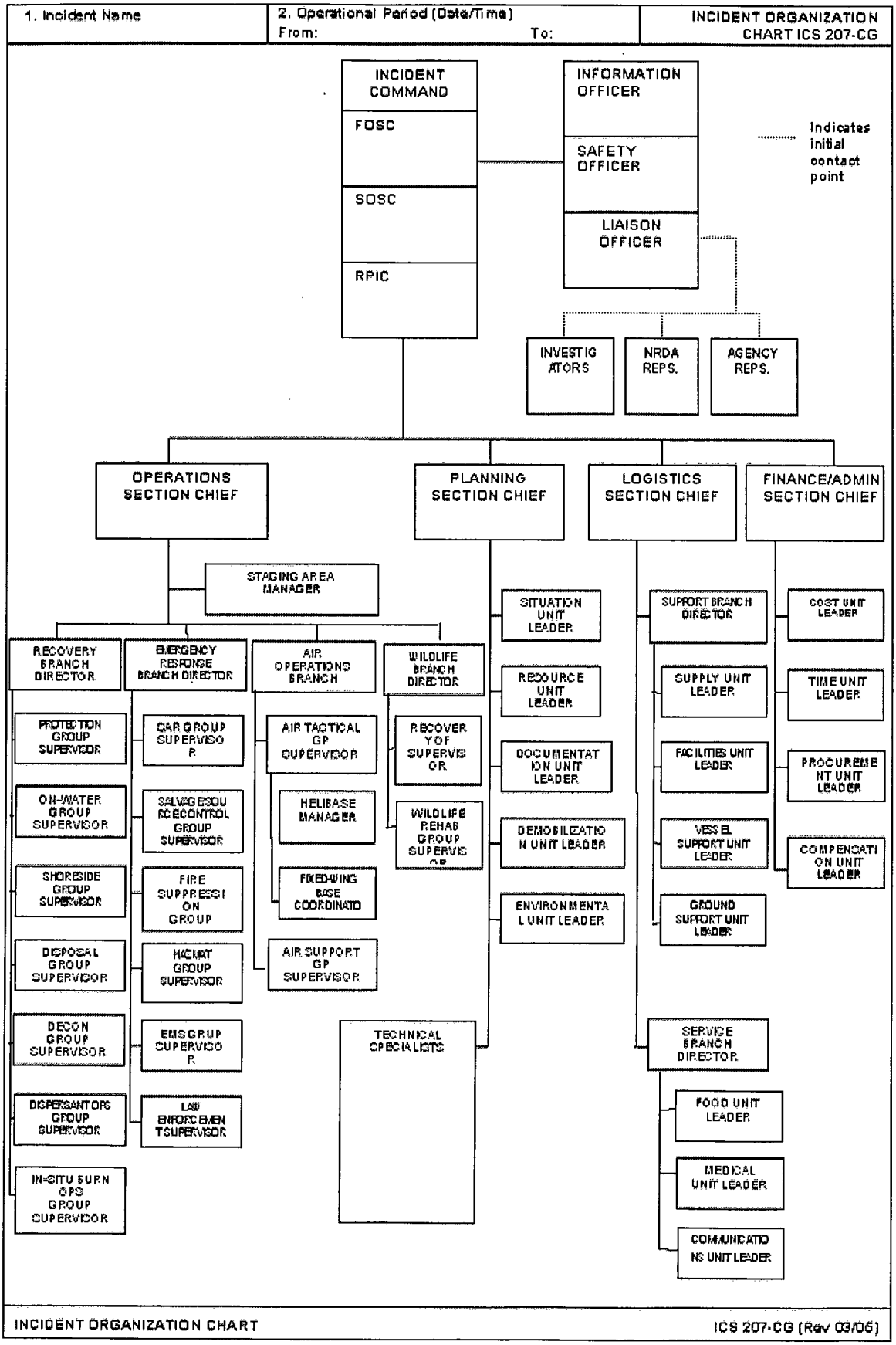

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SITE SAFETY PLAN

I. General

☐ Pump Station ☐ Pipeline Spill ☐ Spill to Water ☐ Excavation ☐ Other: _____

Location: _____

Work to be performed: _____

Issuing Date: _____ Time: _____
Temperature: ___° Wind Direction: ___
Humidity: _____

II. Hazards to be Evaluated

Y	N		Y	N		SPECIFIC HAZARDS Y	N	
☐	☐	Oxygen Deficient/Enriched	☐	☐	Ingestion / Skin Absorption	☐	☐	Crude Oil
☐	☐	Flammable Atmosphere	☐	☐	Frostbite	☐	☐	Other* ( )
		(Explosion Fire)	☐	☐	Chemical/MSDS # _____			
☐	☐	Toxic Atmosphere: _____			(Must be attached)			
☐	☐	Boat Operations	☐	☐	Physical Hazard _____			
☐	☐	Confined Space	☐	☐	Traffic _____			
			☐	☐	Vapor Cloud			

III. Testing & Monitoring (Check required items)

Tests are to be performed in the order listed.

Y	N		Continuous		Frequency
☐	☐	Oxygen Level	☐Y	☐N	_____ every ____.
☐	☐	LEL	☐Y	☐N	_____ every ____.
☐	☐	Hydrogen Sulfide	☐Y	☐N	_____ every ____.
☐	☐	Benzene	☐Y	☐N	_____ every ____.
☐	☐	Total Hydrocarbons	☐Y	☐N	_____ every ____.
☐	☐	Other: _____	☐Y	☐N	_____ every ____.

ACCEPTABLE ENTRY CONDITION: [illegible]

[illegible]	[illegible]	[illegible]
19.5 – 23.0% in air	< 19.5% or 23.0% in air	< 16.0 or ≥ 23.5% in air
< 10% in air	≥ 10.0 but < 20.0% in air	≥ 20.0% in air
< 10 ppm	≥ 10 but < 100 ppm	≥ 100 ppm
< 5 ppm	≥ 5 but < 10 ppm	≥ 10 ppm
< 300 ppm -	≥ 300 but < 750 ppm	≥ 750 ppm

IV. Required Personal Protective Equipment (Check for required use)

General	Eye Prot.	Respiratory Prot.	Hearing Prot.	Gloves	Footwear	Clothing
☐ Hard Hat	☐ Safety Glasses	☐ SCBA/Air Line w/Escape	☐ Ear Plugs	☐ Leather	☐ Steel-toes	☐ FR Coveralls
☐ Safety Harness	☐ Goggles	☐ Air Line	☐ Ear Muffs	☐ Rubber	☐ Rubber	☐ Tyvek
☐ PFD	☐ Face-shield	☐ Air Purifying (Full Mask)	☐ Combination	☐ Nitrile	☐ Hip-boots	☐ Coated Tyvek
	☐ Tinted Lens	Cartridge Type: ☐ OV	☐ Hepa-OV	☐ PVC	☐ _____	☐ Saranyx
				☐		☐ _____

Any other special PPE: _____

V. Emergency Information and Rescue Services

Emergency Contact Person: _____ Contact by: _____
Fire Department: _____ Contact by: _____
Ambulance: _____ Contact by: _____
Hospital: _____ Contact by: _____
Rescue Services: _____ Contact by: _____
(if not provided by above)

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VI. Required Safety & Rescue Equipment (on site)

☐ Lights	☐ Fall Protection	☐ First Aid Kit	☐ Drinking Water	☐ Fire Extinguisher	☐ Tripod	☐ Other:
☐ Ladder	☐ Retrieval Lines	☐ Resuscitator	☐ Communication Method			

VII. Comments or Special Work Procedures

VIII. Report All Injuries Immediately

IX. Control Measures

• Isolation & Lockout (identify items to be locked out)	• Ventilation ☐ Natural ☐ Mechanical
• Establish Work Zones when completed	Continuous ☐ No ☐ Yes
☐ Hot Zone = Red Ribbon	• Flagman / Watchman ☐
☐ Warm Zone = Yellow Ribbon	• Confined Space – Safety Watch ☐
☐ Cold Zone = Blue Ribbon	(See Exhibit "B" for Permit)
	• Evacuation Routes – (Identify on Map)
	☐ Air Horn – Emergency
	☐ Primary Route
	☐ Secondary Route

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X. Monitoring Results	Zone													
Oxygen	Time													
	Level													
	By													
LEL	Time													
	Level													
	By													
Hydrogen Sulfide	Time													
	Level													
	By													
Benzene	Time													
	Level													
	By													
VOC	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													
	Time													
	Level													
	By													

Equipment: Type:_____ Mfger:_____Calibration / Expiration: _____
Type:_____ Mfger:_____Calibration / Expiration: _____

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG ICS 214-CG
3. Unit Name/Designators	4. Unit Leader (Name and ICS Position)	

5. Personnel Assigned

NAME	ICS POSITION	HOME BASE

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time

UNIT LOG ICS 214-CG (Rev 6/05)

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NRC Incident No. #_____

1. Incident Name	2. Operational Period (Date/Time) From: To:	UNIT LOG (CONT.) ICS 214-CG

6. Activity Log (Continue on Reverse)

TIME	MAJOR EVENTS

7. Prepared by: Date/Time:

UNIT LOG ICS 214-CG (Rev 6/05)

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6.0 SPILL IMPACT CONSIDERATIONS

6.1 Critical Areas to Protect

6.2 Environmental/Socio-Economic Sensitivities

6.3 Fisheries and Wildlife Protection

6.4 Staging Areas

6.5 Containment and Recovery of Spilled Product

6.6 Vulnerability Analysis

6.7 Alternative Response Strategies

Figure 6.1 On-Water Response Flowchart

Figure 6.2 Environmental Sensitivity Maps

Figure 6.3 Endangered/Threatened Species Listing

Figure 6.4 Aquifers

Figure 6.5 Affected HCA/Environmental

Figure 6.6 Drain Tiles

Figure 6.7 Reference Websites

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6.1 CRITICAL AREAS TO PROTECT

The critical areas to protect are classified as high, moderate, and low sensitivity to oil for non-coastal/inland environments. The Federal, Province/State, and Local authorities will further clarify these categories at the time of the response. The categories are defined as follows:

HIGH SENSITIVITY

- Areas which are high in productivity, abundant in many species, extremely sensitive, difficult to rehabilitate, or inhabited by threatened/endangered species.
- Areas which consist of populated areas, rural water systems, well head or source water protection areas or drinking water wells.
- Areas which consist of forested areas, brush/grassy areas, wooded lake areas, freshwater marshes, wildlife sanctuaries/refuges, and vegetated river/stream banks.

MODERATE SENSITIVITY

- Areas of moderate productivity, somewhat resistant to the effects of oiling.
- Areas which consist of degraded marsh habitat, clay/silt banks with vegetated margins, and gravel/cobble beaches.

LOW SENSITIVITY

- Areas of low productivity, man-made structures, and/or high energy.
- Areas which consist of gravel, sand, or clay material, barren/rocky riverbanks and lake edges, man-made structures, and concrete/compacted earthen drainage ditches.

6.2 ENVIRONMENTAL/SOCIO-ECONOMIC SENSITIVITIES

Environmental/Socio-economic sensitivities are of extreme importance when planning a response effort.The health and safety of the public and the environment, as well as the protection of the various socio-economic sensitivities, must be promptly addressed in order to mitigate the extent of damage and minimize the cost of the clean-up effort.

It is important to protect archeological sites and heritage resources (e.g. National Parks, National Marine Conservation Areas, and National Historic Sites). Impacted archeological sites or heritage resources of an area need to be identified and the likely impacts that result from the activities should be addressed. Specific consideration should be given to access to, and general use and disturbance of areas. The assessment should consider both direct and indirect impacts, cultural protocols and strategies for minimizing impacts. Consultation with local indigenous communities should occur as part of the planning process.

The Company will explore, where appropriate, equivalent environmental protection systems, methods, devices, or technologies that maintain or may be less damaging to the character of heritage resources or archeological sites. If a release from the pipeline impacts a heritage resource, the Company will respond as outlined in Section 3.0, report to the appropriate authority prescribed by law, cleanup and restore the area as required by regulation, and conduct such sampling, analyses, or associated monitoring during and after restoration.

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All environmental/socio-economic sensitivities are worthy of protection, but must be prioritized during a response effort. When making decisions on which areas to designate as collection areas and which to protect, the following sources may be consulted:

- Canadian Wildlife Services, U.S. Fish and Wildlife Service and related province/ state agencies;
- Applicable Area Contingency Plans;
- Other industry and private experts; and
- Indigenous groups.

The environmental and socio-economic sensitivities in the vicinity of the Pipeline have been broken down into specific categories and identified in this Section. To further clarify the location of the sensitive areas of concern, references to published Area Contingency Plans and Environmental Sensitivity Maps are also provided in this section.

6.3 FISHERIES AND WILDLIFE PROTECTION

The Company will work with Federal, Province/State, and local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill, as necessary. Oversight of the Company's wildlife preservation activities and coordination with Federal, Province/State, and Local agencies during an oil spill is the responsibility of the Incident Commander.

Protecting fish habitat (e.g. spawning and rearing grounds) is important to both consumers and commercial fisheries. Beyond typical response strategies, other options could include moving floating facilities, temporarily sinking facilities using cages designed for this purpose, temporary suspension of water intakes, or closing sluice gates to isolate the facilities from contamination.

Special consideration should be given to the protection and rehabilitation of endangered species and other wildlife and their habitat in the event of an oil spill and subsequent response. Jurisdictional authorities should be notified and worked with closely on all response/clean-up actions related to wildlife protection and rehabilitation. Laws with significant penalties are in place to ensure appropriate protection of these species.

Wildlife Rescue

The Company will work with Federal, Province/State, and Local agency personnel to provide labor and transportation to retrieve, clean, and rehabilitate wildlife affected by an oil spill, as the situation demands.

The following are items which should be considered for wildlife rescue and rehabilitation during a spill response:

- Bird relocation can be accomplished using a variety of deterrents, encouraging birds to avoid areas of spilled oil. Bird relocation can be accomplished by utilizing deterrent methods including:
  - Use of visual stimuli, such as inflatable bodies, owls, stationary figures, or helium balloons, etc.
  - Use of auditory stimuli, such as propane cannons, recorded sounds, or shell crackers.
  - Use of herding with aircraft, boats, vehicles, or people (as appropriate).Use of capture and relocation.

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Search and Rescue - Points to consider

- **The Company's involvement should be limited to offering assistance as needed or requested by the agencies.**
- Prior to initiating any organized search and rescue plan, **authorization must be obtained from the appropriate Federal/State agency.**
- **Initial search and rescue efforts, if needed, should be left up to the appropriate agencies.**They have the personnel, equipment, and training to immediately begin capturing contaminated wildlife.
- With or without authorization, it must be anticipated that volunteer citizens will aid distressed/contaminated wildlife on their own. It is important to communicate that it may be illegal to handle wildlife without express authority from appropriate agencies. Provisions should be made to support an appropriate rehabilitator; however, **no support should be given to any unauthorized volunteer rescue efforts.**
- The regulatory agencies and response personnel should be provided the name and location of a qualified rehabilitator in the event contaminated wildlife is captured.
- Resources and contacts that can assist with wildlife rescue and rehabilitation are provided in Section 2.0. This list includes:
  - Outside rehabilitation organizations;
  - Local regulatory agencies; and
  - Other resources.

6.4 STAGING AREAS

When establishing personnel and equipment staging areas for a response to a Pipeline discharge, the following criteria should be evaluated:

- Access to waterborne equipment launching facilities and/or land equipment.
- Access to open space for staging/deployment of heavy equipment and personnel.
- Access to public services utilities (electricity, potable water, public phone, restroom and washroom facilities, etc.).
- Access to the environmental and socio-economically sensitive areas which are projected for impact.

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6.5 CONTAINMENT AND RECOVERY OF SPILLED PRODUCT

General descriptions of various specific response techniques that may be applied during a response effort are discussed below. Company responders are free to use all or any combination of these methods as incident conditions require, provided they meet the appropriate safety standards and other requirements relative to the situation encountered. Data was obtained from reports, manuals and pamphlets prepared by the American Petroleum Institute, Environmental Protection Agency, and the United States Coast Guard. The most effective cleanup of a product spill will result from an integrated combination of clean-up methods. Each operation should complement and assist related operations and not merely transfer spillage problems to areas where they could be more difficult to handle.

The spill should be assessed as soon as possible to determine the source, extent and location of travel. Terrain and other physical conditions downgradient of the spill site will determine the methods of control at a point in advance of the moving product. Often, the bulk of a spill can be contained at a single location or a few key locations in the immediate vicinity of the source point. When possible, the execution of this type of initial containment strategy helps confine a spill to a relatively limited area.

Spill on Land / Source Control

- **Containment Methods**

  After safety, the highest priority for TransCanada during a spill response is to prevent product from reaching water and mitigate migration of oil out of the source area. To accomplish this there are many different ways to contain or deflect product. Product can be trapped in ditches and gullies by earth dams. Where excavating machinery is available, dams can be bulldozed to contain lakes of product. Dams, small and large, should be effectively employed to protect priority areas such as inlets to drains, sewers, ducts and watercourses. These can be constructed of earth, sandbags, absorbents, planks, pillow (inflatable with air/water) dams or any other effective method. If time does not permit a large dam, many small ones can be made, each one holding a portion of the spill as it advances. The terrain will dictate the placement of the dams. If the spill is minor, natural dams or earth absorption will usually stop the product before it advances a significant distance. Cleanup is the main concern in such situations.

  Whenever possible, potential routes of migration should be closed off by the use of sandbags, planks, earth or other dams. This is used as a preventative measure in case precipitation begins and the product starts to migrate.

  In urban locations such as city streets or concrete drainage ditches, a combination of sorbent booms in front with a layer sandbags behind holding the boom in place can be used as a very effective means to create containment along with some collection.

  Instead of building up dikes and dams, another method of containment is to dig collection pits. By creating a new low point for the oil to run it provides an excellent recovery point for removal.

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- **Removal Methods**

The best approaches to remove oil from urban infrastructure include:

- Removal with suction equipment to tank truck if concentrated in volumes large enough to be picked up. Channels can be formed to drain pools of product into storage pits. The suction equipment can then be used.
- Small areas can be cleaned by hand. Use of sorbent pads to soak up the oil is the preferred method.
- If safe, controlled burning presents the possibility of a fast, simple, and inexpensive method of destruction of the remainder of the product. If all other options have been executed and the site is still unsafe for further activity because explosive vapors persist, the vapors may need to be intentionally ignited to prevent an accumulation sufficient to become an explosive mixture, provided the other requirements of these guidelines for controlled burning are met.

Intentional ignition to remove released product should be utilized only if all of the following conditions are met:

- Other steps and procedures have been executed and a determination has been made that this is the safest remaining method of control.
- Intentional burning will not unduly damage pipelines, adjacent property, or the environment.
- Controlled burning is permitted by Federal and State/Provincial government authorities. Local government authorities to be contacted may include city council, county board of commissioners, city or county fire chiefs, the county forestry commission or fire tower, and the local environmental protection agency. In seeking permission from these authorities, be prepared to convince them that adequate safety precautions have been and will be taken during the operation. Also be ready to conduct water or soil sampling upon completion as may be required.
- Controlled burning is conducted with the consent of local land owners.
- Safety must always be a prime consideration when considering controlled burning of product. Sparks and heat radiation from large fires can start secondary fires and strong winds make fire control difficult. There must be no danger of the fire spreading beyond control limits. All persons must be at a safe distance from the edge of the inflammable area. Remember that all burning must be controlled burning.

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Spill on Lake or Pond (Calm or Slow-Moving Water)

- **Containment Methods**

A lake or pond offers the best conditions for removal of product from water. Although the removal is no easy task, the lake or pond presents the favorable conditions of low or no current and low or no waves.

The movement of product on a lake or pond is influenced mainly by wind. The product will tend to concentrate on one shore, bank or inlet. Booms should be set up immediately to hold the product in the confined area in the event of a change in wind direction.

If the spill does not concentrate itself on or near a shore (no wind effect), then a sweeping action using boats and floating booms will be necessary.

The essential requirement for this operation is that it be done very slowly. The booms should be moved at not more than 40 feet per minute. Once the slick is moved to a more convenient location (near shore), the normal operations of removal should begin.

If the slick is small and thin (rainbow effect) and not near the shoreline, an absorbent boom instead of a regular boom should be used to sweep the area very slowly and absorb the slick. The product may not have to be moved to the shoreline. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

If the Containment slick is thick enough, regular suction equipment may be used first; however, in most instances, a floating skimmer should be used.

If the floating skimmer starts picking up excess water (slick becomes thin), drawing the boom closer to the bank as product is removed will also keep film of product thicker. However, when the slick becomes too thin, the skimmer should be stopped and an absorbent applied (with a boat if necessary) to remove the final amounts. The floating skimmer (if speed is a must) or hand skimmers (if water is shallow enough) or both can be used to pick up the product-soaked absorbent. Before pumping the product-soaked absorbent with a floating skimmer, ensure that the absorbent in question can be pumped and will not harm the pump. Several types are nonabrasive to pump internals. If the floating skimmer is used first, the product-soaked absorbent/water mixture should be pumped into a tank truck.

A better method of retrieving the product-soaked absorbent is to draw it in as close to the shore as possible with the booms used to confine the product initially. The absorbent can then be hand skimmed from the water surface and placed in drums, on plastic sheets or in lined roll-off boxes. It should then be disposed of by acceptable means.

The final rainbow on the surface can be removed with additions of more absorbent.

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Spill on Small to Medium Size Streams (Fast-Flowing Creeks)

- **Containment Methods**

The techniques used for product containment on fast-flowing shallow streams are quite different from the ones used on lakes, ponds, or other still bodies of water. The containment and removal processes require a calm stretch of water to allow the product to separate onto the surface of the water. If a calm stretch of water does not exist naturally, a deep slow-moving area should be created by damming. The dam can be constructed by using sandbags, planks or earth. If a dam is required, it should be situated at an accessible point where the stream has high enough banks. The dam should be constructed soundly and reinforced to support the product and water pressure.

- Underflow dam - The underflow dam is one method that can be used, especially on small creeks. The water is released at the bottom, of the dam using a pipe or pipes which are laid during construction of the dam. The flow rate through the pipe must be sufficient to keep the dam from overflowing. One method is to lay the pipe at an angle through the dam (while dam is being constructed) so that the height of the downstream end of the pipe will determine the height the water will rise behind the dam.

  Another method used with the underflow dam is having the pipe or pipes sized to carry only a portion of the flow needed. The pipe would be placed at the bottom of the dam and level with the creek bed. The remaining flow of the creek could be siphoned or preferably pumped around the dam from a point away from the dam and from the deepest portion of the pool. The pumping or siphoning can be controlled to maintain the desired water level at the dam. The key is the removal of water through or around the dam at the lowest point in the basin. This prevents the oil from escaping with the released water.

- Overflow dam - Another method of containment is the overflow type dam. The dam is constructed so that water flows over the dam, but a deep pool is created which slows the surface velocity of the water. Therefore, the condition of a calm stretch of water is met. The overflow dam may be used where larger flow rates (medium size creeks) of water are involved

  With this type dam, a separate barrier (floating or stationary boom) must be placed across the pool created by the dam. The separate barrier arrests the surface layer of product. At the same time, the water is flowing under the barrier and over the top of the dam. The barrier should be placed at an angle of 45 % across the pool to decrease the effective water velocity beneath it. Also, it helps to concentrate the product at the bank and not all along the barrier. A second barrier should be placed approximately 10 to 15 feet downstream of the first one as a secondary back-up.

  The stationary boom type barrier should be made of wood planks or other suitable material. The stationary boom should be soundly constructed and sealed against the bank. The ends of the planks can be buried in the banks of the stream and timber stakes driven into the stream bed for support as needed. The necessary length of the boom will be approximately 1-1/2 times the width of the waterway.

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The plank boom should extend six to eight inches deep into the water and about two inches or higher above the water level. If the increase in velocity under the stationary boom is causing release of trapped product, it should be moved upward slightly. At no time should barrier be immersed more than 20% of the depth of the pool at the barrier location; that is, if the pool created by damming is three feet deep, do not exceed an immersion depth of seven inches with the barrier at the position the barrier is installed.

A floating boom can be used in place of the stationary type if the created pool's size (bank to bank) and depth will permit. Since changing the depth and/or length of a standard floating boom in a small stream is difficult, the use of the separation of product and water. The advantages of using a floating boom are the speed of deployment and the fact that there is not need for additional support as with the stationary boom.

- Multiple Impoundments - Since emergency built dams (either underflow or overflow) are seldom perfect, a series of dams is usually required. The first one or two will trap the bulk and the ones that are downstream will trap the last traces of product. Precautions should be taken to ensure that the foundations of emergency dams are not washed away by the released water. If earth is used to construct an overflow dam, a layer of earth-filled bags should be placed on top of the dam so erosion will not take place. See Figure 6.1 for on-water recovery decision tree.

- **Removal Methods**

Once the containment dams are constructed, the problem or removal of the product from the water surface should be the prime consideration. The removal must be continuous or else build-up of product behind the dams or booms might lead to product escaping the traps.

The type of removal procedures used depends largely on the amount of product being trapped in a given span of time, if the amount of product moving down the stream is of sufficient quantity, the first dam or fixed boom would quite possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and possibly some water to a tank truck or other holding tank. Separated water may be released from the bottom of the tank truck if it becomes necessary. The absorbents could then be used at downstream dams or booms. It is inadvisable to place an absorbent in the stream prior to or at the first dam in anticipation of the arriving product. Let the product accumulate at the first dam and use the floating skimmer to recover the product.

Disposal of gross amount of product-soaked absorbent would not then be a problem. Follow directions on use of each absorbent. Some are designed to be placed on water before product arrives; others are intended only to be placed on the product after it accumulates on the water. Plastic sheets should be used to place the product- soaked absorbent on as it is hand skimmed from the water. Alternatively, the material may be placed in drums or lined roll-off boxes.

The containment and removal of spilled product on small to medium fast-flowing streams might require a combination of underflow or overflow dams, fixed booms, skimmers, and absorbents, to ensure a complete cleanup.

Spill on Large Streams and Rivers

- **Containment Methods**

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The containment techniques differ considerably on large streams and rivers versus small streams. First, the smooth calm area of water necessary for product-water separation must be found along the stream or river rather than making one as with small streams. Floating booms (rather than fixed booms or dams) must be used to trap the surfaced product.

Local conditions of current and wind must be considered when selecting the site for the boom. A point with a low water velocity near the bank, sufficient depth to operate the product removal equipment, and good access are required. The fact that wind may tend to concentrate the product against one bank must be considered. A smooth, undisturbed area of water is required immediately upstream of the boom to ensure that the product has opportunity to separate out onto the surface. The boom should be positioned where the current is at a minimum. It is more effective to boom at a wide, slow position than on a narrow, fast stretch of water.

If the boom are positioned straight across a river or stream, at right angles to the flow, surface water tends to dive beneath the barrier (boom) when current velocities exceed about ½ knot (0.8 ft./sec.). However, if the current of the entire river is ½ knot or less, then a boom can be positioned straight across the river or large stream, but angled slightly in relation of the banks. By placing the boom at an angle to the banks, product on the surface is diverted along the boom to the side of the river.

The current velocity is usually much slower near the river bank than in the center and the product will move along the boom toward the bank for removal. A water-tight seal between the bank and the boom is essential. A secondary boom should be set up immediately downstream of the first one to capture the amounts that escape the upstream boom. A boom can be employed parallel to the river flow at the bank to form the seal with the booms used to trap the product.

Where the current velocity of the chosen site exceeds ½ knot, the boom should be positioned in two smooth curves from a point of maximum velocity (usually the center of the river) to both banks. However, this double-boom required product to be removed from both sides of the river. To determine the appropriate angle of boom placement and support (mooring) needed to hold the booms in position, the current velocity should be measured by timing a floating object which is 80% submerged over a distance of 100 feet. A time of 60 seconds over this distance indicates a water current of approximately 1 knot.

For currents from 1 to 2.5 knots (1.7 to 4.2 ft./sec.), the more the boom will have to be angled acute to the bank because of oil entrainment. The length of the boom will have to be such to reach the center of the river. For currents between ½ and 1 knot (0.8 and 1.7 ft./sec.), the angle of employment can be enlarged.

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The major load on the boom is taken by the terminal moorings, particularly the one in the center of the river. However, intermediate moorings are also required both to maintain the smooth curve of the boom to prevent breaking of the boom and to assist with preventing skirt deflection. The intermediate moorings are preferably positioned every 25 feet and must be adjusted to avoid the formation of indentations in the boom profile. These trap product in pockets, prevent its deflection to the bank, and also encourage diving currents. The moorings? ropes should be five times the water depth.

In certain situations, it might be advantageous to position booms to deflect the approaching spilled product to a slower moving area. Naturally, additional booms would have to be positioned around this slower moving area prior to deflecting the product to the area. This approach has been used along river which has lagoons, etc., with a very low current action. The recovery would take place in the lagoons and not along the river bank. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

The product collected upstream of the floating booms in a large stream or river should be removed from the water surface as it accumulates. Regular suction equipment, a floating skimmer, and/or absorbents (including absorbent booms) should be used to remove the product as appropriate to the quantity being trapped in a given span of time. If the amount moving down the stream is of sufficient quantity, the primary floating boom would possibly trap enough for the floating skimmer to work efficiently. The skimmer will pump the product and some water to a tank truck or other holding tank.

The absorbents would then be used upstream of the secondary boom to absorb the underflow from the primary boom. An absorbent boom can also be placed between the primary and secondary booms to help the other absorbents control the underflow from the primary boom.

It is best to hand skim the saturated absorbents and place on plastic sheets. However, if the absorbent used can be pumped after product absorption and speed of removal is a necessity, the floating skimmer can be used to remove the product-soaked absorbent.

The disadvantage of pumping the product-soaked absorbent to a truck is the volume that will accumulate (skimmer will pump excess water) and the disposal problems associated with the large water/product-soaked absorbent mixture.

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Spill on Stream which Flows into Lake or Pond

In certain locations where streams (small and large ones) flow into lakes or ponds at relatively short distances, it is conceivable that a spill could reach the lake before containment and recovery operations are set up. If time permits for containment operations to be set up on the stream in question, it then would be handled as described above depending upon the stream size involved.

However, if product in the stream is near the lake site or if product is flowing into the lake with a significant amount yet to arrive, a different containment should be employed.

- **Containment Methods**

  Product on a stream flowing into a lake should be boomed as close to the entrance as possible. The boom should be positioned on the lake at an angle to the residential stream current so as to direct the surface water to a slower moving area. The area where the product is being deflected should be enclosed by booms to contain it. An additional boom for sweeping the product to the bank will be required. This area of containment should not have a current velocity of more than 1/2 knot (0.8 ft./sec.), preferably less. See Figure 6.1 for on-water rcovery decision tree.

- **Removal Methods**

  The removal of product from the lake or pond?s surface would be handled as described earlier.

  For sizable releases, collected product will usually be pumped into tank trucks and transported to a storage facility. Tank trucks are available at several locations throughout.

Sinking or Submerged Oil

- **Containment Methods**

  Sinking and submerged oil can be contained. Oil that is heavier than water will become submerged in the water column or sink to the bottom. Oil that sinks to the bottom may act much like oil on dry land, collecting in low lying areas and thus containing itself on the bottom. Sinking or submerged oil is simply oil that has not reached the bottom yet or has been disturbed and is currently suspended in the water column by tide or current. In water with a current of less than 0.7 knots oil that is heavier than water will tend to sink to the bottom. Any current above 0.7 knots has the potential to remove oil from its resting place on the bottom and carry the oil downstream. Types of equipment used to contain oil that is sunken or submerged include net booms, bottom hugging weighted boom and Watergate dams, silt curtains, gabion baskets lined with impermeable membranes, filter fences such as Turner Valley Gates which can also be lined with impermeable membranes, and boom with deep skirts to help resurface submerged oil.

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Methods to detect submerged oil include the use of Sonar which has been used in an attempt to locate submerged oil with some success. Remote and diver operated underwater video detection systems have proved to be useful but is dependent on visibility. Visual observation can be used in shallow water although expert analysis is essential for this technique as aquatic biota (vegetation) in the water may be mistaken for oil. Currently the best method for sampling for submerged oil is to drop weighted sorbent materials such as "pom-pom" snare boom or sorbent chain drags into low areas for short distances and then visually inspected for oil to map oil distribution. This provides a bottom sample indicating whether or not oil is present. Gabion baskets filled with sorbent materials are also used for detection of sunken and mobile oil. These sorbent filters allow water to flow through them thus capturing any suspended or sunken oil. By examining the filter, it can be determined if submerged or sunken oil is present. Collection of core samples can also be a method to detect sunken oil. The sampling area of the core may be too small to be effective but has been historically used for subsurface contamination assessments.

- **Removal Methods**

The most effective method to recover oil is the use of drivers with vacuum system to collect concentrations of submerged oil on the bottom. The diver can direct the pumping of oil and can detect when the oil has been recovered.

Another common method is to dredge the bottom and remove the oil along with some of the bottom substrate. Dredging is a common method currently used to remediate contaminated sites but may generate a large amount of waste material that must be properly managed and disposed of.

Both diver-directed pumping and dredging only work for completely sunken oil. To capture suspended oil an underwater filter can be constructed. This filter is created using some form of porous container such as a Gabion Basket, prawn or crab traps, silt fences and even chicken wire. The container is filled with sorbent material such as oil snares, weighted down, and submerged into the water column. The sorbent materials are monitored and replaced as needed to continue recovery of oil.

Trawl nets have also been specifically designed for spill recovery in response to the increased transport of heavy crude oils by cargo ship.

In shallow water, where oil can be seen from the surface, dip nets or pool nets have been successfully used as the most effective way to collect oil. This method is useful if the oil has emulsified or is thick enough to scoop up with nets.

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Spill in Urban Areas

Oil spills in urban areas can greatly impact recreational use, human health, wildlife habitat(s), and potential beach or park closures. Manmade structures along waterways require unique protection strategies. Manmade structures could include vertical shore protection structures such as seawalls, piers, and bulkheads, as well as riprap revetments and groins, breakwaters, and jetties. Vertical structures can be constructed of concrete, wood, and corrugated metal. They usually extend below the water surface, although seawalls can have beaches or riprap in front of them. These structures are very common along developed shores, particularly in harbors, marinas, and residential areas. The range in degree of exposure to waves and currents varies widely, from very low in dead-end canals, to very high on offshore breakwaters. Boat wakes can generate wave energy in otherwise sheltered areas. Maintaining shipping or other kinds of vessel traffic through navigation channels or waterways during a spill response is a difficult consideration because there is usually economic and political pressure to re-establish normal operations as soon as possible. This consideration extends to vehicular traffic through urban areas. Deploying booms and skimmers or constructing recovery sites can conflict with such traffic for several days. Also, passage of deep-draft vessels through the waterway can suddenly change water level and flow or create wakes, causing booms to fail. For these reasons, recovery efforts must be coordinated through the Unified Command to ensure the cooperation of all parties involved.

- **Containment Methods**

  Containment techniques in an urban area depend greatly on the ability to deploy equipment due to obstacles presented by the urban area. Most booming and containment techniques will work with slight modifications such as direct anchoring instead of the use of booming buoys. Often, debris and other obstacles cause gaps in containment or clog up the flow of oil in diversion booming. Vessel traffic can also cause containment to fail, due to splash over from vessel wakes.

- **Removal Methods**

  Normal recovery techniques work when recovering oil in an urban area. However, recovery can be hampered by several situations. Floating debris clogging skimming equipment is the main cause for low recovery rates. Another problem for recovery in an urban area is lack of storage space. Often traffic problems or lack of access prevent storage equipment such as frac tanks and vacuum trucks from approaching the recovery zone.

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Spill Under Ice

- **Containment Methods**

The traditional strategy for dealing with oil under the ice in a river or lake is to cut a slot to aid in recovery. Ice slots can be cut using chain saws, handsaws, ice augers or some form of trencher. Another effective variation of this technique is the diversionary plywood barrier method which is also discussed below. See Figure 6.1 for on-water decision tree.

- **Removal Methods**

Ice slotting is a very basic technique used to gain access to oil trapped beneath the ice. In ice slotting, a J shaped outline is sketched into the ice at a 30 degree angle to the current. The slight J hook or curve is necessary at the upstream side to provide flow towards the recovery area. In general, the slot width should be 1.5 times the thickness of the ice. Remember, a block of ice is heavy and the width of the slot must be taken into consideration so it can be safely removed or pushed under if the water beneath the ice is sufficiently deep. The length of the slot will be determined by the width of the river and strategy.

This technique is a successful strategy to implement. However, there are a few pit falls to be aware off. First, responders will fatigue rapidly if required to cut the slot or slots by hand using a chain saw or hand held saw. This can present a problem if there are not a sufficient number of Hazmat technicians available. Secondly, when cutting with chain saws, large volumes of water are kicked up by the moving chain onto the responder. This is a safety problem when the responders get wet in extreme cold weather conditions. Wearing rain gear however can reduce this problem.

A second technique is to slot the ice and use plywood to help divert oil beneath the ice to a recovery area. This technique is called the diversionary plywood barrier method. In this technique, a narrow slot is made through the ice and 4' x 8' sheets of plywood or equivalent are dropped into the slot to create a barrier and force the oil to follow along it to the collection area. This is the same principal employed when using floating boom.

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The slot can be cut or drilled depending on the equipment available at the time of the response. If drilling is required, a gas powered ice auger can be used. In this scenario a series of 8" or 10" holes are drilled next to each other in the J pattern.

A chain saw can be used to connect the holes if an ice bridge exists between two auger holes. After the ice auguring is complete, plywood can be dropped into the augured slot.

Again, river ice is dirty and chipper blades on the augers may only last long enough to complete a single auger hole. This technique requires a large inventory of chipper blades. Extra auger flights can be used, which reduces down time to change blades. A real plus to slotting the ice with an ice auger is the limited exposure of responders to water. The water is generally restricted to the area around the responder's feet.

If an ice auger is not available, a chain saw can be used to cut a narrow slot. After the slot has been cut and ice removed, plywood can be inserted. When using a chainsaw that makes a 3/8" cut, a 1/8"-1/4" plywood or outdoor siding can be inserted into the slot and effectively be used to create the barrier. Again, the down side when using a large chain saws is fatigue and splash from water being kicked up by the chain. However, this problem is not as bad as cutting large slots as described above. Since only a single slot is made, the number of responders can be reduced and extra personal protective equipment in the form of rain gear can be used to minimize the water splash.

Spill on Ice

When managing an oil spill on ice special consideration must be given to several safety factors. Thickness of the ice and general accessibility of equipment must be considered when planning for on-ice recovery. Ice that is too thin to safely traverse or broken ice may prevent active recovery.

- **Containment Methods**

  For ice-covered on-land or on- water spills, snow or earthen berms may be constructed to contain oil around the leak, if terrain permits. Dikes filled with sorbent materials may be used on spills in smaller streams to create a manmade dam to prevent the further migration of the oil.

  Oil may become encapsulated due to melting and refreezing of the ice. Oil may then be more difficult to access and remove. See Figure 6.1 for on-water recovery decision tree.

- **Removal Methods**

  Generally, on-ice recovery consists of the manual removal of the product from the spill site. If conditions permit, vacuum trucks or suction pumps may be used to remove pools of oil that may have collected. Often, product removal will be done by hand using brooms, shovels and rakes. Manually moving the oil/snow mixture into piles for collection where it is either vacuum or manually collected into storage containers.

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Spill in Wetland Areas

Wetlands, which include upland and inland marshes, swamps and bogs, are highly sensitive to spills because they collect run-off from surrounding environments, and because they are home to many commercially and ecologically important species. Wetlands are very susceptible to damage and are a high priority to protect. Precautions should be taken so that the recovery effort does not cause more damage than that cause by the release.

- **Containment Methods**

  Containment booms can be strategically deployed to contain or divert the product into recovery areas where skimmers and vacuums can be used to remove the product. Berms can also be built to contain or divert the product. Consideration must be given to the damage that can be caused by holding the product in the wetland areas. Often, allowing the product to flow to natural collection areas and possibly assisting the flow by the use of high volume low pressure water pumps may be the best course of action.

- **Removal Methods**

  Skimmers and vacuums can be deployed to recover contained oil. Other acceptable response techniques might include bioremediation, sorbents and in-situ burning. The use of heavy equipment is often not practical because of the damage it can cause to plant and animal life. During recovery, specially designed flat bottom shallow draft vessels and the use of plywood or boards may be used to reduce the damage caused by recovery personnel. If the water table is high and the oil will not permeate the soil, shallow trenches may be dug to collect oil for removal.

  The Unified Command must balance the need to remove the product with the damage caused by active removal. Considerations for long term passive recovery should be considered.

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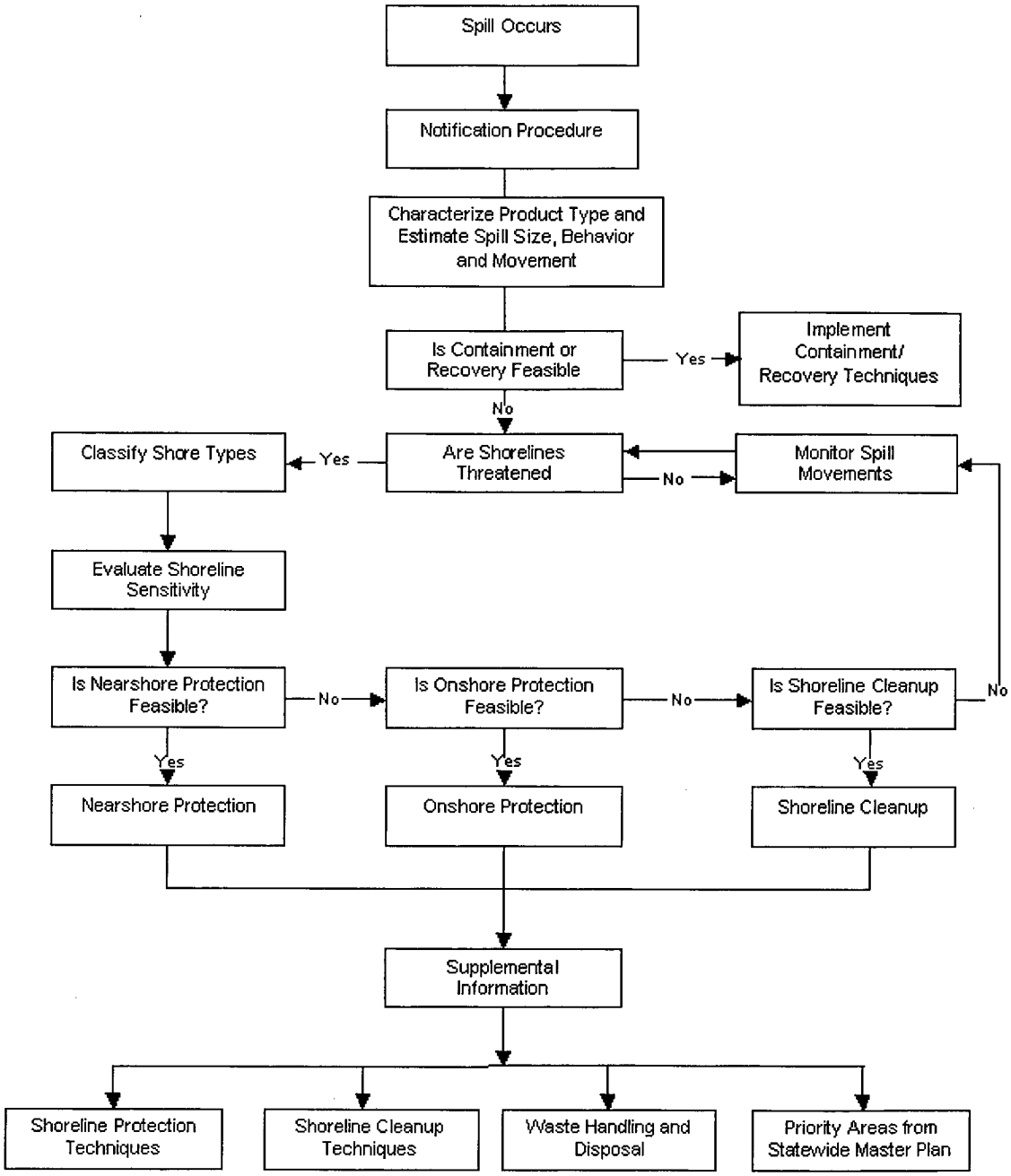
FIGURE 6.1
ON-WATER RESPONSE FLOWCHART



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6.6 VULNERABILITY ANALYSIS

The thorough examination of published Area Contingency Plans (ACPs) was conducted to identify sensitive areas in all the response zones.

The Environmental Sensitivity Maps located in Figure 6.2 identify sensitive areas along the Pipeline. The appropriate Area Contingency Plan maps are also included to provide more detailed information on sensitivities and possible potential response options.

6.7 ALTERNATIVE RESPONSE STRATEGIES

There are no pre-approved response options for inland spills within the United States. Any plans to use dispersants or in situ burn by the Company must be approved of by the Unified Command and submitted to the Federal On-Scene Coordinator for Regional Response Team approval prior to such action being taken.

IN SITU BURNING

When considering the use of in situ burning the following considerations should be evaluated. In most cases, an agency application with further considerations will need to be completed before burning will be approved by the agency.

Size, Nature, and Product Spilled

- Flammability of the product. (Will the product burn?)
- Location of spill. (Distance and direction to nearest human use areas.)
- Volume of product released.
- Estimate of the surface area covered by the spill.
- How long has oil been exposed?
- Will burning cause more hazardous by-products?

Weather and Forecast

- Current weather conditions. (Rain / Heat)
- Wind speed and direction.
- 24-hour forecast.
- 48-hour forecast.

Evaluate the Response Operations

- Is there time enough to conduct burning?
- Is safety equipment available?
- Is adequate personnel available for monitoring / emergency response?
- Is mechanical recovery more intrusive than burning?

Habitats Impacted and Resources at Risk

- Have local agency / officials been contacted?
  - Public Health
  - Land Owner / Manager
  - Local Fire Management (Fire Marshall)
  - Historic Property Specialist

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Province / State Resource Agency
Aboriginal / Native American interests
- What is / will be the impact to surface water intakes and wells.
- Are endangered habitats / endangered species present?
- Is area used by migratory animals?
- What wildlife is present?

Burn Plan

- How much of the oil is expected to burn?
- How long will it be expected to burn?
- How will burn be ignited?
- How will burn be extinguished?
- How will burned oil residue be collected?
- What are the monitoring protocols?

DISPERSANT USE

Dispersants are not commonly used on inland spills. Working closely with Federal, Province / State and local agencies will be necessary for gaining approval to use dispersants. Since dispersants do not eliminate the oil, only break up and spread the oil throughout the water column, it is important to look at the total effect the oil will have on the environment while considering the use of dispersants. Water sampling may be required to analyze the effects of the dispersant in the water column.

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FIGURE 6.2
ENVIRONMENTAL SENSITIVITY MAPS

Remember these maps are to be utilized as guidelines only. During a real response effort Federal, Province/State, and local agencies should be contacted to provide further assistance in the proper identification and protection of the various environmental and socio-economic sensitive areas

Canada ESM Map 1
Canada ESM Map 2
Canada ESM Map 3
Canada ESM Map 4
Canada ESM Map 5
Canada ESM Map 6
Canada ESM Map 7
Canada ESM Map 8
Canada ESM Map 9
Canada ESM Map 10
Canada ESM Map 11
Canada ESM Map 12
Canada ESM Map 13
Canada ESM Map 14
Canada ESM Map 15
Canada ESM Map 16
Canada ESM Map 17
Canada ESM Map 18
Canada ESM Map 19
Canada ESM Map 20
Canada ESM Map 21
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Canada ESM Map 26
Canada ESM Map 27
Canada ESM Map 28
US ESM Map 1
US ESM Map 2
US ESM Map 3
US ESM Map 4
US ESM Map 5
US ESM Map 6
US ESM Map 7
US ESM Map 8
US ESM Map 9
US ESM Map 10
US ESM Map 11
US ESM Map 12
US ESM Map 13
US ESM Map 14
US ESM Map 15

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

US ESM Map 16
US ESM Map 17
US ESM Map 18
US ESM Map 19
US ESM Map 20
US ESM Map 21
US ESM Map 22
US ESM Map 23
US ESM Map 24
US ESM Map 25
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US ESM Map 31
US ESM Map 32
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US ESM Map 34
US ESM Map 35
US ESM Map 36
US ESM Map 37
US ESM Map 38
USL Index Map
USL Map 2
USL Map 3
USL Map 3C1
USL Map 3D1
USL Map 3D2
USL Map 3D3
USL Map 3D4
USL Map 5P51
USL Map 5P53
USL Map 5P54
USL Map 5P62
USL Map 6
USL Map 6P61
USL Map 8
USL Map 9
USL Map 10
USL Map 11
USL Map 12
USL Map 12A2

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

USL Map 12A3
USL Map 12C2
USL Map 12D2
USL Map 13
USL Map 18
USL Map 19
USL Map 24
Cushing Extension ESM 1
Cushing Extension ESM 2
Cushing Extension ESM 3
Cushing Extension ESM 4
Cushing Extension ESM 5
Cushing Extension ESM 6
Cushing Extension ESM 7
Cushing Extension ESM 8
Cushing Extension ESM 9
Cushing Extension ESM 10
Cushing Extension ESM 11
Gulf Coast Project ESM 1
Gulf Coast Project ESM 2
Gulf Coast Project ESM 3
Gulf Coast Project ESM 4
Gulf Coast Project ESM 5
Gulf Coast Project ESM 6
Gulf Coast Project ESM 7
Gulf Coast Project ESM 8
Gulf Coast Project ESM 9
Gulf Coast Project ESM 10
Gulf Coast Project ESM 11
Gulf Coast Project ESM 12
Gulf Coast Project ESM 13
Gulf Coast Project ESM 14
Gulf Coast Project ESM 15
Gulf Coast Project ESM 16
Gulf Coast Project ESM 17
Gulf Coast HCA Index
Gulf Coast HCA Map 1
Gulf Coast HCA Map 2
Gulf Coast HCA Map 3
Gulf Coast HCA Map 4
Gulf Coast HCA Map 5
Gulf Coast HCA Map 6
Gulf Coast HCA Map 7

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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ENVIRONMENTAL SENSITIVITY MAPS (Cont'd)

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FIGURE 6.3

ENDANGERED/THREATENED SPECIES LISTING

Canada

Common Name	Scientific Name
Animals	
Burrowing Owl	Athene cunicularia
Olive-backed Pocket Mouse	Perognathus fasciatus
Long-billed Curlew	Numenius americanus
Short-eared Owl	Asio flammeus
Northern Leopard Frog	Rana pipiens
Sprague's Pipit	Anthus spragueii
Plants	
Bushy cinquefoil	Potentilla paradoxa
Chaffweed	Anagallis minima
Common tickseed	Coreopsis tinctoria
Dillen's wood sorrel	Oxalis dillenii
Endolepis	Atriplex suckleyi
Few-flowered aster	Aster pauciflorus
Few-flowered salt-meadow grass	Torreyochloa pallida var pauciflora
Lance-leaved loosestrife	Lysimachia hybrida
Little-seed rice grass	Oryzopsis micrantha
Low townsedia	Townsendia exscapa
Nevada rush	Juncus nevadensis
Pale blue-eyed grass	Sisyrinchium septentrionale
Rush-pink	Stephanomeria runcinata
Salt-marsh sand spurry	Spergularia salina
Short-stalk mouse-ear chickweed	Cerastium brachypodum
Shrubby evening-primrose	Calylophus serrulatus
American pellitory	Parietaria pensylvanica
American lopseed	Phryma leptostachya
Fox sedge	Fox sedge
Honewort	Cryptotaenia canadensis
Rice cutgrass	Leersia oryzoides
Yellow water crowfoot	Ranunculus flabellaris
Other	
None Listed	N/A

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Illinois

Common Name	Scientific Name
Animals	
Bald Eagle	Haliaeetus leucocephalus
Loggerhead Shrike	Lanius ludovicianus
Indiana Bat	Myotis sodalis
Black-crowned Night Heron	Nycticorax nycticorax
Eastern Massasauga	Sistrurus catenatus catenatus
Western Sand Darter	Ammocrypta clarum
Kirtland's Snake	Clonophis kirtlandi
Least Bittern	Lxobrychus exilis
Greater Prairie Chicken	Tympanuchus cupido
Barn Owl	Tyto alba
Lake Sturgeon	Acipenser fulvescens
Timber Rattlesnake	Crotalus horridus
Little Blue Heron	Egretta caerulea
Butterfly	Ellipsaria lineolata
Peregrine Falcon	Falco peregrinus
Common Moorhen	Gallinula chloropus
Bigeye Shiner	Notropis boops
Yellow-crowned Night Heron	Nyctanassa violacea
Illinois Chorus Frog	Pseudacris streckeri
Pallid Sturgeon	Scaphirhynchus albus
Royal Catchfly	Silene regia
Lined Snake	Tropidoclonion lineatum
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Henslow's SparrowAmmodramus henslowii	Ammodramus henslowii
Short-eared Owl	Asio flammeus
Upland Sandpiper	Bartramia longicauda
Northern Harrier	Circus cyaneus
King Rail	Rallus elegans
Barn Owl	Tyto alba
Plants	
Prairie Rose Gentian	Sabatia campestris
Ear-leafed Foxglove	Tomanthera auriculata
Sedge	Carex bromoides
Fibrous-rooted Sedge	Carex communis
Drooping Sedge	Carex prasina
Blazing Star	Liatris scariosa var. nieuwlandii
Prairie Rose Gentian	Sabatia campestris
Grass-leaved Lily	Stenanthium gramineum
Ear-leafed Foxglove	Tomanthera auriculata
Spring Ladies' Tresses	Spiranthes vernalis
Prairie Spiderwort	Tradescantia bracteata

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Decurrent False Aster	Boltonia decurrens
Other	
None Listed	N/A

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Kansas

Common Name	Scientific Name
Animals	
American Burying Beetle	Nicrophorus americanus
Bald Eagle	Haliaeetus leucocephalus
Eastern Spotted Skunk	Spilogale putorius
Eskimo Curlew	Numenius borealis
Least Tern	Sterna antillarum
Peregrine Falcon	Falco peregrinus
Piping Plover	Charadrius melodus
Snowy Plover	Charadrius alexandrinus
Western Silvery Minnow	Hybognathus argyritis
Chestnut Lamprey	Ichthyomyzon castaneus
Flathead Chub	Platygobio gracilis
Pallid Sturgeon	Scaphirhynchus albus
Sicklefin Chub	Macrhybopsis meeki
Silver Chub	Macrhybopsis storeriana
Silverband Shiner	Notropis shumardi
Smooth Earth Snake	Virginia valeriae
Sturgeon Chub	Macrhybopsis gelida
Topeka Shiner	Notropis topeka
Whooping Crane	Grus americana
Sharp Hornsnail	Pleurocera acuta
Arkansas Darter	Etheostoma cragini
Arkansas River Shiner	Notropis girardi
Arkansas River Speckled Chub	Macrhybopsis tetranema
Flutedshell Mussel	Lasmigona costata
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Missouri

Common Name	Scientific Name
Animals	
Indiana Bat	Myotis sodalis
Bald Eagle	Haliaeetus leucocephalus
Pallid Sturgeon	Scaphirhynchus albus
Interior Least Tern	Sterna antillarum athalassos
Eastern Massasauga	Sistrurus catenatus catenatus
Spectaclecase	Cumberlandia monodonta
Plants	
Running Buffalo Clover	Trifolium stoloniferum
Decurrent False Aster	Boltonia decurrens
Other	
None Listed	N/A

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North Dakota

Common Name	Scientific Name
Animals	
Horned Grebe	Podiceps auritus
American White Pelican	Pelecanus erythrorhynchos
American Bittern	Botaurus lentiginosus
Swainson's Hawk	Buteo swainsoni
Ferruginous Hawk	Buteo regalis
Yellow Rail	Coturnicops noveboracensis
Willet	Catoptrophorus semipalmatus
Upland Sandpiper	Bartramia longicauda
Long-billed Curlew	Numenius americanus
Marbled Godwit	Limosa fedoa
Wilson's Phalarope	Phalaropus tricolor
Franklin's Gull	Larus pipixcan
Black Tern	Chlidonias niger
Black-billed Cuckoo	Coccyzus erythropthalmus
Sprague's Pipit	Anthus spragueii
Grasshopper Sparrow	Ammodramus savannarum
Baird's Sparrow	Ammodramus bairdii
Nelson's Sharp-tailed Sparrow	Ammodramus nelsonii
Lark Bunting	Calamospiza melanocorys
Chestnut-collared Longspur	Calcarius ornatus
Canadian Toad	Bufo hemiophrys
Plains Spadefoot	Spea bombifrons
Smooth Green Snake	Liochlorophis vernalis
Western Hognose Snake	Heterodon nasicus
Black-tailed Prairie Dog	Cynomys ludovicianus
Sturgeon Chub	Macrhybopsis gelida
Sicklefin Chub	Macrhybopsis meeki
Pearl Dace	Margariscus margarita
Blue Sucker	Cycleptus elongatus
Northern Pintail	Anas acuta
Canvasback	Aythya valisineria
Redhead	Aythya americana
Northern Harrier	Circus cyaneus
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
Prairie Falcon	Falco mexicanus
Sharp-tailed Grouse	Tympanuchus phasianellus
Greater Prairie Chicken	Tympanuchus cupido
Greater Sage-grouse	Centrocercus urophasianus
Piping Plover	Charadrius melodus
American Avocet	Recurvirostra americana

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Least Tern	Sterna antillarum
Short-eared Owl	Asio flammeus
Burrowing Owl	Athene cunicularia
Red-headed Woodpecker	Melanerpes erythrocephalus
Loggerhead Shrike	Lanius ludovicianus
Sedge Wren	Cistothorus platensis
Dickcissel	Spiza americana
Le Conte's Sparrow	Ammodramus leconteii
Bobolink	Dolichonyx oryzivorus
Common Snapping Turtle	Chelydra serpentina
Short-horned Lizard	Phrynosoma douglassi
Northern Redbelly Snake	Storeria occipitomaculata
Pygmy Shrew	Sorex hoyi
Richardson's Ground Squirrel	Spermophilus richardsonii
Swift Fox	Vulpes velox
River Otter	Lutra canadensis
Black-footed Ferret	Mustela nigripes
Paddlefish	Polyodon spathula
Pallid Sturgeon	Scaphirhynchus albus
Silver Chub	Macrhybopsis storeriana
Northern Redbelly Dace	Phoxinus eos
Flathead Chub	Platygobio gracilis
Trout-perch	Percopsis omiscomaycus
Threeridge	Amblema plicata
Wabash Pigtoe	Fusconaia flava
Mapleleaf	Quadrula quadrula
Black Sandshell	Ligumia recta
Creek Heelsplitter	Lasmigona compressa
Pink Heelsplitter	Potamilus alatus
Whooping Crane	Grus americana
Peregrine Falcon	Falco peregrinus
Brewer's Sparrow	Spizella breweri
McCown's Longspur	Calcarius mccownii
Smooth Softshell Turtle	Apalone mutica
False Map Turtle	Graptemys pseudogeographica
Northern Prairie Skink	Eumeces septentrionalis
Northern Sagebrush Lizard	Sceloporus graciosus
Arctic Shrew	Sorex arcticus
Western Small-footed Myotis	Myotis ciliolabrum
Long-eared Myotis	Myotis evotis
Long-legged Myotis	Myotis volans
Plains Pocket Mouse	Perognathus flavescens
Hispid Pocket Mouse	Chaetodipus hispidus
Sagebrush Vole	Lemmiscus curtatus
Eastern Spotted Skunk	Spilogale putoris

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Gray Wolf	Canis lupis
Chestnut Lamprey	Ichthyomyzon castaneus
Silver Lamprey	Ichthyomyzon unicuspis
Central Stoneroller	Campostoma anomalum
Hornyhead Chub	Nocomis biguttatus
Pugnose Shiner	Notropis anogenus
Blacknose Shiner	Notropis heterolepis
Rosyface Shiner	Notropis rubellus
Finescale Dace	Phoxinus neogaeus
Yellow Bullhead	Ameiurus natalis
Flathead Catfish	Pylodictis olivaris
Logperch	Percina caprodes
River Darter	Percina shumardi
Pink Papershell	Potamilus ohiensis
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Nebraska

Common Name	Scientific Name
Animals	
Eskimo Curlew	Numenius borealis
Whooping Crane	Grus americana
Interior Least Tern	Sterna antillarum athalassos
Bald Eagle	Haliaeetus leucophalus
Piping Plover	Charadrius melodus
Mountain Plover	Charadrius montanus
Black-footed Ferret	Mustela nigripes
Swift Fox	Vulpes velox
River Otter	Lutra canadensis
Southern Flying Squirrel	Glaucomys volans
Black-tailed Prairie Dog	Cynomys ludovicianus
Pallid Sturgeon	Scaphirhyncus albus
Topeka Shiner	Notropis topeka
Sturgeon chub	Macrhybopsis gelida
Blacknose shiner	Notropis heteropis
Lake sturgeon	Acipenser fulvescens
Northern Redbelly Dace	Phoxinus eos
Finescale Dace	Phoxinus neogaeus
American Burying Beetle	Nicrophorus americanus
Massasauga	Sistrurs catenatus
Scaleshell Mussel	Leptodea leptodon
Plants	
Hayden's (blowout) penstemon	Penstemon haydenii
Colorado Butterfly Plant	Gaura neomexicana coloradensis
Saltwort	Salicornia rubra
Western Prairie Fringed Orchid	Platanthera praeclara
Ute Lady's Tresses	Spiranthes diluvialis
Ginseng	Panax quinquefolium
Small White Lady's Slipper	Cypripedium candidum
Other	
None Listed	N/A

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South Dakota

Common Name	Scientific Name
Animals	
American Burying Beetle	Nicrophorus americanus
Scaleshell	Leptodea leptodon
Higgins Eye	Lampsilis higginsii
Dakota Skipper	Hesperia dacotae
Banded Killifish	Fundulus diaphanus
Blacknose Shiner	Notropis heterolepis
Finescale Dace	Phoxinus neogaeus
Longnose Sucker	Catostomus catostomus
Northern Redbelly Dace	Phoxinus eos
Pallid Sturgeon	Scaphirhynchus albus
Pearl Dace	Margariscus margarita
Sicklefin Chub	Macrhybopsis meeki
Sturgeon Chub	Macrhybopsis gelida
Topeka Shiner	Notropis topeka
Eastern Hognose Snake	Heterodon platirhinos
False Map Turtle	Graptemys pseudogeographica
Lined Snake	Tropidoclonion lineatum
American Dipper	Cinclus mexicanus
Bald Eagle	Haliaeetus leucocephalus
Eskimo Curlew	Numenius borealis
Interior Least Tern	Sterna antillarum athalassos
Osprey	Pandion haliaetus
Peregrine Falcon	Falco peregrinus
Piping Plover	Charadrius melodus
Whooping Crane	Grus americana
Black-footed Ferret	Mustela nigripes
Gray Wolf	Canis lupus
River Otter	Lontra canadensis
Swift Fox	Vulpes velox
Western Prairie Fringed Orchid	Platanthera praeclara
Plants	
None Listed	N/A
Other	
None Listed	N/A

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Oklahoma

Common Name	Scientific Name
Animals	
Mississippi Alligator	Alligator mississippiensis
Gray Bat	Myotis grisescens
Indian Bat	Myotis sodalis
Ozark Bat	Corynorhinus townsendii ingens
Ozark Cavefish	Amblyopsis rosae
Whopping Crane	Grus americana
Eskimo Curlew	Numenius borealis
Leopards Darter	Percina pantherina
Bald Eagle	Haliaeetus leucocephalus
Neosho Madtom	Noturus placidus
Pipping Plover	Charadrius melodus
Ouachita Rock Pocketbook	Arkansia wheeleri
Arkansas River Shiner	Notropis girardi
Least Tern	Sterna antillarum
Black-Capped Vireo	Vireo atricapillus
Red-Cockaded Woodpecker	Picoides borealis
Plants	
Western Prairie Fringed Orchid	Platanthera praeclara
Other	

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Texas

Common Name	Scientific Name
Animals	
Houston Toad	Anaxyrus houstonensis
Salado Salamander	Eurycea chisholmensis
Cascade Caverns Salamander	Eurycea latitans
San Marcos Salamander	Eurycea nana
Georgetown Salamander	Eurycea naufragia
Texas Blind Salamander	Eurycea rathbuni
Blanco Blind Salamander	Eurycea robusta
Barton Springs Salamander	Eurycea sosorum
Jollyville Salamander	Eurycea tonkawae
Comal Blind Salamander	Eurycea tridentifera
Austin blind salamander	Eurycea waterlooensis
Sheep Frog	Hypopachus variolosus
White-lipped Frog	Leptodactylus fragilis
Black-spotted Newt	Notophthalmus meridionalis
Mexican Burrowing Toad	Rhinophrynus dorsalis
South Texas Siren (large form)	Siren sp. 1
Mexican Treefrog	Smilisca baudinii
Bachman's Sparrow	Aimophila aestivalis
Botteri's Sparrow	Aimophila botterii arizonae
Texas Botteri's Sparrow	Aimophila botterii texana
Sprague's Pipit	Anthus spragueii
White-tailed Hawk	Buteo albicaudatus
Zone-tailed Hawk	Buteo albonotatus
Gray Hawk	Buteo nitidus
Red Knot	Calidris canutus
Northern Beardless-tyrannulet	Camptostoma imberbe
Piping Plover	Charadrius melodus
Western Yellow-billed Cuckoo	Coccyzus americanus occidentails
Golden-cheeked Warbler	Dendroica chrysoparia
Reddish Egret	Egretta rufescens
Swallow-tailed Kite	Elanoides forficatus
Southwestern Willow Flycatcher	Empidonax traillii extimus
Northern Aplomado Falcon	Falco femoralis septentrionalis
American Peregrine Falcon	Falco peregrinus anatum
Cactus Ferruginous Pygmy-owl	Glaucidium brasilianum cactorum
Whooping Crane	Grus americana
Bald Eagle	Haliaeetus leucocephalus
Wood Stork	Mycteria americana
Eskimo Curlew	Numenius borealis
Rose-throated Becard	Pachyramphus aglaiae
Tropical Parula	Parula pitiayumi

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Red-cockaded Woodpecker	Picoides borealis
White-faced Ibis	Plegadis chihi
Interior Least Tern	Sterna antillarum athalassos
Sooty Tern	Sterna fuscata
Mexican Spotted Owl	Strix occidentalis lucida
Attwater's Greater Prairie Chicken	Tympanuchus cupido attwateri
Lesser Prairie-Chicken	Tympanuchus pallidicinctus
Black-capped Vireo	Vireo atricapilla
River Goby	Awaous banana
Mexican Stoneroller	Campostoma ornatum
Mexican Goby	Ctenogobius claytonii
Blue Sucker	Cycleptus elongatus
Proserpine Shiner	Cyprinella proserpina
Leon Springs Pupfish	Cyprinodon bovinus
Comanche Springs Pupfish	Cyprinodon elegans
Conchos Pupfish	Cyprinodon eximius
Pecos Pupfish	Cyprinodon pecosensis
Devils River Minnow	Dionda diaboli
Creek Chubsucker	Erimyzon oblongus
Fountain Darter	Etheostoma fonticola
Rio Grande Darter	Etheostoma grahami
San Felipe Gambusia	Gambusia clarkhubbsi
Big Bend Gambusia	Gambusia gaigei
San Marcos Gambusia (species extinct)	Gambusia georgei
Clear Creek Gambusia	Gambusia heterochir
Pecos Gambusia	Gambusia nobilis
Blotched Gambusia (extinct in the wild)	Gambusia senilis
Rio Grande Chub	Gila pandora
Rio Grande Silvery Minnow	Hybognathus amarus
Opossum Pipefish	Microphis brachyurus
Chihuahua Shiner	Notropis chihuahua
Arkansas River Shiner	Notropis girardi
Bluntnose Shiner (species extinct)	Notropis simus
Blackside Darter	Percina maculata
Smalleye Shiner	Notropis buccula
Sharpnose Shiner	Notropis oxyrhynchus
Paddlefish	Polyodon spathula
Smalltooth Sawfish	Pristis pectinata
Bluehead Shiner	Pteronotropis hubbsi
Widemouth Blindcat	Satan eurystomus
Shovelnose Sturgeon	Scaphirhynchus platorynchus
Toothless Blindcat	Trogloglanis pattersoni
Pecos assiminea Snail	Assiminea pecos
Coffin Cave Mold Beetle	Batrisodes texanus
Helotes Mold Beetle	Batrisodes venyivi

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Robber Baron Cave Meshweaver	Cicurina baronia
Madla Cave Meshweaver	Cicurina madla
Bracken Bat Cave Meshweaver	Cicurina venii
Government Canyon Bat Cave Meshweaver	Cicurina vespera
Warton Cave Meshweaver	Cicurina wartoni
Texas Pigtoe	Fusconaia askewi
Triangle Pigtoe	Fusconaia lananensis
Diminuitie Amphipod	Gammarus hyalleloides
Comal Springs Riffle Beetle	Heterelmis comalensis
Texas Fatmucket	Lampsilis bracteata
Sandbank Pocketbook	Lampsilis satura
Government Canyon Bat Cave Spider	Neoleptoneta microps
Tooth Cave Spider	Neoleptoneta myopica
American Burying Beetle	Nicrophorus americanus
Southern Hickorynut	Obovaria jacksoniana
Louisiana Pigtoe	Pleurobema riddellii
Texas Hornshell	Popenaias popeii
Texas Heelsplitter	Potamilus amphichaenus
Salina Mucket	Potamilus metnecktayi
Phantom Cave Snail	Pyrgulopsis texana
Golden Orb	Quadrula aurea
Smooth Pimpleback	Quadrula houstonensis
False Spike	Quadrula mitchelli
Texas Pimpleback	Quadrula petrina
A Ground Beetle	Rhadine exilis
A Ground Beetle	Rhadine infernalis
Tooth Cave Ground Beetle	Rhadine persephone
Peck's Cave Amphipod	Stygobromus pecki
Comal Springs Dryopid Beetle	Stygoparnus comalensis
Tooth Cave Pseudoscorpion	Tartarocreagris texana
Kretschmarr Cave Mold Beetle	Texamaurops reddelli
Cokendolpher Cave Harvestman	Texella cokendolpheri
Reddell Harvestman	Texella reddelli
Bone Cave Harvestman	Texella reyesi
Mexican Fawnsfoot	Truncilla cognata
Texas Fawnsfoot	Truncilla macrodon
Phantom Spring Snail	Tryonia cheatumi
Gonzales Springsnail	Tryonia circumstriata
Finback Whale	Balaenoptera physalus
Gray Wolf	Canis lupus
Red Wolf	Canis rufus
Rafinesque's Big-eared Bat	Corynorhinus rafinesquii
Texas Kangaroo Rat	Dipodomys elator
Spotted Bat	Euderma maculatum

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Pygmy Killer Whale	Feresa attenuata
Short-finned Pilot Whale	Globicephala macrorhynchus
Jaguarundi	Herpailurus yaguarondi
Pygmy Sperm Whale	Kogia breviceps
Dwarf Sperm Whale	Kogia simus
Southern Yellow Bat	Lasiurus ega
Ocelot	Leopardus pardalis
Margay	Leopardus wiedii
Mexican Long-nosed	Leptonycteris nivalis
Humpback Whale	Megaptera novaeangliae
Gervais' Beaked Whale	Mesoplodon europaeus
White-nosed Coati	Nasua narica
Killer Whale	Orcinus orca
Coues' Rice Rat	Oryzomys couesi
Jaguar	Panthera onca
Palo Duro Mouse	Peromyscus truei comanche
False Killer Whale	Pseudorca crassidens
Atlantic Spotted Dolphin	Stenella frontalis
Rough-toothed Dolphin	Steno bredanensis
West Indian Manatee	Trichechus manatus
Black Bear	Ursus americanus
Louisiana Black Bear	Ursus americanus luteolus
Goose-beaked Whale	Ziphius cavirostris
Loggerhead Sea Turtle	Caretta caretta
Scarlet Snake	Cemophora coccinea
Green Sea Turtle	Chelonia mydas
Reticulated Gecko	Coleonyx reticulatus
Black-striped Snake	Coniophanes imperialis
Timber (Canebrake) Rattlesnake	Crotalus horridus
Reticulate Collared Lizard	Crotaphytus reticulatus
Leatherback Sea Turtle	Dermochelys coriacea
Texas Indigo Snake	Drymarchon melanurus erebennus
Speckled Racer	Drymobius margaritiferus
Atlantic Hawksbill Sea Turtle	Eretmochelys imbricata
Texas Tortoise	Gopherus berlandieri
Cagle's Map Turtle	Graptemys caglei
Chihuahuan Mud Turtle	Kinosternon hirtipes murrayi
Kemp's Ridley Sea Turtle	Lepidochelys kempii
Northern Cat-eyed Snake	Leptodeira septentrionalis
Smooth Green Snake	Liochlorophis vernalis
Alligator Snapping Turtle	Macrochelys temminckii
Brazos Water Snake	Nerodia harteri
Texas Horned Lizard	Phrynosoma cornutum
Mountain Short-horned Lizard	Phrynosoma hernandesi
Louisiana Pine Snake	Pituophis ruthveni

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Chihuahuan Desert Lyre Snake	Trimorphodon vilkinsonii
Plants	
Large-fruited Sand-verbena	Abronia macrocarpa
South Texas Ambrosia	Ambrosia cheiranthifolia
Star Cactus	Astrophytum asterias
Texas Ayenia	Ayenia limitaris
Texas Poppy-mallow	Callirhoe scabriuscula
Bunched Cory Cactus	Coryphantha ramillosa ssp. ramillosa
Terlingua Creek Cat's-eye	Cryptantha crassipes
Chisos Mountains Hedgehog Cactus	Echinocereus chisoensis var. chisoensis
Davis' Green Pitaya	Echinocereus davisii
Black Lace Cactus	Echinocereus reichenbachii var. albertii
Nellie's Cory Cactus	Escobaria minima
Sneed's Pincushion Cactus	Escobaria sneedii var. sneedii
Guadalupe Fescue	Festuca ligulata
Johnston's Frankenia	Frankenia johnstonii
Earth Fruit	Geocarpon minimum
Pecos Sunflower	Helianthus paradoxus
Neches River Rose-mallow	Hibiscus dasycalyx
Slender Rushpea	Hoffmannseggia tenella
Texas Prairie Dawn	Hymenoxys texana
Texas Golden Gladecress	Leavenworthia texana
Walker's Manioc	Manihot walkerae
Texas Trailing Phlox	Phlox nivalis ssp. texensis
White Bladderpod	Physaria pallida
Zapata Bladderpod	Physaria thamnophila
Little Aguja Pondweed	Potamogeton clystocarpus
Hinckley's Oak	Quercus hinckleyi
Chaffseed	Schwalbea americana
Tobusch Fishhook Cactus	Sclerocactus brevihamatus ssp. tobuschii
Lloyd's Mariposa Cactus	Sclerocactus mariposensis
Navasota Ladies'-tresses	Spiranthes parksii
Bracted Twistflower	Streptanthus bracteatus
Texas Snowbells	Styrax platanifolius spp. texanus
Ashy Dogweed	Thymophylla tephroleuca
Texas Wild-rice	Zizania texana
Other	

Note: Country and Province information is maintained separately from the plan for emergency responder use.

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FIGURE 6.4

AQUIFERS		
NAME	COUNTY/STATE	PROVINCE
Johsbourgh Valley & Empress	-----	SK
Buried Sand Gravel		
Swift Current Valley	-----	SK
Gravebourgh Valley	-----	SK
Neidpath Valley	-----	SK
Condie Moraine	-----	SK
Great Sand Hills	-----	SK
Upper Foral Formation Sands and Gravels	-----	SK
Empress Buried Valley Group	-----	SK
Aquifers and Interglacial Aquifers		SK
Judith River Formation		SK
Winkler	-----	MB
Pembina River	Cavalier & Pembina, ND	-----
Icelandic	Cavalier, Pembina, ND	-----
Pembina Delta	Cavalier, Pembina, ND	-----
Edinburg	Pembina & Walsh, ND	-----
Eliot	Ransom, ND	-----
Englevale	Sargent, ND	-----
Spiritwood A.D. System	Sargent, ND	-----
Brampton	Sargent, ND	-----
High Plains	Nebraska	-----
Lower Cretacous	Marshall, Kansas	-----
Ozark Plateaus	Missouri	-----
Mississippian	Madison, Illinois	-----

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FIGURE 6.4 (Cont'd)

AQUIFERS		
NAME	**COUNTY/STATE**	**PROVINCE**
Oklahoma Major Aquifers		
Vamoods Ada	Payne, Creek, Lincoln, Okfuskee, Hughes, Seminole/OK	-----
Garber Wellington	Payne, Lincoln/OK	-----
Antlers	Bryan, Johnston, Atoka/OK	-----
Arbuckle Simpson	Johnston, Pontotoc, Coal/OK	--
Gerty Sand	Pontotoc/OK	-----
Canadian River	Seminole, Pontotoc, Hughes/OK	-----
North Canadian River	Okfuskee, Seminole/OK	-----
Salt Fork of the Arkansas River	Kay, Noble Co.s OK	-----
Arkansas River	Kay, Noble, Osage, and Pawnee Co.s OK	-----
Vamoosa-Ada	Payne, Lincoln Co.s OK	-----
Oklahoma Minor Aquifers		
East Central Oklahoma	Okfuskee, Hughes/OK	-----
Pennsylvanian	Coal/OK	-----
Kiamichi	Atoka/OK	-----
Woodbine, Red River	Bryan/OK	-----
Texas Major Aquifers		
Trinity (subcrop)	Fannin, Lamar, Delta/TX	-----
Carrizo Wilcox	Hopkins, Franklin/TX	-----
Carrizo Wilcox, Carrizo Wilcox (sub crop)	Wood/TX	-----
Carrizo Wilcox (sub crop)	Upshur/TX	-----
Carrizo Wilcox, Carrizo Wilcox (sub crop)	Rusk, Smith, Cherokee, Nacogdoches/TX	-----
Carrizo Wilcox (sub crop)	Angelina/TX	-----
Gulf Coast	Polk, Hardin, Liberty, Orange, Jefferson/TX	-----
Texas Minor Aquifers		
Woodbine, Woodbine (subcrop)	Fannin/TX	-----
Woodbine, Woodbine (subcrop), Blossom, Blossom (subcrop)	Lamar/TX	-----
Nacatoch	Delta, Franklin/TX	-----
Nacatoch, Nacatoch (subcrop)	Hopkins/TX	-----
Queen City	Wood, Upshur,Smith, Rusk /TX	-----
Queen City, Sparta	Cherokee/TX	-----

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FIGURE 6.4 (Cont'd)

AQUIFERS		
NAME	COUNTY/STATE	PROVINCE
Texas Minor Aquifers, Cont'd		
Queen City, Queen City(subcrop),Sparta, Sparta (subcrop), Yegua-Jackson	Nacogdoches/TX	-----
Queen City (subcrop), Sparta (subcrop), Yegua-Jackson	Angelina/TX	-----
Yegua-Jackson	Polk/TX	-----
Kansas Aquifers		
Glacial Drift Aquifer	Washington Co., KS	-----
Dakota Aquifer	Washington, Clay, Dickenson, & Marion Co.s, KS	-----
Alluvial Aquifer	Washington, Clay, Riley, Dickenson, Marion, Butler, Cowley, & Sumner Co.s, KS	-----

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HYDRAULICALLY SENSITIVE AREAS AND OPERATOR DESIGNATED HCAs	
NAME	LOCATION
Winkler Aquifer	Winkler, Manitoba
Middle James Aquifer	Marshall County, SD
Kickapoo Indian Reservation	Brown County, KS
Seward Wellhead Protection Area	Seward, NE

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FIGURE 6.5

US ENVIRONMENTAL SENSITIVE AREAS			
ID	SOURCE	ORGANIZATION	MAP SHEET
365	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
368	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
412	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
640	SDNHPPT	South Dakota Natural Heritage Database	
826	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
828	NENHPPT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
842	NENHPPT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
458	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
125	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
131	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
132	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
140	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
141	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
142	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
143	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
144	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
145	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
146	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
153	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
187	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
210	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
211	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
232	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
233	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
234	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
254	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
257	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
272	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
273	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
274	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
275	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
276	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
277	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
292	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
326	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
344	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
345	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
722	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
723	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
724	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
725	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
726	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
751	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
775	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
776	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
777	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
778	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
779	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16
805	NENHPTT	Nebraska Natural Heritage Program	U.S. Map Sheet 16

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
433	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map Sheet 16
445	SDNHPPT	South Dakota Natural Heritage Database	U.S. Map sheet 13
800	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
865	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
792	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
825	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
283	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
284	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
614	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
615	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
1027	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
1028	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
223	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
224	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
285	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
286	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
287	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
312	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
361	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
539	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
540	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
551	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
616	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
617	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
618	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
644	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 16
768	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 18
780	NENHPPT	Nebraska Natural Heritage Program	U.S. Map sheet 19
587	NDNHPPT	North Dakota Natural Heritage Program	U.S. Map sheet 7
109	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
110	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
115	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
119	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
120	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
129	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
130	MONHPPT	Missouri Natural Heritage Program	U. S. Map sheet 36
1227	ILNHPPT	Illinois Natural Heritage Database Program	U. S. Map sheet 36
1273	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
1282	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
1283	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
239	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1057	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1058	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1059	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1066	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1067	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
186	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 31
187	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
194	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28
195	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
203	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
204	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
214	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
227	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
245	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
246	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
249	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
253	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
254	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
258	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1230	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1232	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1261	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
1286	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
20	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
556	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 32
560	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 28
1060	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1062	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1063	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1065	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
1069	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
48	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
145	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
181	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
417	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
142	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
203	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 24
226	KSNHPPT	Kansas Natural Heritage Inventory	U.S. Map sheet 27
424	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
425	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
427	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
428	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 27
45	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 36
521	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
522	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
527	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
537	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
554	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
555	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
556	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
562	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
563	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
103	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
132	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
416	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 35
536	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
539	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
540	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
541	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
180	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
378	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
381	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
436	ILNHPPT	Illinois Natural Heritage Database Program	U.S. Map sheet 38
508	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
557	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
559	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
560	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
561	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
564	MONHPPT	Missouri Natural Heritage Program	U.S. Map sheet 36
438	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
954	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
1466	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 11
1608	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
2298	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
557	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
840	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
976	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2384	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2559	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2925	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
71	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
145	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
152	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
199	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
200	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 13
857	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
858	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
1246	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
1292	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 10
1401	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
1477	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
1647	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
1731	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
1757	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2046	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2057	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 10
2109	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2169	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2237	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 15
2394	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 12
2407	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2579	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
2583	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2663	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
2846	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 14
2958	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 17
3017	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9
3018	TXNHPPT	The Nature Conservancy of Texas	XL Line Map Sheet 9

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
3180	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3183	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3209	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3211	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3217	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
3218	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
532	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
137	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
141	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
144	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
155	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
173	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
194	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
321	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
322	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
410	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 5
202	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 5
210	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
361	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
387	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
390	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
396	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 4
478	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
570	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
713	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
715	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
725	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
728	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 4
729	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
737	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
738	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 6
770	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
796	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
797	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 1
816	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
826	OKNHPPT	Oklahoma Natural Heritage Inventory	XL Line Map Sheet 3
316	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
323	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
325	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
333	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
349	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
357	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
660	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
688	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
695	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
716	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 10
738	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
806	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
808	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
810	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11

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US ENVIRONMENTAL SENSITIVE AREAS (Cont'd)			
ID	SOURCE	ORGANIZATION	MAP SHEET
811	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
813	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
821	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 11
824	OKNHPPT	Oklahoma Natural Heritage Inventory	Cushing Map Sheet 9
64	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
76	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
87	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
90	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
112	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
113	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
125	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
134	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
144	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
166	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
168	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
170	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
181	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
184	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
189	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
197	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
200	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
201	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8
202	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
203	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 2
206	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
211	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
212	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
216	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
217	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 6
219	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
239	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 4
244	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
246	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 3
248	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
252	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
260	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
261	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 5
325	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 7
349	KSNHPPT	Kansas Natural Heritage Inventory	Cushing Map Sheet 8

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US HIGH POPULATED AREAS				
HPA ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
737	St. Joseph, MO-KS	Buchanan	Missouri	U. S. Map Sheet 27
887	Alton, IL	Madison	Illinois	U. S. Map Sheet 36
888	St. Louis, MO-IL	Madison	Illinois	U. S. Map Sheet 36

US POPULATED AREAS				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
4048	Yankton	Yankton	South Dakota	U. S. Map Sheet 16
4150	Roswell	Miner	South Dakota	U. S. Map Sheet 13
4204	Iroquois	Kingsbury	South Dakota	U. S. Map Sheet 12
4220	Menno	Hutchinson	South Dakota	U. S. Map Sheet 15
4323	Raymond	Clark	South Dakota	U. S. Map Sheet 11
9956	Hoskins	Wayne	Nebraska	U. S. Map Sheet 18
9957	Sholes	Wayne	Nebraska	U. S. Map Sheet 17
10011	Seward	Seward	Nebraska	U. S. Map Sheet 21
10369	Leigh	Colfax	Nebraska	U. S. Map Sheet 19
10405	Randolph	Cedar	Nebraska	U. S. Map Sheet 17
10429	Garrison	Butler	Nebraska	U. S. Map Sheet 20
10526	Lankin	Walsh	North Dakota	U. S. Map Sheet 3
10639	Walhalla	Pembina	North Dakota	U. S. Map Sheet 1
12318	Renick	Randolph	Missouri	U. S. Map Sheet 32
12480	Middletown	Montgomery	Missouri	U. S. Map Sheet 34
12556	Cave	Lincoln	Missouri	U. S. Map Sheet 34
12560	Moscow Mills	Lincoln	Missouri	U. S. Map Sheet 35
12561	Old Monroe	Lincoln	Missouri	U. S. Map Sheet 35
12563	Troy	Lincoln	Missouri	U. S. Map Sheet 34
12832	Gower	Clinton	Missouri	U. S. Map Sheet 28
12836	Plattsburg	Clinton	Missouri	U. S. Map Sheet 28
12877	Brunswick	Chariton	Missouri	U. S. Map Sheet 30
12880	Keytesville	Chariton	Missouri	U. S. Map Sheet 31
12952	Cowgill	Caldwell	Missouri	U. S. Map Sheet 29
12955	Kingston	Caldwell	Missouri	U. S. Map Sheet 29
12961	Agency	Buchanan	Missouri	U. S. Map Sheet 27
12965	Gower	Buchanan	Missouri	U. S. Map Sheet 28
16649	Severance	Doniphan	Kansas	U. S. Map Sheet 26
16754	Robinson	Brown	Kansas	U. S. Map Sheet 26
17901	Vernon	Marion	Illinois	U. S. Map Sheet 38
18793	Keyesport	Bond	Illinois	U. S. Map Sheet 38
18797	Pierron	Bond	Illinois	U. S. Map Sheet 37
18798	Pocahontas	Bond	Illinois	U. S. Map Sheet 37
	Cushing	Payne	Oklahoma	U.S. Map Sheet 1
	Perkins		Oklahoma	U.S. Map Sheet 1
	Quay		Oklahoma	U.S. Map Sheet 1
	Ripley		Oklahoma	U.S. Map Sheet 1
	Stillwater		Oklahoma	U.S. Map Sheet 1
	Yale		Oklahoma	U.S. Map Sheet 1
	Depew	Creek	Oklahoma	U.S. Map Sheet 1
	Drumright		Oklahoma	U.S. Map Sheet 1
	Oilton		Oklahoma	U.S. Map Sheet 1
	Shamrock		Oklahoma	U.S. Map Sheet 1

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Agra	Lincoln	Nebraska	U.S. Map Sheet 1
	Chandler		Nebraska	U.S. Map Sheet 1
	Davenport		Nebraska	U.S. Map Sheet 1
	Kendrick		Nebraska	U.S. Map Sheet 1
	Prauge		Nebraska	U.S. Map Sheet 1
	Sparks		Nebraska	U.S. Map Sheet 1
	Stroud		Nebraska	U.S. Map Sheet 1
	Tryon		Nebraska	U.S. Map Sheet 1
	Bearden	Okfuskee	Oklahoma	U.S. Map Sheet 2
	Boley		Oklahoma	U.S. Map Sheet 2
	Castle		Oklahoma	U.S. Map Sheet 2
	Okemah		Oklahoma	U.S. Map Sheet 2
	Paden		Oklahoma	U.S. Map Sheet 2
	Atwood	Hughes	Oklahoma	U.S. Map Sheet 3
	Calvin		Oklahoma	U.S. Map Sheet 3
	Gerty		Oklahoma	U.S. Map Sheet 4
	Holdenville		Oklahoma	U.S. Map Sheet 3
	Horntown		Oklahoma	U.S. Map Sheet 3
	Spaulding		Oklahoma	U.S. Map Sheet 3
	Wetumka		Oklahoma	U.S. Map Sheet 3
	Yeager		Oklahoma	U.S. Map Sheet 3
	Bowlegs	Seminole	Oklahoma	U.S. Map Sheet 3
	Cromwell		Oklahoma	U.S. Map Sheet 3
	Lima		Oklahoma	U.S. Map Sheet 3
	Sasakwa		Oklahoma	U.S. Map Sheet 3
	Seminole		Oklahoma	U.S. Map Sheet 3
	Wewoka		Oklahoma	U.S. Map Sheet 3
	Allen	Pontotoc	Oklahoma	U.S. Map Sheet 4
	Fancis		Oklahoma	U.S. Map Sheet 4
	Stonewall		Oklahoma	U.S. Map Sheet 4
	Centrahoma	Coal	Oklahoma	U.S. Map Sheet 4
	Coalgate		Oklahoma	U.S. Map Sheet 4
	Lehigh		Oklahoma	U.S. Map Sheet 5
	Phillips		Oklahoma	U.S. Map Sheet 4
	Tupelo		Oklahoma	U.S. Map Sheet 4
	Bromide	Johnston	Oklahoma	U.S. Map Sheet 5
	Kenefic		Oklahoma	U.S. Map Sheet 5
	Wapanucka		Oklahoma	U.S. Map Sheet 5
	Atoka	Atoka	Oklahoma	U.S. Map Sheet 5
	Caney		Oklahoma	U.S. Map Sheet 5
	Stringtown		Oklahoma	U.S. Map Sheet 5
	Tushka		Oklahoma	U.S. Map Sheet 5
	Bennington	Bryan	Oklahoma	U.S. Map Sheet 6
	Bokchito		Oklahoma	U.S. Map Sheet 6
	Caddo		Oklahoma	U.S. Map Sheet 5
	Paris	Lamar	Texas	U.S. Map Sheet 7
	Reno		Texas	U.S. Map Sheet 7
	Roxton		Texas	U.S. Map Sheet 7
	Toco		Texas	U.S. Map Sheet 7

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Honey Grove	Fannin	Texas	U.S. Map Sheet 7
	Cooper	Delta	Texas	U.S. Map Sheet 7
	Pecan Gap		Texas	U.S. Map Sheet 7
	Mount Vernon	Franklin	Texas	U.S. Map Sheet 8
	Winnsboro		Texas	U.S. Map Sheet 9
	Como	Hopkins	Texas	U.S. Map Sheet 8
	Sulphur Springs		Texas	U.S. Map Sheet 8
	Tira		Texas	U.S. Map Sheet 8
	Hawkins	Wood	Texas	U.S. Map Sheet 10
	Quitman		Texas	U.S. Map Sheet 9
	Big Sandy	Upshur	Texas	U.S. Map Sheet 10
	Gilmer		Texas	U.S. Map Sheet 10
	Arp	Smith	Texas	U.S. Map Sheet 10
	New Chapel Hill		Texas	U.S. Map Sheet 10
	Troup		Texas	U.S. Map Sheet 11
	Tyler		Texas	U.S. Map Sheet 10
	Whitehouse		Texas	U.S. Map Sheet 10
	Winona		Texas	U.S. Map Sheet 10
	Henderson	Rusk	Texas	U.S. Map Sheet 11
	New London		Texas	U.S. Map Sheet 11
	Overton		Texas	U.S. Map Sheet 11
	Alto	Cherokee	Texas	U.S. Map Sheet 12
	Gallatin		Texas	U.S. Map Sheet 11
	New Summerfield		Texas	U.S. Map Sheet 11
	Reklaw		Texas	U.S. Map Sheet 11
	Rusk		Texas	U.S. Map Sheet 11
	Wells		Texas	U.S. Map Sheet 12
	Cushing	Nacogdoches	Texas	U.S. Map Sheet 12
	Nacogdoches		Texas	U.S. Map Sheet 12
	Burke	Angelina	Texas	U.S. Map Sheet 13
	Diboll		Texas	U.S. Map Sheet 13
	Hudson		Texas	U.S. Map Sheet 13
	Lufkin		Texas	U.S. Map Sheet 13
	Corrigan	Polk	Texas	U.S. Map Sheet 14
	Goodrich		Texas	U.S. Map Sheet 14
	Livingston		Texas	U.S. Map Sheet 14
	Seven Oaks		Texas	U.S. Map Sheet 14
	West Livingston		Texas	U.S. Map Sheet 14

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US POPULATED AREAS (Cont'd)				
ID	NAME	COUNTY NAME	STATE NAME	MAP SHEET
	Ames	Liberty	Texas	U.S. Map Sheet 16
	Daisetta		Texas	U.S. Map Sheet 16
	Dayton Lakes		Texas	U.S. Map Sheet 16
	Devers		Texas	U.S. Map Sheet 16
	Hardin		Texas	U.S. Map Sheet 16
	Kenefick		Texas	U.S. Map Sheet 16
	Liberty		Texas	U.S. Map Sheet 16
	Lumberton	Hardin	Texas	U.S. Map Sheet 16
	Pinewood Estates		Texas	U.S. Map Sheet 16
	Sour Lake		Texas	U.S. Map Sheet 16
	Bridge City	Orange	Texas	U.S. Map Sheet 17
	Mauriceville		Texas	U.S. Map Sheet 17
	Orange		Texas	U.S. Map Sheet 17
	Rose City		Texas	U.S. Map Sheet 17
	Vidor		Texas	U.S. Map Sheet 17
	West Orange		Texas	U.S. Map Sheet 17
	Beaumont	Jefferson	Texas	U.S. Map Sheet 17
	Bevil Oaks		Texas	U.S. Map Sheet 17
	Central Gardens		Texas	U.S. Map Sheet 17
	China		Texas	U.S. Map Sheet 16
	Groves		Texas	U.S. Map Sheet 17
	Nome		Texas	U.S. Map Sheet 16
	Pine Forest		Texas	U.S. Map Sheet 17
	Port Arthur		Texas	U.S. Map Sheet 17
	Port Neches		Texas	U.S. Map Sheet 17
	Nederland		Texas	U.S. Map Sheet 17

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US DAMS				
DAM NAME	COUNTY	RIVER	STATE	MAP SHEET
Unnamed	Doniphan	TR-Missouri River	KS	U.S. Map Sheet 27
Ksnoname 4213	Doniphan	TR-Brush Creek	KS	U.S. Map Sheet 27
Upper Turtle R. Fld. Ret #2	Grand Forks	Skunk Coulee	ND	U.S. Map Sheet 3
Tydol	Creek	TR-Tiger CR	OK	Cushing Map Sheet 11
SCS-Stillwater Creek Site-01	Payne	Deer Creek	OK	Cushing Map Sheet 11
SCS-Stillwater Creek Site-40	Noble	North Stillwater Creek	OK	Cushing Map Sheet 10
SCS-Stillwater Creek Site-41	Noble	TR-North Stillwater Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-19M	Pawnee	Black Bear Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-23	Pawnee	TR-Camp Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-16	Pawnee	TR-Pepper Creek	OK	Cushing Map Sheet 10
SCS-Lower Black Bear Creek Site-04	Pawnee	Skedee CR	OK	Cushing Map Sheet 10
Sooner	Pawnee	Greasy CR	OK	Cushing Map Sheet 10
Kaw Lake	Kay	Arkansas River	OK	Cushing Map Sheet 9
Ponca	Kay	Turkey Creek	OK	Cushing Map Sheet 9
Winfield, City Of, Timber Creek MPD No 29	Cowley	Timber Creek	KS	Cushing Map Sheet 7
Muddy Creek WJD No 27, FRD No 4-6	Butler	Muddy Creek	KS	Cushing Map Sheet 7
Augusta, City Of, Santa Fe Lake Dam	Butler	Dry Creek	KS	Cushing Map Sheet 7
El Dorado Lake	Butler	Walnut River	KS	Cushing Map Sheet 6
Marion County	Marion	TR-Cottonwood River	KS	Cushing Map Sheet 5
Marion Lake	Marion	Cottonwood River	KS	Cushing Map Sheet 5
Herington, City Of, Multiple Purpose Dam #6	Dickinson	Lyon Creek	KS	Cushing Map Sheet 4
Lyons Creek MPD #6	Dickinson	Lyon Creek	KS	Cushing Map Sheet 4
Kansas F F and Game Commission (Kansas Dept. Of Wildlife & Parks)	Geary	TR-Lyon Creek	KS	Cushing Map Sheet 4
Milford Dam	Geary	Republican River	KS	Cushing Map Sheet 3
Franklin County Dam	Franklin	Big Cypress Creek	TX	U.S. Map Sheet 9
Lake Loma Dam	Upshur	Big Sandy Creek	TX	U.S. Map Sheet 10
Lake Striker Dam	Rusk	Striker Creek	TX	U.S. Map Sheet 11
Bayou Loco Dam	Nacogdoches	Loco Bayou	TX	U.S. Map Sheet 12

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US LAKES		
NAME	STATE	MAP SHEET
Lake Ashtabula	ND	U.S. Map Sheet 5
Lone Tree Lake	ND	U.S. Map Sheet 7
Carlyle Lake	IL	U.S. Map Sheet 38
Stroud Lake	OK	U.S. Map Sheet 1
Antwine Lake	OK	Cushing Map Sheet 9
Horseshoe Lake	OK	Cushing Map Sheet 9
Indian Hills Lake	OK	Cushing Map Sheet 9
Cushing Lake	OK	Cushing Map Sheet 11
Hazen Lake	OK	Cushing Map Sheet 10
Lake McMurtry	OK	Cushing Map Sheet 10
Sanborn Lake	OK	Cushing Map Sheet 10
Yost Reservoir	OK	Cushing Map Sheet 10
Boomer Lake	OK	Cushing Map Sheet 10
Feaster Lake	OK	Cushing Map Sheet 10
Pawnee Lake	OK	Cushing Map Sheet 10
Tydol Lake	OK	Cushing Map Sheet 11
Stroud Lake	OK	Cushing Map Sheet 11
Callan Lake	OK	Cushing Map Sheet 1
Washington County State Lake	OK	Cushing Map Sheet 1
Ash Lake	OK	Cushing Map Sheet 1
Lake Herington	OK	Cushing Map Sheet 4
Marion Reservoir	OK	Cushing Map Sheet 5
Marion County Lake	OK	Cushing Map Sheet 5
Stillwater Lake	OK	Cushing Map Sheet 2
Clay County Lake	OK	Cushing Map Sheet 3
Terrapin Lake	OK	Cushing Map Sheet 4
Geary County State Lake	OK	Cushing Map Sheet 4
Wentz Lake	OK	Cushing Map Sheet 9
Timber Creek Lake	OK	Cushing Map Sheet 7
Newkirk Country Club Lake	OK	Cushing Map Sheet 9
Newkirk Lake	OK	Cushing Map Sheet 8
Lake Wynds	OK	Cushing Map Sheet 8
Harvey County East Park Lake	OK	Cushing Map Sheet 6
Santa Fe Lake	OK	Cushing Map Sheet 7
Beech Lake	OK	Cushing Map Sheet 7
Augusta Lake	OK	Cushing Map Sheet 7
El Dorado Lake	OK	Cushing Map Sheet 6
Big Cypress Creek	TX	U.S. Map Sheet 9
Big Sandy Lake	TX	U.S. Map Sheet 10
Lake Striker	TX	U.S. Map Sheet 11
Fiberboard Lake	TX	U.S. Map Sheet 13
Yellow Bluff Lake	TX	U.S. Map Sheet 13
Ryan Lake	TX	U.S. Map Sheet 13
Black Cat Lake	TX	U.S. Map Sheet 13
Sabine Lake	TX	U.S. Map Sheet 17

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US RIVERS AND STREAMS			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Pembina River	ND	U. S. Map Sheet 1
Stream	Tongue River	ND	U. S. Map Sheet 2
Stream	Cart Creek	ND	U. S. Map Sheet 2
Stream	North Branch Park River	ND	U. S. Map Sheet 2
Stream	Middle Branch Park River	ND	U. S. Map Sheet 2
Stream	South Branch Park River	ND	U. S. Map Sheet 2
Stream	North Branch Forest River	ND	U. S. Map Sheet 3
Stream		ND	U. S. Map Sheet 3
Stream	Middle Branch Forest River	ND	U. S. Map Sheet 3
Stream	South Branch Forest River	ND	U. S. Map Sheet 3
Stream Intermittent	Skunk Coulee	ND	U. S. Map Sheet 3
Stream Intermittent	North Branch Turtle River	ND	U. S. Map Sheet 3
Stream Intermittent	Goose Creek	ND	U. S. Map Sheet 4
Stream	Goose River	ND	U. S. Map Sheet 4
Stream	Sheyenne River	ND	U. S. Map Sheet 7
Stream Intermittent	Crow Creek	ND	U. S. Map Sheet 9
Stream Intermittent		SD	U. S. Map Sheet 9
Stream Intermittent	Antelope Creek	SD	U. S. Map Sheet 9
Stream Intermittent		SD	U. S. Map Sheet 10
Stream	Mud Creek	SD	U. S. Map Sheet 10
Stream Intermittent	Foster Creek	SD	U. S. Map Sheet 11
Stream Intermittent		SD	U. S. Map Sheet 11
Stream Intermittent	Pearl Creek	SD	U. S. Map Sheet 12
Stream Intermittent	South Pearl Creek	SD	U. S. Map Sheet 12
Stream Intermittent		SD	U. S. Map Sheet 12
Stream Intermittent	West Redstone Creek	SD	U. S. Map Sheet 12
Stream Intermittent	Redstone Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Jim Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Rock Creek	SD	U. S. Map Sheet 13
Stream Intermittent	Wolf Creek	SD	U. S. Map Sheet 14
Stream	James River	SD	U. S. Map Sheet 15
Stream Intermittent	Beaver Creek	SD	U. S. Map Sheet 16
Stream	James River	SD	U. S. Map Sheet 16
Stream	West Bow Creek	NE	U. S. Map Sheet 16
Stream	Bow Creek	NE	U. S. Map Sheet 17
Stream	Middle Logan Creek	NE	U. S. Map Sheet 17
Stream	Dog Creek	NE	U. S. Map Sheet 17
Stream	Elk Horn River	NE	U. S. Map Sheet 18
Stream	Elk Horn River	NE	U. S. Map Sheet 18
Stream	Union Creek	NE	U. S. Map Sheet 18
Stream	West Fork Maple Creek	NE	U. S. Map Sheet 19
Stream	Shell Creek	NE	U. S. Map Sheet 19
Stream	Lost Creek	NE	U. S. Map Sheet 19
Stream	North Branch Big Blue River	NE	U. S. Map Sheet 20
Stream	Big Blue River	NE	U. S. Map Sheet 20
Stream	Lincoln Creek	NE	U. S. Map Sheet 21
Stream	West Fork Big Blue River	NE	U. S. Map Sheet 21
Stream	Turkey Creek	NE	U. S. Map Sheet 21
Stream	Swan Creek	NE	U. S. Map Sheet 22

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US RIVERS AND STREAMS (cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream Intermittent	Cub Creek	NE	U. S. Map Sheet 22
Stream Intermittent	Big Indian Creek	NE	U. S. Map Sheet 23
Stream	Big Indian Creek	NE	U. S. Map Sheet 23
Stream	Little Blue River	NE	U. S. Map Sheet 23
Stream	Little Blue River	KS	U. S. Map Sheet 23
Stream	Big Blue River	KS	U. S. Map Sheet 24
Stream	Horseshoe Creek	KS	U. S. Map Sheet 24
Stream	Walnut Creek	KS	U. S. Map Sheet 26
Stream	Wolf River	KS	U. S. Map Sheet 26
Stream	Robidoux Creek	KS	U. S. Map Sheet 24
Stream	Delaware River	KS	U. S. Map Sheet 25
Stream Intermittent	Craig Creek	KS	U. S. Map Sheet 25
Stream	South Fork Big Nemaha River	KS	U. S. Map Sheet 25
Stream	Shoal Creek	MO	U. S. Map Sheet 29
Stream	Independence Creek	KS	U. S. Map Sheet 26
Stream	Shoal Creek	MO	U. S. Map Sheet 28
Stream	Castile Creek	MO	U. S. Map Sheet 28
Stream	Platte River	MO	U. S. Map Sheet 27
Stream	Mud Creek	MO	U. S. Map Sheet 29
Stream	Grand River	MO	U. S. Map Sheet 30
Stream	Big Creek	MO	U. S. Map Sheet 30
Stream	Grand River	MO	U. S. Map Sheet 30
Stream	Chariton River	MO	U. S. Map Sheet 31
Stream	Mussel Fork	MO	U. S. Map Sheet 31
Stream	Little Platte River	MO	U. S. Map Sheet 28
Stream	Chariton River	MO	U. S. Map Sheet 31
Stream	Turkey Creek	MO	U. S. Map Sheet 29
Stream	Coon Creek	MO	U. S. Map Sheet 32
Stream	Reese Fork	MO	U. S. Map Sheet 32
Stream	Middle Fork Little Chariton River	MO	U. S. Map Sheet 31
Stream	East Fork Little Chariton River	MO	U. S. Map Sheet 31
Stream	Old Channel Chariton River	MO	U. S. Map Sheet 31
Stream	Saling Creek	MO	U. S. Map Sheet 32
Stream	Youngs Creek	MO	U. S. Map Sheet 32
Stream	Long Branch	MO	U. S. Map Sheet 32
Stream	South Fork Salt River	MO	U. S. Map Sheet 33
Stream	Littleby Creek	MO	U. S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 33
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 34
Stream	West Fork Cuivre River	MO	U. S. Map Sheet 34
Stream	Cuivre Slough	MO	U. S. Map Sheet 35
Stream	Elkhorn Creek	MO	U. S. Map Sheet 34
Stream	Brick House Slough	MO	U. S. Map Sheet 36
Stream	Cuivre River	MO	U. S. Map Sheet 35
Stream	Cuivre River	MO	U. S. Map Sheet 35
Stream	Dardenne Creek	MO	U. S. Map Sheet 35
Dam	Lock and Dam Number 26	MO	U. S. Map Sheet 36
Stream		MO	U. S. Map Sheet 35
Stream	Cora Island Chute	MO	U. S. Map Sheet 36

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US RIVERS AND STREAMS (cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Big Creek	MO	U. S. Map Sheet 35
Stream	Cahokia Creek	IL	U. S. Map Sheet 36
Stream	Indian Creek	IL	U. S. Map Sheet 36
Stream	Cahokia Creek	IL	U. S. Map Sheet 36
Stream	Peruque Creek	MO	U. S. Map Sheet 35
Dam	Dam Number 27	MO	U. S. Map Sheet 36
Stream	North Fork Kaskaskia Creek	IL	U. S. Map Sheet 38
Stream	Dardenne Creek	MO	U. S. Map Sheet 35
Stream	East Fork Silver Creek	IL	U. S. Map Sheet37
Stream	Silver Creek	IL	U. S. Map Sheet 37
Stream	Beaver Creek	IL	U. S. Map Sheet 37
Stream	Shoal Creek	IL	U. S. Map Sheet 37
Stream	Sugar Creek	IL	U. S. Map Sheet 37
Stream	Euchee Creek	OK	U. S. Map Sheet 1
Stream	Rattlesnake Creek	OK	U. S. Map Sheet 1
Stream	Turkey Creek	OK	U. S. Map Sheet 1
Stream	Lilly Creek	OK	U. S. Map Sheet 1
Stream	Salt Creek	OK	U. S. Map Sheet 1
Stream	Little Hilliby Creek	OK	U. S. Map Sheet 2
Stream	North Canadian River	OK	U. S. Map Sheet 2
Stream	Sand Creek	OK	U. S. Map Sheet 3
Stream	Little Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Big Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Wewoka Creek	OK	U. S. Map Sheet 3
Stream	Jacobs Creek	OK	U. S. Map Sheet 3
Stream	Bird Creek	OK	U. S. Map Sheet 3
Stream	Canadian River	OK	U. S. Map Sheet 3
Stream	Arbeca Creek	OK	U. S. Map Sheet 3
Stream	Little Sandy Creek	OK	U. S. Map Sheet 4
Stream	Big Sandy Creek	OK	U. S. Map Sheet 4
Stream	Sandy Creek	OK	U. S. Map Sheet 4
Stream	Peach Creek	OK	U. S. Map Sheet 4
Stream	Owl Creek	OK	U. S. Map Sheet 4
Stream	Little Caney Boggy Creek	OK	U. S. Map Sheet 4
Stream	Coon Creek	OK	U. S. Map Sheet 4
Stream	French Henry Creek	OK	U. S. Map Sheet 5
Stream	Fronter house Creek	OK	U. S. Map Sheet 5
Stream	Clear Boggy Creek	OK	U. S. Map Sheet 5
Stream	Cowpen Creek	OK	U. S. Map Sheet 5
Stream	Little Cowpen Creek	OK	U. S. Map Sheet 5
Stream	Long Branch	OK	U. S. Map Sheet 5
Stream	Pine Creek	OK	U. S. Map Sheet 5
Stream	Straight Creek	OK	U. S. Map Sheet 5
Stream	Cowpen Creek	OK	U. S. Map Sheet 6
Stream	Straight Creek	OK	U. S. Map Sheet 6
Stream	Rock Branch	OK	U. S. Map Sheet 6
Stream	Sassafras Creek	OK	U. S. Map Sheet 6
Stream	Sulphur Creek	OK	U. S. Map Sheet 6
Stream	McGee Creek	OK	U. S. Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Winters Creek	OK	U. S. Map Sheet 6
Stream	Whitesand Creek	OK	U. S. Map Sheet 6
Stream	Slash Creek	OK	U. S. Map Sheet 6
Stream	Wolf Creek	OK	U. S. Map Sheet 6
Stream	Frazier Creek	OK	U. S. Map Sheet 6
Stream	Whitegrass Creek	OK	U. S. Map Sheet 6
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Stillwater Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Brush Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Elm Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Spring Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Spring Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Boomer Creek	OK	Cushing Map Sheet 10
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Artificial Path	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	West Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Long Branch	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Artificial Path	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	Dry Creek	OK	Cushing Map Sheet 10
Stream/River	North Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Cow Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Boomer Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Artificial Path	Otoe Creek	OK	Cushing Map Sheet 10
Artificial Path	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Willow Creek	OK	Cushing Map Sheet 10
Stream/River	Otoe Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Willow Creek	OK	Cushing Map Sheet 10
Stream/River	Mule Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Peters Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Turkey Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Lion Creek	OK	Cushing Map Sheet 10
Stream/River	Panther Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Oak Creek	OK	Cushing Map Sheet 10
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Feather Creek	OK	Cushing Map Sheet 10
Stream/River	East Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Council Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 10
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Little Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Stillwater Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	West Beaver Creek	OK	Cushing Map Sheet 11
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Headquarters Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Sand Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Dugout Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Dugout Creek	OK	Cushing Map Sheet 11
Stream/River	Walnut Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Walnut Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Brush Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	East Fork Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Headquarters Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Dog Creek	OK	Cushing Map Sheet 11
Stream/River	Dog Creek	OK	Cushing Map Sheet 11
Stream/River	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	East Spring Creek	OK	Cushing Map Sheet 11
Artificial Path	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	West Spring Creek	OK	Cushing Map Sheet 11
Stream/River	West Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Wild Horse Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Possum Trot Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Rattlesnake Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Spring Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	North Branch Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Turkey Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dosie Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Dry Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	Chuckaho Creek	OK	Cushing Map Sheet 11
Stream/River	North Branch Ranch Creek	OK	Cushing Map Sheet 11
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	East Beaver Creek	OK	Cushing Map Sheet 11
Stream/River	Ranch Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Cabin Creek	OK	Cushing Map Sheet 11
Artificial Path	Big Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Short Creek	OK	Cushing Map Sheet 11
Stream/River	Short Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Cabin Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Elm Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Big Creek	OK	Cushing Map Sheet 11
Stream/River	Wildhorse Creek	OK	Cushing Map Sheet 11
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 11
Stream/River	Polecat Creek	OK	Cushing Map Sheet 11
Stream/River	Polecat Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	East Spring Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Euchee Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Buckeye Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Euchee Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Tiger Creek	OK	Cushing Map Sheet 11
Stream/River	Sand Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Little Deep Fork Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Lilly Creek	OK	Cushing Map Sheet 11
Stream/River	Gray Horse Creek	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Mud Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Artificial Path	Salt Creek	OK	Cushing Map Sheet 10
Artificial Path	Long Branch	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Council Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Short Creek	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Mud Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Lagoon Creek	OK	Cushing Map Sheet 11
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Salt Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 10
Stream/River	Eagle Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Stream/River	Council Creek	OK	Cushing Map Sheet 11
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Little Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Black Bear Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Pepper Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Camp Creek	OK	Cushing Map Sheet 10
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Artificial Path	Cimarron River	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Deer Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Swan Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Catfish Creek	OK	Cushing Map Sheet 11
Artificial Path	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Little Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Catfish Creek	OK	Cushing Map Sheet 11
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Scribner Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Scribner Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Mulberry Creek	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Artificial Path	Republican River	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 2
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Pinkerton Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Gray Branch	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Gray Branch	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Turkey Creek	OK	Cushing Map Sheet 1
Stream/River	Stub Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	Iowa Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Parsons Creek	OK	Cushing Map Sheet 2
Stream/River	Parsons Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Plum Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Iowa Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 1
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 1
Stream/River	Melvin Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Buffalo Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Ash Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Turkey Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Joy Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Riddle Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Salt Creek	OK	Cushing Map Sheet 1
Stream/River	Jones Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Connector	School Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	School Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	School Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Lane Branch	OK	Cushing Map Sheet 1
Stream/River	Lane Branch	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Lane Branch	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Mercer Creek	OK	Cushing Map Sheet 2
Stream/River	Malone Creek	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 1
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Mill Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Beaver Creek	OK	Cushing Map Sheet 2
Stream/River	Malone Creek	OK	Cushing Map Sheet 2
Stream/River	Mercer Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Deadman Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Deadman Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Five Creek	OK	Cushing Map Sheet 3
Artificial Path	Huntress Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Finney Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Lincoln Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 2
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	North Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Five Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Huntress Creek	OK	Cushing Map Sheet 3
Stream/River	Finney Creek	OK	Cushing Map Sheet 3
Stream/River	Lincoln Creek	OK	Cushing Map Sheet 3
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Carter Creek	OK	Cushing Map Sheet 2
Connector	Dry Creek	OK	Cushing Map Sheet 2
Connector	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Spring Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Dry Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Branch Dry Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	North Fork Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 2
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 2
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	West Branch Mall Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Silver Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Smith Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rock Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Artificial Path	Brawner Creek	OK	Cushing Map Sheet 1
Artificial Path	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Whisky Run	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Brawner Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Stream/River	Rose Creek	OK	Cushing Map Sheet 1
Artificial Path	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Connector	Cub Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Cub Creek	OK	Cushing Map Sheet 1
Connector	Big Indian Creek	OK	Cushing Map Sheet 1
Connector	Big Indian Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Elm Creek	OK	Cushing Map Sheet 1
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Artificial Path	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Elm Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Stream/River	Bottle Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Sicily Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Artificial Path	Bottle Creek	OK	Cushing Map Sheet 1
Artificial Path	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Ash Creek	OK	Cushing Map Sheet 1
Stream/River	Bills Creek	OK	Cushing Map Sheet 1
Stream/River	Sicily Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Camp Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Coon Creek	OK	Cushing Map Sheet 2
Stream/River	Sulphur Creek	OK	Cushing Map Sheet 2
Stream/River	Swede Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	North Otter Creek	OK	Cushing Map Sheet 2
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	West Fancy Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Crooked Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Walnut Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	Mill Creek	OK	Cushing Map Sheet 3
Stream/River	School Branch	OK	Cushing Map Sheet 2
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 1
Stream/River	Cedar Creek	OK	Cushing Map Sheet 1
Stream/River	Spring Creek	OK	Cushing Map Sheet 1
Stream/River	Walnut Creek	OK	Cushing Map Sheet 1
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Raemer Creek	OK	Cushing Map Sheet 1
Stream/River	Mountain Creek	OK	Cushing Map Sheet 1
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	East Fork Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Bolling Creek	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Little Blue River	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Walnut Creek	OK	Cushing Map Sheet 2
Stream/River	Bolling Creek	OK	Cushing Map Sheet 2
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Little Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Horseshoe Creek	OK	Cushing Map Sheet 1
Stream/River	Meadow Creek	OK	Cushing Map Sheet 1
Stream/River	Mountain Creek	OK	Cushing Map Sheet 1
Stream/River	Raemer Creek	OK	Cushing Map Sheet 1
Stream/River	Hop Creek	OK	Cushing Map Sheet 1
Stream/River	Big Indian Creek	OK	Cushing Map Sheet 1
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	West Branch Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Walnut Creek	OK	Cushing Map Sheet 6
Artificial Path	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Beaver Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Walnut Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Artificial Path	West Wildcat Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Artificial Path	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Sand Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	West Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Chisholm Creek	OK	Cushing Map Sheet 6
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Artificial Path	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	Silver Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Stony Brook	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	South Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Antelope Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Branch	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Artificial Path	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Cress Creek	OK	Cushing Map Sheet 5
Stream/River	Cress Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Lyon Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Artificial Path	Middle Branch	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Stream/River	Mud Creek	OK	Cushing Map Sheet 5
Connector	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 4
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	East Branch Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Clear Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Catlin Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Martin Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Artificial Path	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Connector	Diamond Creek	OK	Cushing Map Sheet 6
Connector	Fourmile Creek	OK	Cushing Map Sheet 6
Connector	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Brush Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 6
Stream/River	Doyle Creek	OK	Cushing Map Sheet 5
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Henry Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	East Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Diamond Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Holland Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	East Holland Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Pinkerton Branch	OK	Cushing Map Sheet 3
Stream/River	Chestnut Branch	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Mud Creek	OK	Cushing Map Sheet 3
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Basket Creek	OK	Cushing Map Sheet 3
Stream/River	Chapman Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Republican River	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Reeder Branch Five Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3
Stream/River	Otter Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Timber Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Stream/River	Dry Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Chapman Creek	OK	Cushing Map Sheet 4
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Connector	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Stream/River	Goose Creek	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Mud Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Mud Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	East Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Middle Branch	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	East Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	Turkey Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Turkey Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Lone Tree Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Lone Tree Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Connector	Carry Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Chapman Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Schuler Branch	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Carry Creek	OK	Cushing Map Sheet 4
Artificial Path	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	Kohls Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	West Branch Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Artificial Path	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Lime Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Diamond Creek	OK	Cushing Map Sheet 4
Stream/River	Threemile Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 4
Stream/River	Clarks Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Stream/River	Otter Creek	OK	Cushing Map Sheet 4
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Kansas River	OK	Cushing Map Sheet 3
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Artificial Path	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Smoky Hill River	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Stream/River	Lyon Creek	OK	Cushing Map Sheet 4
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Artificial Path	Republican River	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 3
Stream/River	Little Arkansas Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Sevenmile Creek	OK	Cushing Map Sheet 3
Stream/River	Sevenmile Creek	OK	Cushing Map Sheet 3
Stream/River	Threemile Creek	OK	Cushing Map Sheet 3
Stream/River	Threemile Creek	OK	Cushing Map Sheet 3
Stream/River	Little Arkansas Creek	OK	Cushing Map Sheet 3
Stream/River	Wind Creek	OK	Cushing Map Sheet 3
Artificial Path	Gilmore Branch	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Stream/River	Gilmore Branch	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Turkey Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Creek	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Stream/River	Bills Creek	OK	Cushing Map Sheet 6
Artificial Path	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Coon Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Artificial Path	French Creek	OK	Cushing Map Sheet 5
Artificial Path	French Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Bruno Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	French Creek	OK	Cushing Map Sheet 5
Stream/River	Cedar Creek	OK	Cushing Map Sheet 5
Stream/River	Cottonwood River	OK	Cushing Map Sheet 5

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Camp Creek	OK	Cushing Map Sheet 4
Stream/River	Camp Creek	OK	Cushing Map Sheet 5
Stream/River	Diamond Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Spring Creek	OK	Cushing Map Sheet 5
Stream/River	Mulberry Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Stribby Creek	OK	Cushing Map Sheet 5
Stream/River	Middle Creek	OK	Cushing Map Sheet 5
Artificial Path	Chikaskia River	OK	Cushing Map Sheet 9
Artificial Path	Scatter Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Scatter Creek	OK	Cushing Map Sheet 9
Stream/River	Dry Creek	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Doe Creek	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Bitter Creek	OK	Cushing Map Sheet 9
Stream/River	Lost Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Lost Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Scatter Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Stink Creek	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Chikaskia River	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Connector	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Grassy Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Cottonwood Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Connector	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Little Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Osage Creek	OK	Cushing Map Sheet 8
Artificial Path	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Deer Creek	OK	Cushing Map Sheet 8
Artificial Path	Sweetwater Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Sweetwater Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Lost Creek	OK	Cushing Map Sheet 8
Stream/River	Duck Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 8
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Spring Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Otter Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Grouse Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Stream/River	Little Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Little Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Osage Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Stream/River	Deer Creek	OK	Cushing Map Sheet 8
Connector	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Middle Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	East Bitter Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Chilocco Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Negro Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Salt Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Salt Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Stream/River	Negro Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Walnut River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Connector	Skinny Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Coon Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Charley Creek	OK	Cushing Map Sheet 9
Artificial Path	Charley Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Houston Creek	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Prettyhair Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Little Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Simpkins Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Charley Creek	OK	Cushing Map Sheet 9
Stream/River	Charley Creek	OK	Cushing Map Sheet 9
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Cat Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Bird Creek	OK	Cushing Map Sheet 9
Stream/River	Skinny Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Houston Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9
Stream/River	Bird Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Skinny Creek	OK	Cushing Map Sheet 9
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Prettyhair Creek	OK	Cushing Map Sheet 9
Stream/River	Simpkins Creek	OK	Cushing Map Sheet 9
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Prettyhair Creek	OK	Cushing Map Sheet 9
Stream/River	Little Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Simpkins Creek	OK	Cushing Map Sheet 9
Stream/River	Big Drum Creek	OK	Cushing Map Sheet 9
Stream/River	Coon Creek	OK	Cushing Map Sheet 9
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Coon Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Long Branch	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 9
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Deadman Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Birds Nest Creek	OK	Cushing Map Sheet 9
Artificial Path	Birds Nest Creek	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Salt Fork Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Deadman Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Duck Creek	OK	Cushing Map Sheet 9
Stream/River	East Cattle Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 9
Stream/River	Birds Nest Creek	OK	Cushing Map Sheet 9
Stream/River	Bois d'Arc Creek	OK	Cushing Map Sheet 9
Stream/River	East Cattle Creek	OK	Cushing Map Sheet 9
Stream/River	West Cattle Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Big Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Big Drum Creek	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 9
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Mud Creek	OK	Cushing Map Sheet 10
Artificial Path	Brush Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Walker Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Rock Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Red Rock Creek	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Arkansas River	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Artificial Path	Walker Creek	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Artificial Path	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 9
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 9
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Brush Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Red Rock Creek	OK	Cushing Map Sheet 10

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Rock Creek	OK	Cushing Map Sheet 10
Stream/River	Walker Creek	OK	Cushing Map Sheet 10
Stream/River	Greasy Creek	OK	Cushing Map Sheet 10
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Connector	Whitewater River	OK	Cushing Map Sheet 7
Artificial Path	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Badger Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Bitter Creek	OK	Cushing Map Sheet 7
Artificial Path	Short Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Turner Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Bitter Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Cowskin Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Antelope Creek	OK	Cushing Map Sheet 8
Stream/River	Winser Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Gypsum Creek	OK	Cushing Map Sheet 7
Artificial Path	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Middle Fork Chisholm Creek	OK	Cushing Map Sheet 6
Connector	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Dry Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Connector	Walnut River	OK	Cushing Map Sheet 7
Connector	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dry Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Branch	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Stream/River	Dog Creek	OK	Cushing Map Sheet 7
Connector	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Whitewater Creek	OK	Cushing Map Sheet 6
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 7
Artificial Path	Fourmile Creek	OK	Cushing Map Sheet 7
Artificial Path	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Rock Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Wildcat Creek	OK	Cushing Map Sheet 6
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Prairie Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	West Branch Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Dry Creek	OK	Cushing Map Sheet 6
Stream/River	Whitewater River	OK	Cushing Map Sheet 6
Stream/River	Whitewater Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Fourmile Creek	OK	Cushing Map Sheet 7
Stream/River	Republican Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Artificial Path	Elm Creek	OK	Cushing Map Sheet 6
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Elm Creek	OK	Cushing Map Sheet 7
Artificial Path	Spring Branch	OK	Cushing Map Sheet 6
Artificial Path	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Spring Branch	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Constant Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Sutton Creek	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Elm Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Turkey Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Turkey Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Elm Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Muddy Creek	OK	Cushing Map Sheet 7
Artificial Path	Swisher Branch	OK	Cushing Map Sheet 7
Artificial Path	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Whitewater River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Foos Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Foos Creek	OK	Cushing Map Sheet 8
Stream/River	Foos Creek	OK	Cushing Map Sheet 8
Stream/River	Crooked Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Connector	Dutch Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Lost Creek	OK	Cushing Map Sheet 8
Artificial Path	Lost Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Beaver Creek	OK	Cushing Map Sheet 8
Artificial Path	Beaver Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Slate Creek	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Lost Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Slate Creek	OK	Cushing Map Sheet 8
Stream/River	Beaver Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Artificial Path	Ninnescah River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Arkansas River	OK	Cushing Map Sheet 8
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 7
Artificial Path	Cowskin Creek	OK	Cushing Map Sheet 7
Artificial Path	Arkansas River	OK	Cushing Map Sheet 7
Stream/River	Ninnescah River	OK	Cushing Map Sheet 8
Stream/River	Maple Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Maple Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Coon Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Coon Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Eightmile Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Polecat Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Walnut River	OK	Cushing Map Sheet 7
Stream/River	Stewart Creek	OK	Cushing Map Sheet 7
Stream/River	Bitter Creek	OK	Cushing Map Sheet 7
Stream/River	Short Creek	OK	Cushing Map Sheet 7
Stream/River	Short Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Spring Creek	OK	Cushing Map Sheet 8
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Sanford Creek	OK	Cushing Map Sheet 7
Stream/River	Spring Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Artificial Path	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Durham Creek	OK	Cushing Map Sheet 7
Stream/River	Swisher Branch	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Stalter Branch	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Little Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Foos Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Cedar Creek	OK	Cushing Map Sheet 8
Stream/River	Lone Elm Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Posey Creek	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	Walnut River	OK	Cushing Map Sheet 8
Stream/River	East Badger Creek	OK	Cushing Map Sheet 8
Stream/River	West Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Black Crook Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 8
Stream/River	Big Badger Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Snake Creek	OK	Cushing Map Sheet 8

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Pebble Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Harper Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Silver Creek	OK	Cushing Map Sheet 8
Stream/River	Snake Creek	OK	Cushing Map Sheet 8
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Stream/River	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Richland Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Artificial Path	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Lower Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Dutch Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Timber Creek	OK	Cushing Map Sheet 7
Stream/River	Cedar Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Little Walnut River	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Hickory Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Muddy Creek	OK	Cushing Map Sheet 7
Stream/River	Chigger Creek	OK	Cushing Map Sheet 7
Stream/River	Rock Creek	OK	Cushing Map Sheet 7
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Artificial Path	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Bird Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	West Branch Walnut River	OK	Cushing Map Sheet 6
Stream/River	Bird Creek	OK	Cushing Map Sheet 6
Stream/River	Walnut River	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Turkey Creek	OK	Cushing Map Sheet 6
Stream/River	Skedee Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream/River	Coal Creek	OK	Cushing Map Sheet 10
Stream/River	Mud Creek	OK	Cushing Map Sheet 10
Stream	Red River	TX	U. S. Map Sheet 6
Stream	Slough Creek	TX	U. S. Map Sheet 6
Stream	Sanders Creek	TX	U. S. Map Sheet 7
Stream	Cottonwood Creek	TX	U. S. Map Sheet 7
Stream	Bergher Creek	TX	U. S. Map Sheet 7

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Doss Creek	TX	U. S. Map Sheet 7
Stream	Maxey Creek	TX	U. S. Map Sheet 7
Stream	West Fork Cottonwood Creek	TX	U. S. Map Sheet 7
Stream	Maxwell Creek	TX	U. S. Map Sheet 7
Stream	Mallory Creek	TX	U. S. Map Sheet 7
Stream	Justiss Creek	TX	U. S. Map Sheet 7
Stream	Cherry Creek	TX	U. S. Map Sheet 7
Stream	Robertson Creek	TX	U. S. Map Sheet 7
Stream	Lake Creek	TX	U. S. Map Sheet 7
Stream	McGuyer Branch	TX	U. S. Map Sheet 7
Stream	South Sulphur River	TX	U. S. Map Sheet 8
Stream	Wolfpen Creek	TX	U. S. Map Sheet 8
Stream	Crosstimber Creek	TX	U. S. Map Sheet 8
Stream	Briar Branch	TX	U. S. Map Sheet 8
Stream	Stouts Creek	TX	U. S. Map Sheet 8
Stream	Greenwood Creek	TX	U. S. Map Sheet 8
Stream	Huggins Creek	TX	U. S. Map Sheet 8
Stream	Little Cypress Creek	TX	U. S. Map Sheet 8
Stream	Coon Creek	TX	U. S. Map Sheet 9
Stream	Glade Branch	TX	U. S. Map Sheet 9
Stream	Brushy Creek	TX	U. S. Map Sheet 9
Stream	Briary Creek	TX	U. S. Map Sheet 9
Stream	Ready Creek	TX	U. S. Map Sheet 9
Stream	Mill Creek	TX	U. S. Map Sheet 9
Stream	Blue Branch	TX	U. S. Map Sheet 9
Stream	Gin Creek	TX	U. S. Map Sheet 9
Stream	Rogers Creek	TX	U. S. Map Sheet 10
Stream	Kay Creek	TX	U. S. Map Sheet 10
Stream	Sabine River	TX	U. S. Map Sheet 10
Stream	Hills Creek	TX	U. S. Map Sheet 10
Stream	Glade Creek	TX	U. S. Map Sheet 10
Stream	Prairie Creek	TX	U. S. Map Sheet 10
Stream	Kickapoo Creek	TX	U. S. Map Sheet 11
Stream	Denton Creek	TX	U. S. Map Sheet 11
Stream	Beaver Run	TX	U. S. Map Sheet 11
Stream	Grissom Creek	TX	U. S. Map Sheet 11
Stream	Mill Creek	TX	U. S. Map Sheet 11
Stream	Johnson Creek	TX	U. S. Map Sheet 11
Stream	Campground Creek	TX	U. S. Map Sheet 11
Stream	Boggy Branch	TX	U. S. Map Sheet 11
Stream	Hudspeth Creek	TX	U. S. Map Sheet 11
Stream	Boggy Branch	TX	U. S. Map Sheet 11
Stream	Autry Branch	TX	U. S. Map Sheet 11
Stream	Striker Creek	TX	U. S. Map Sheet 11
Stream	Indian Creek	TX	U. S. Map Sheet 11
Stream	Angelina River	TX	U. S. Map Sheet 12
Stream	Beech Creek	TX	U. S. Map Sheet 12
Stream	Legg Creek	TX	U. S. Map Sheet 12
Stream	Bingham Creek	TX	U. S. Map Sheet 12

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US RIVERS AND STREAMS (Cont'd)			
FEATURE (STREAM/RIVER)	NAME	STATE	MAP SHEET
Stream	Beaver Creek	TX	U. S. Map Sheet 12
Stream	Stokes Creek	TX	U. S. Map Sheet 12
Stream	Doyle Creek	TX	U. S. Map Sheet 12
Stream	Red Bayou	TX	U. S. Map Sheet 12
Stream	Watson Branch	TX	U. S. Map Sheet 12
Stream	Durham Creek	TX	U. S. Map Sheet 13
Stream	Buncombe Creek	TX	U. S. Map Sheet 13
Stream	Neches River	TX	U. S. Map Sheet 13
Stream	Crawford Creek	TX	U. S. Map Sheet 13
Stream	Zed Creek	TX	U. S. Map Sheet 13
Stream	Moccasin Creek	TX	U. S. Map Sheet 13
Stream	Hackberry Creek	TX	U. S. Map Sheet 13
Stream	White Oak Creek	TX	U. S. Map Sheet 13
Stream	Lower Sulphur Creek	TX	U. S. Map Sheet 13
Stream	Piney Creek	TX	U. S. Map Sheet 13
Stream	Sandy Branch	TX	U. S. Map Sheet 13
Stream	McManus Creek	TX	U. S. Map Sheet 13
Stream	Creeds Creek	TX	U. S. Map Sheet 13
Stream	Bear Creek	TX	U. S. Map Sheet 13
Stream	Dry Creek	TX	U. S. Map Sheet 13
Stream	Brushy Creek	TX	U. S. Map Sheet 14
Stream	Kennedy Creek	TX	U. S. Map Sheet 14
Stream	Johnson Creek	TX	U. S. Map Sheet 14
Stream	Bundix Branch	TX	U. S. Map Sheet 14
Stream	Big Sandy Creek	TX	U. S. Map Sheet 14
Stream	Bluff Creek	TX	U. S. Map Sheet 14
Stream	Mathis Branch	TX	U. S. Map Sheet 14
Stream	Beech Creek	TX	U. S. Map Sheet 14
Stream	Dry Branch	TX	U. S. Map Sheet 14
Stream	Menard Creek	TX	U. S. Map Sheet 14
Stream	Yellow Branch	TX	U. S. Map Sheet 14
Stream	Williams Creek	TX	U. S. Map Sheet 15
Stream	Beef Head Creek	TX	U. S. Map Sheet 15
Stream	Trinity River	TX	U. S. Map Sheet 15
Stream	Batiste Creek	TX	U. S. Map Sheet 15
Stream	Mayhaw Creek	TX	U. S. Map Sheet 16
Stream	West End Slough	TX	U. S. Map Sheet 16
Stream	Six-Ten Slough	TX	U. S. Map Sheet 16
Stream	Pine Island Bayou	TX	U. S. Map Sheet 16
Stream	Cotton Creek	TX	U. S. Map Sheet 16
Stream	Willow Marsh Bayou	TX	U. S. Map Sheet 17
Stream	Neches River	TX	U. S. Map Sheet 17
Stream	Grays Bayou	TX	U. S. Map Sheet 17
Stream	Bird Island Bayou	TX	U. S. Map Sheet 17

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ALBERTA, CANADA SENSITIVITY AREAS		
OBJECT ID	SITE NAME	MAP SHEET
389	Silver Heights (wetlands only)	Ca. Map Sheet 2
395	Ribstone Creek – Nose Hill	Ca. Map Sheet 2
405	Neutral Hills	Ca. Map Sheet 2
413	Middle Lakes	Ca. Map Sheet 2
421	Gooseberry Lake	Ca. Map Sheet 3
433	Grassy Island Native Prairie	Ca. Map Sheet 3
440	Muddy Buttes	Ca. Map Sheet 3
449	Muddy Buttes Badlands	Ca. Map Sheet 3
450	Grassy Island Native Prairie	Ca. Map Sheet 3
460	Sounding Creek Native Prairie	Ca. Map Sheet 4
479	Alkali Creek Moraine	Ca. Map Sheet 5
493	Red Deer River – Alkali Creek/Dune Point	Ca. Map Sheet 5
501	Remount	Ca. Map Sheet 6
504	South Saskatchewan Canyon	Ca. Map Sheet 7

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CANADIAN WILDLIFE		
WOP ID	OBSERVATION	MAP SHEET
Alb06WOP1	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP3	Plains Spadefoot Toad	Ca. Map Sheet 6
Alb06WOP5	Plains Spadefoot Toad & Great Plains To	Ca. Map Sheet 6
Alb06WOP12	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb06WOP13	Loggerhead Shrike nest	Ca. Map Sheet 6
Alb07WOP3	Northern Leopard Frog (wetland)	Ca. Map Sheet 6
Alb07WOP4	Potential Amphian Breeding Wetland	Ca. Map Sheet 6
Alb07WOP6	Unidentified	Ca. Map Sheet 2
Alb07WOP7	Raptor sp.	Ca. Map Sheet 3
Alb07WOP9	Raptor sp.	Ca. Map Sheet 3
Alb07WOP10	Burrowing Owl	Ca. Map Sheet 6
Alb07WOP11	Sharp-tailed Grouse	Ca. Map Sheet 4
Man06WOP2	Northern Leopard Frog	Ca. Map Sheet 28
Man06WOP3	Northern Leopard Frog	Ca. Map Sheet 28

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CANADIAN POPULATED AREAS				
PLACE ID	PROVIDENCE	GEONAME	CONCISE	MAP SHEET
581	Manitoba	Reinland	Unincorporated area	Ca. Map Sheet 28
611	Manitoba	Brookdale	Unincorporated area	Ca. Map Sheet 23
1230	Saskatchewan	Caronport	Village	Ca. Map Sheet 13
2459	Manitoba	Miniota	Unincorporated area	Ca. Map Sheet 21

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CANADIAN MANUFACTURING WATERWELLS				
WELL_ID	WELL_OWNER	AQUIFER	WELL_USE	MAP SHEET
110879	G Neufeld	Sand and Gravel	Production	Ca. Map Sheet 26
120590	T Barber	Sand and Gravel	Production	Ca. Map Sheet 26
120592	Unknown	Sand and Gravel	Production	Ca. Map Sheet 26
120639	Unknown	Shale	Production	Ca. Map Sheet 26
120885	Unknown	Sand and Gravel	Production	Ca. Map Sheet 26
120887	S Moffat	Limestone or Dolomite	Production	Ca. Map Sheet 26
160562	Robinson	Sand and Gravel	Production	Ca. Map Sheet 27
160564	Robinson & McClomnel	Sand and Gravel	Production	Ca. Map Sheet 27
181435	Unknown	Shale	Production	Ca. Map Sheet 25
210553	J Swanton	Sand and Gravel	Production	Ca. Map Sheet 27

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CANADIAN MUNICIPAL WELLS			
WATER USE	WELL USE	Sask_ID	MAP SHEET
Municipal	Water Test Hole	7403	Ca. Map Sheet 17
Municipal	Water Test Hole	26975	Ca. Map Sheet 13
Municipal	Withdrawal	28444	Ca. Map Sheet 10
Municipal	Water Test Hole	28445	Ca. Map Sheet 10
Municipal	Water Test Hole	28446	Ca. Map Sheet 10
Municipal	Water Test Hole	28447	Ca. Map Sheet 10
Municipal	Water Test Hole	28448	Ca. Map Sheet 10
Municipal	Withdrawal	28449	Ca. Map Sheet 10
Municipal	Water Test Hole	28450	Ca. Map Sheet 10
Municipal	Observation	28451	Ca. Map Sheet 10
Municipal	Water Test Hole	28452	Ca. Map Sheet 10
Municipal	Withdrawal	28453	Ca. Map Sheet 10
Municipal	Observation	28454	Ca. Map Sheet 10
Municipal	Water Test Hole	31129	Ca. Map Sheet 7
Municipal	Withdrawal	77323	Ca. Map Sheet 10

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CANADIAN LAKES		
NAME	Lake_ID	MAP SHEET
Chaplin Lake	Chaplin Lake (ID956)	Ca. Map Sheet 12

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CANADIAN RIVERS & STREAMS	
NAME	**MAP SHEET**
Battle River	Ca. Map Sheet 1
Battle River	Ca. Map Sheet 1
Ribstone Creek	Ca. Map Sheet 2
Monitor Creek	Ca. Map Sheet 3
Sounding Creek	Ca. Map Sheet 4
Alkali Creek	Ca. Map Sheet 5
Alkali Creek	Ca. Map Sheet 5
Red Deer River	Ca. Map Sheet 6
South Saskatchewan River	Ca. Map Sheet 7
Miry Creek	Ca. Map Sheet 9
Thunder Creek	Ca. Map Sheet 13
9787107	Ca. Map Sheet 13
Thunder Creek	Ca. Map Sheet 13
Swift Current Creek	Ca. Map Sheet 11
Moose Jaw River	Ca. Map Sheet 14
Wascana Creek	Ca. Map Sheet 15
Thunder Creek	Ca. Map Sheet 13
10656107	Ca. Map Sheet 15
Pipestone Creek	Ca. Map Sheet 18
11701107	Ca. Map Sheet 20
Pipestone Creek	Ca. Map Sheet 18
11948107	Ca. Map Sheet 19
Arrow River	Ca. Map Sheet 21
12233107	Ca. Map Sheet 21
Assiniboine River	Ca. Map Sheet 21
Boggy Creek	Ca. Map Sheet 23
12527107	Ca. Map Sheet 21
Little Saskatchewan River	Ca. Map Sheet 22
12589107	Ca. Map Sheet 21
Oak River	Ca. Map Sheet 22
Whitemud River	Ca. Map Sheet 23
13019107	Ca. Map Sheet 24
13199107	Ca. Map Sheet 24
12959107	Ca. Map Sheet 22
Assiniboine River	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
13416107	Ca. Map Sheet 24
13333107	Ca. Map Sheet 24
13577107	Ca. Map Sheet 25
13379107	Ca. Map Sheet 23
13826107	Ca. Map Sheet 25
Assiniboine River	Ca. Map Sheet 25
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
Boyne River	Ca. Map Sheet 27
14914107	Ca. Map Sheet 27
14990107	Ca. Map Sheet 27
15172107	Ca. Map Sheet 27
15266107	Ca. Map Sheet 27

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CANADIAN RIVERS & STREAMS (Cont'd)	
NAME	**MAP SHEET**
15321107	Ca. Map Sheet 27
15329107	Ca. Map Sheet 27
15606107	Ca. Map Sheet 28
15601107	Ca. Map Sheet 27
15776107	Ca. Map Sheet 28
15867107	Ca. Map Sheet 28
16006107	Ca. Map Sheet 28
16034107	Ca. Map Sheet 28

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FIGURE 6.6

DRAIN TILES

"Consideration needs to be given to the presence of drain tiles and how they could provide a hydraulic conduit for the migration of the product off the right of way."

SPREAD 3B DRAIN TILE LOCATIONS - NORTH OF 197TH STREET								
POINT	STATION	ANGLE	DESCRIPTION	DC FILE	TRACT NO.	MILE POST	LAT	LONG
307767	16743+49	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53200896	-97.89247984
307770	16744+14	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53183143	-97.89245705
307772	16744+67	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53168576	-97.89243408
307776	16745+93	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53134183	-97.89239009
307779	16746+57	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109B	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53116714	-97.89236812
356839	16748+83	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53055093	-97.89228272
356844	16749+73	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53030697	-97.89225127
356846	16750_36	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109	708 - DALIN V. FAST, ET UX	317 - 317.5	44.53013350	-97.89222979
307788	16750+94	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52997441	-97.89221202
307793	16752+40	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52957499	-97.89215925
307797	16753+60	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52924885	-97.89211328
307799	16754+23	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52907604	-97.89209397
307802	16754+83	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52891223	-97.89207042
307805	16755+50	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52872737	-97.89204441
307807	16756+05	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52857692	-97.89202495
307810	16756+65	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52841262	-97.89200039
307812	16757+27	85-90	PVC_CLAY-FLEX "RUBBER"	JR073109C	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52824298	-97.89197686
356861	16757+95	85-90	PVC_CLAY-FLEX "RUBBER"	LM081109A	708 - DALIN V. FAST, ET UX	317 - 317.5	44.52806164	-97.89193937
RANDOM LOCATION								
313489	18802+85	85-90	1" BLACK RUBBER HOSE	JR090209A	786 - THOMAS E. JOHNSON	356.5	43.99016912	-97.70254357

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FIGURE 6.7

REFERENCE WEBSITES

The following is a list of websites that can be used as reference material during an incident.

EPA Region 5 - Regional Contingency Plan **http://www.rrt5.org/plans.php**
EPA Region 6 - Regional Contingency Plan **http://www.epaosc.org/site/site_profile.aspx?site_id=5087**
EPA Region 7 - Regional Contingency Plan
http://www.rrt7.nrt.org/production/NRT/RRTHome.nsf/AllPages/rrt_vii-ricp.htm?OpenDocument
EPA Region 8 - Regional Contingency Plan
http://www.rrt8.nrt.org/production/NRT/RRTHome.nsf/Web+Pages/rrt_viii_ricp.htm
U.S. National Oil and Hazardous Substances Pollution Contingency Plan (NCP) **http://www.ecfr.gov/cgi-bin/text-idx?**
Canada - United States Joint Inland Pollution Contingency Plan - Annex II
http://www.epa.gov/oem/docs/chem/canusplain.pdf
CA National Environmental Emergencies Contingency Plan **http://www.ec.gc.ca/ee-ue/default.asp**
Greater St. Louis Sub-Area Plan **http://www.umrba.org/hazspills/greaterstlouisplan.pdf**

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APPENDIX A

RESPONSE EQUIPMENT / RESOURCES

A.1 Company Owned Response Equipment

A.2 Other Company Resources

A.3 Contract Resources

A.4 Cooperative/Mutual Aid Resources

A.5 Volunteers

A.6 Communications

Figure A.1 Company Owned Spill Response Equipment

Figure A.2 Response Resources

Figure A.3 USCG OSRO Classifications

Figure A.4 Coop Agreements/OSRO Contracts

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A.1 COMPANY OWNED RESPONSE EQUIPMENT

The Company owns and operates oil spill response equipment contained within response trailers staged throughout the pipeline system. This equipment is maintained according to manufacturer's recommendations by Company and/or contracted personnel. An equipment summary detailing locations, type and amount stored in the response trailers is listed in Figure A.1. The Company also has contracts in place with Oil Spill Removal Organizations and other clean-up contractors that are capable of responding to all discharges along the Pipeline. Figure A.2 lists the contracted Oil Spill Removal Organizations.

Equipment trailers are located at strategic points along the pipeline. The locations of each trailer is listed in the response zone annex. The equipment inventory for each trailer is listed in Figure A.1.

The Qualified Individual has the authority to activate other private contractors, experts, and consultants as the situation demands.

All Pipeline personnel who might be involved in an oil spill have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water and that dispersants can only be used with the approval of the Canadian Regional Environmental Emergency Team (REET) or US Regional Response Team, the interagency group composed of Federal and State agency representatives that coordinates oil spill response.

A.2 OTHER COMPANY RESOURCES

Additional Company spill response equipment and manpower resources are not available to supplement the response operation; however, third party contractors will be activated on an as needed basis.

A.3 CONTRACT RESOURCES

The resources will be secured from a Company approved contractor. Management will typically handle notification/implementation of these resources. Figure A.2 provides a quick reference to the Oil Spill Removal Organizations and details their response capability and estimated response times. **Telephone reference is provided in Figure 2.5.** *(Note: The Company will ensure that each OSRO has a comprehensive maintenance program and applicable training / drills programs in place at contract renewal.)*

A.4 COOPERATIVE/MUTUAL AID RESOURCES

The Company is a member of the following Oil Spill Cooperatives or mutual aid groups:

- Western Canadian Spill Services Ltd.
- Alberta - Area U and S Oil Spill Cooperatives
- Saskatchewan - Area 3, 6, and 4 & 5 Oil Spill Cooperatives

A.5 VOLUNTEERS

Volunteers will not be utilized by the Company for the response operations. In the U.S., all volunteers will be referred to the Federal Regional Response Team.

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A.6 COMMUNICATIONS

Effective and efficient communications systems are essential for emergency response at every level. The communications system will be utilized to gather information and current status reports as well as to provide coordination and direction to widely separated work groups involved in search, containment/diversion, repair, traffic control, public control or evacuation, and restoration.

The Company's overall Emergency Notification Chart (Figure 2.2) indicates individuals within the Company and governmental agencies who must be contacted in the event of an emergency.

Notification information for the Qualified Individuals, Alternate Qualified Individuals, emergency response contractors, and governmental agencies is located in Section 2.0 and the Response Zone Annexes.

Lines of communication between the Incident Commander, local personnel, and contractors are demonstrated in the organization charts provided in Figures 4.1 and 4.2. Communication of the overall spill response operation between the Company and the responsible government agencies will occur between the Incident Commander and the Federal On-Scene Coordinator.

Central Communications System

Prearranged communication channels are of the utmost importance in dealing with Company emergencies. The notification procedures and telephone contacts documented in Section 2.0 will be reviewed in accordance with the earlier documented updating procedures. The predetermined communications channels include the following:

- A list of emergency telephone numbers for internal management and emergency response personnel (Figures 2.2 and 2.5).
- A list of emergency telephone numbers for various external resources such as the Fire Departments, Public Officials and local agencies is provided in the Annexes.
- A list of emergency telephone numbers for contract response resources (Figure 2.5).

Communications Equipment

Field communications during a spill response will be handled via radios, telephones, cellular phones, fax machines, and computers, which will be maintained by Company personnel. In the event of a Worst Case Discharge, field communications will be enhanced with contract resources as the situation demands.

Communications Type

Voice communications may be conducted over the public telephone system or Company provided two-way radio equipment.

Radios - Hand-held and vehicle-mounted radio sets are the most effective means of communication for the field response operation. The units are battery operated, multi-channeled, and have a typical range that will cover the area of the response operation. Additional radio sets and battery packs/charges will be necessary in the event of a prolonged response operation.

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Telephone (Conventional) - Conventional land line telephones are the most effective means of communication for regulatory and advisory notifications during a spill response operation. Additional telephone lines can be installed in the event of a prolonged response operation. All major facilities have access to standard telephone service.

Cellular - Cellular telephones are useful during spill events giving the user the ability to travel while using the communication system.

FAX Machines - FAX machines allow for a rapid transfer of information/documentation such as status reports/updates, written notifications, and purchase orders. All administrative office have facsimile machines.

Computers - Computers are commonly used in networks which allow access to various other locations and company personnel. Computers also speed the consolidation of information and preparation of a written report.

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FIGURE A.1

COMPANY OWNED RESPONSE EQUIPMENT

Click to view the file - Hardisty Trailer

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Hardisty 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #1

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equipment
1	20' Trailer/Model JT820TA2	1TRAIEN820	1	EA			
2	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
17	Tool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
21	30 Gal Drum w/Lid & Ring		1	EA			
22	16 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			

26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			
29	Incident Command GO BOX & Printer		1	EA			
[illegible]	Funnel		1	EA			
	letal Files		2	EA			
32	Pack of Large Zip ties		1	EA			
33	Emergency air horn		1	EA			
34	Shovels		4	EA			
35	Eye wash bottle		1	EA			
36	Large Traffic Cones		10	EA			
37	6000 Watt diesel Generator		1	EA			
38	Trolley line kit		1	EA			
39	5 Gallon Gasoline jerry ca		1	EA			
40	5 Gallon Diesel jerry can		1	EA			
	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			
6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
	oom Trailer Support Equiptment Kit 2						
	Wheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Modifications to the Trailer						
1	Axel Upgrades to 5500lbs. Each (11,000 lbs.)						
2	Intereior wall moved to center of trailer						
3	Man door ramp installed from right side						
4	Non slip coating applied to front and rear ramps						
5	Racks for anchors installed						
6	Racks for Motor installed						
7	Shelving for tools and absorbents installed						
8	Hooks for Buoys and ropes installed						
9	Tie downs for large equipment installed						
10	5 Rope reels installed						
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
	horeline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			

7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
11	400' of 25' x 1" rope with end quick connectors on rope reel						
12	500' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
18	12' Zodiac		1	EA			
19	20hp Honda 4 Stroke for Zodiac		1	EA			
20	Gas tank for Zodiac		1	EA			
21	Bag of Zodiac parts, and repair kit		1	EA			
	Secondary Containment						
1	Portable Fold Down berms, various sizes, in individual sizes, orange, marked bags						
2	Skimmer station		1	EA			
3	Fuel Station		1	EA			
4	Generator Statotion		1	EA			
5	Pump Station		1	EA			

Regina 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #2

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equpment
1	20' Trailer/Model JT820TA2 (Serial# 40LAB20279P156448)	1TRAIEN820	1	EA			
2	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved (Serial# TSDH11809248)	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count (Serial# D4090016)	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
17	Tool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
21	30 Gal Drum w/Lid & Ring		1	EA			
22	16 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			
26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			

	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			

6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
	Boom Trailer Support Equiptment Kit 2						
	Vheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
3	Shoreline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			
7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
11	400' of 25' x 1" rope with end quick connectors on rope reel						
12	500' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
	Modifications to the Trailer						
	ıxel Upgrades to 7000lds. Each (14,000lbs.)						
2	Interior wall movable to 8', 10', or 12' from rear door						
3	48" door with ramp installed front left side						
4	Full width rear double door with ramp						
5	Non slip coating applied to front and rear ramps						
6	2 x 7' x 10' aluminium containment troughs designed as the cover 500 Gallons capacity each.						

KEYSTONE EQUIPMENT TRAILER	INVENTORY

Trailer 2 VIN: 5N6200S3691025773

Original Checklist — **Winnipeg**

	Equipment Trailer and Component Description	Qty per Trailer	Unit	Removed	Returned	Condition
1	34' 18,000 GVW Trailer, with 3 axles	1	ea			
2	28' x 8' Cargo Area plus 7' x 8' Office	1	ea			
3	16" Wheels and Tires TA4 235/80 R16	6	ea			
	lectric Brake System	1	ea			
	nterchangeable Hitch (Ball & Pintle)	1	ea			
6	7000lb Drop Leg Jack	1	ea			
7	Mounteed Wheel and Spare Tire	1	ea			
8	Chains, Lug Wrench, 3 Ton Jack	1	ea			
9	Heavy Duty Door Ramp	1	ea			
10	36" Side Door with lock and keys	1	ea			
11	Stone Guard across front of trailer	4	ea			
12	Stabilizer Scissor Jacks on corners	1	ea			
13	Ladder Racks installed on Roof	1	ea			
14	Roof Racks for 14' Boat and 500' Boom	2	ea			
15	Interior Roof Vents	5	ea			
16	Fluorescent Lighting in Office and Cargo area	4	ea			
17	12V Lights in Office and Cargo area	9	ea			
18	Electrical Outlets in Office and Cargo area	1	ea			
19	50amp Service Panel with 240V cord w/120 Adapter	1	ea			
20	Generator/Shore Power Interface	2	ea			
21	500W Quartz Exterior Lights	3	ea			
22	Heaters/Thermoistats Office (2) Cargo Area (1)	1	ea			
23	Exterior GFI Outlet	1	ea			
24	36" x 15" Office Window	1	ea			
25	Office Door with Window	1	ea			
26	Wrap-Around Desk	1	ea			
27	Base and Upper Storage Cabinets in Office	1	ea			
28	3 Drawer File Cabinet	1	ea			
29	Vinyl Flooring in Office	1	ea			
30	25' Awning on curb side of trailer	1	ea			
31	D-Rings installed C/L of Floor	6	ea			
32	Alarm System with backup battery	1	ea			
33	Exterior LED Lighting	1	ea			

	nunications Equipment Descriptions	Qty per Trailer	Unit			
1	Vilson Dual Band Wireliee Amplifier #801245 Procom Dual Band Antenna 32ft. #301135 BOM/ Keystone - All wiring to office per requirements - All per Keystone revised specification					
2	Midland 2-Way Radios. 22 Chanel FRS/.GMRS with 30 mile range and J1S4 Water-Resistant					
3	AA Batteries 48 Pack					
4	Iridium 9505a Portable Docking Unit with Antena					
5	Scanner, copier, printr all-in-one unit HP Deskjet F4280					

	Containment Equipment	Qty per Trailer	Unit			
1	Simplex Section Boom 6" x 6" x 33' mounted on Equipment Trailer roof rack (495 ft)	15	ea			
2	Bundle Strapsw Fitted 3 per Section	45	ea			
3	Spare Bundle Straps	44	ea			
4	Tow bridles with Bullet Floats	6	ea			
5	Water Barrier 28" x 50ft	1	ea			
6	Add Release Holes / Velcro to Barrier	1	set			
7	PVC Pipe, 3" x 10-ft, Sch-40 for Megasecur Dam	4	ea			
8	Fitted cover for boom rack (TransCanada Blue)	1	ea			
9	Containment Boom Accessory Kit Containing:					
	Storage Container	1	ea			
	Ring Buoy Throw Bag with Line	5	ea			
	Steel Stakes, Approx 1" x 3-ft.	10	ea			
	Boom Connector Pins, Spare	4	ea			
	Duckbill Anchors	10	ea			
	Duckbill Driver (Stored outside of Boom AccKit)	1	ea			
	OP Locking Standard "D" Carabineers	15	ea			
	Petzel Ascenders (Right)	5	ea			
	Petzel Acsenders (Left)	5	ea			
	Pulleys, Climbing/Puller, Rope, 4.5" x 2.5", for 1/2", poly line. CMI RC104	5	ea			
	ledge Hammer 8-lb. 9 (Stored outside of Boom kit)	2	ea			
	~~00' Pier Brindle per Seacor Spec~~	1	ea			

	Recovery Equipment Description	Qty per Trailer	Unit			
	Elastec Skimmer System	1	ea			
	Suction Hose, 3" x 20 ft - 3 x 20' sections for a total of 60', w/Camlok Faittings	1	ea			
1	Power Pack D4 with wheels	1	ea			

	Skimmer Unit 118 Hyd with Grooved Dums	1	ea			
	Hydraulic Pressure Hose 1/2" x 50-ft with Quick Disconnect Couplings	1	ea			
	Hydraulic Return Hose 3/4" x 50' w/o Return Tee	1	ea			
2	Spare Filters	4	ea			
3	Anchor Brides with Alpine hooks	5	ea			
4	~~24 lb Anchor Systems~~	5	ea			
5	~~40 lb Anchor Systems~~	4	ea			
NOTE:	anchor with safety wired galv. Shackle 8ft / 2.43m x 3/8" (10mm) galvanize steel chain lower rode. 2 x 50 ft / 5/8" (16mm) polypropylene rope upper rode with thimbles. Buoy - standard 15" / 38 cm inflatable - 6 ft. / 1.82 m x 5/.8" / 16mm polypropylene painter rope with thimble and					
6	1" Rigid Manta Ray Skimmer head with 3" female cardlock	1	ea			
7	3" female to 3" female aluminum coupling adapter	1	ea			
8	3" Diaphragm Pump with camlocks and wheels	2	ea			
9	Spare diaphragm and valve kit for pumps	2	ea			
10	Hardware Kit for Diaphragm Pumps	2	ea			
11	Flapper Valve	4	ea			
12	Fuel Filter	2	ea			
13	Oil Strainer	2	ea			
14	3" x 20' Oil Res Suction Hose with camlock	1	ea			
15	2 set 3" x 25' Oil Res/Lay Flat with camlock	1	ea			
16	hose pkg. -2 x 25ft discharge & 1x20 suction, oil resistant with plugs/caps, **(2ea) Hose floats**	1	ea			
17	HW Meltblown Pads, 19 x 15 100 Sheets per Bale	10	bales			
18	Socknet Booms, 5" x 10' 4 per Bale	10	bales			
19	Trash Bags, 38" x 65", 50/box	5	bx			
20	Drip Pan, 24" x 24" for 18" Absorbant Pads	2	ea			
21	Oily Debris Bags 36" x 60" x 6 mil (50 ea/bx)	1	bx			
20	7 x Can. Coast Guard approved Mustang Survival MCV 10, "Life Jackets"	7	ea			
21	10 x 10' extendible blue and white reflective cone rails	10	ea			
22	10 x battery operated, white flashing LCD strobe cone lights C/W cone inserts	10	ea			

Storage Equpment Description		**Qty per Trailer**	**Unit**			
1	Tank, Canflex, 2000 Gallon Standard Accessories (Per Tank) (2 ea) 3-inch Anodized Alumninum Fittings (5 ea) D-Ring Anchor Points (5 ea) Handles (2 ea) 3-inch Poly Ball Valves (1 ea tank cover) (1 ea) ground sheet Cover Tie Downs	1	ea			
2	~~Tank, Canflex~~, 500 gallon Open Top Tank Standard Accessories (Per Tank): (2 ea) 3-inch Anodized Aluminum Fittings (5 ea) D-Ring Anchor Points (5 ea) Handles (2 ea) 3-inch Poly Ball Valves (1 ea tank cover) (1 ea) ground sheet Cover Tie Downs	1	ea			

Personal Protection Equipment (PPE) Description		**Qty per Trailer**	**Unit**			
1	Safety Goggles	12	ea			
2	Ear Pulgs 100/ctn	1	ctn			
3	Hard Hats with Chin Straps White	12	ea			
4	Hard Hat Chin Straps	12	ea			
5	Hard had liners	12	ea			
6	Safety Glasses, Visitor-Clear	12	ea			
7	Insect Repellent	2	ea			
8	Safety Glasses / work (clear)	12	ea			
9	Organic Vapor Respirators Medium 5JG98	6	ea			
10	Organic Vapor Respirators Large 5JG98	6	ea			
11	Organic Vapor cartridges (2/ctn)	6	ea			
12	Eye Rinse Solution, 8-oz ea	4	btl			
13	Disposal Repirators Dust Large (20/pkg)	1	pkg			
14	Disposal Repirators Dust Med Dust (20/pkg)	1	pkg			
15	Polar Gloves, Winter Foam Lined, LG	6	pr			
16	Polar Gloves, Winter Foam Lined, XL	6	pr			
17	Nitrile Gloves (100 pr/ctn) Size L	1	ctn			
18	Nitrile Gloves (100 pr/ctn) Size XL	1	ctn			
19	Gloves, Cotton	12	pr			
20	Leather gloves	6	pr			
21	Vinyl 5 mil Gloves, Un-Powered Large (100 ea/box)	1	bx			
22	Tyvek - Disp. Coveralls Size L, Yellow (12 ea/ctn)	2	ctn			

23	Tyvek - Disp. Coveralls Size XL, Yellow (12 ea/ctn)	2	ctn			
24	Tyvek - Disp. Coveralls Size 2X, Yellow (12 ea/ctn)	2	ctn			
25	Latex Over Boot Covers	20	ea			
26						
27	Personal Flotation Device USG Type III Size M	2	ea			
28	Personal Flotation Device USG Type III Size L	4	ea			
29	Personal Flotation Device USG Type III Size XL	4	ea			
	ersonal Flotation Device USG Type III Size XXL	2	ea			
	lip Boots, Assorted, Size 8	1	ea			
32	Hip Boots, Assorted, Size 9	1	ea			
33	Hip Boots, Assorted, Size 10	2	ea			
34	Hip Boots, Assorted, Size 11	2	ea			
35	Hip Boots, Assorted, Size 12	1	ea			
36	Hip Boots, Assorted, Size 13	1	ea			
37	Chaps for Chain saw Large	1	pr			
38	Chaps for Chain Saw Extra Large	1	pr			
39	Ice Sandles with Metal Screws (Mens 7-9)	1	pr			
40	Ice Sandles with Metal Screws (Mens 10-12)	6	pr			
41	Ice Sandles with Metal Screws (Mens 13-15)	1	pr			
42	Rubber Gloves, Insulated, Hi-Viz, Orange	10	pr			
43	Goggles, Snow Machine	2	ea			
44	Face Shield Frame, Clear fits on Hard Hats	2	ea			
45	Visor/Face Shield	4	ea			
46	First Aid Kit, Large	1	ea			
47	Yellow Barricade Flagging, CAUTION, 1000-ft. Roll	1	rl			
48	Flaggin Tape, Orange 150-ft Roll	2	rl			
49	Traffic cones - orange	6	ea			
50	Wheel Chocks	4	ea			
51	Fire Extinguisher - Dry Chemical 10 lb	2	ea			
52	Wall Mount Bracket for Fire Extinguisher	2	ea			
53	Rain Jackets Size L	3	ea			
54	Rain Jackets Size XL	3	ea			
55	Rain Jackets Size XXL	1	ea			
56	Rain Jackets/Bibs Size L	3	ea			
57	Rain Jackets/Bibs Size XL	3	ea			
58	Rain Jackets/Bibs Size XXL	1	ea			
59	Safety Harnesses, Full Body (XL-LG)	2	ea			
60	Safety Vaests Universal Size	6	ea			

	nal Decontamination Equipment Description	**Qty per Trailer**	**Unit**			
1	2 Compartment Decon Pool 8' x 10' x 8"	1	ea			
2	Decon Pool Carrying Bag	1	ea			
3	Storage Container	1	ea			
4	Barricade, Eaasel W/O Barricade Light	1	ea			
5	PVC Ground Cloth/Liner, approx. 6-ft x 18-ft.	1	ea			
6	Wash Brushes, Long Handle	2	ea			
7	1-gallon Galvanized Bucket	3	ea			
8	Degreaser, Simple Green, 1 gal.	1	ea			
9	Protective Hand Lotion, minimum of 16-0z	2	ea			
10	Splash proof goggles	6	ea			
11	Pressurized Spray Can-water, 2 gallon, w/42"Hose	1	ea			
12	Duct Tape, 2" x 60 yd	5	ea			

Support Equipment Description		**Qty per Trailer**	**Unit**			
	Diesel Generator 6KW	1	ea			
	Wheel Kit	1	ea			
1	Spare Fuel Filter	2	ea			
	Recoil Assembly	1	ea			
	Spare Keys	1	ea			
	Oil Strainer	1	ea			
2	50' Generator Cord	1	ea			
	Stihl Chainsaw 36" with Bar Guard	1	ea			
	Spare Bar	1	ea			
	Ice Chain	2	ea			
3	Wood Chain	1	ea			
	Bar Oil	1	ea			
	Spare Spark Plug	1	ea			
	Chain Sharpening File	1	ea			
4	Gas Brush Cutter-Line Trimmer & Brush Blade	1	ea			
	' Gal Gas Can for 2 Cycle	2	ea			
	-Cycle Oil-40/1 (6 per Pkg)	1	ea			
5	Ice Thickness Kit-(1) / 1 Meter Auger Flights, (1) 1/2 Meter Extension (1) Drill Bit. Hand Brace, Cutting Bits,Drill Adapter, Thickness gauge to 4.5 ft and Carrying Case	1	ea			
	Ice Auger 8", 2 cyl, Gas, w/Spare Plug & Starter Rope	1	ea			
6	Ice tong - 300lb 16 1/2"	1	ea			

7	Ice Lifting Chain WLL 2000lbs @ 90 degrees + Bag	1	ea			
8	Toolbox, Yellow Plastic	2	ea			
9	Socket Set with Raqtchet, 3/8" or 1/2"	1	ea			
10	Hack Kit	1	ea			
11	Tie Wire	1	ea			
12	Cable Ties (Zip Ties) Pkg 50,24"	1	ea			
13	Aluminum Pipe Wrench, approx. 18" - 36"	1	ea			
14	Screwdriver Phillips, #1, 6"	1	ea			
15	Screwdriver Phillips, #2, 6"	1	ea			
16	Screwdriver Flat, 10"	1	ea			
17	Screwdriver Flat, 8"	1	ea			
18	Screwdriver Flat, 6"	1	ea			
19	Screwdriver Flat, Cabinet Tip, 10"	1	ea			
20	Adjustable Wrench, 10"	2	ea			
21	Measuring Tape, Fiberglass, 100-ft.	1	ea			
22	Measuring Tape, 25'	1	ea			
23	Cutters, Wire, Diagonal, 7"	1	ea			
24	File Flat, Mill Bastard	1	ea			
25	File Flat, Mill, Cut 6"	1	ea			
26	Pliers, Lineman, Flat Nose, 10"	1	ea			
27	Slip Joint Pliers, 8 1/8 in L	1	ea			
28	Vise Grip, Straight Jaws, 10"	1	ea			
29	Spark Plug Wrench for Auger	1	ea			
30	Claw Hammer	1	ea			
31	Rubber Mallet	1	ea			
32	Utility Knives	2	ea			
33	Flahlights /2D Cell	6	ea			
34	D cell batteries (6/ctn)	2	ea			
35	Cordless Drill with charger	1	ea			
36	Drill Bit Set	1	ea			
37	Screwdriver Bit Set	1	ea			
38	Steel drum	1	ea			
39	20 lb. sledge hammer	1	ea			
40	Machete	2	ea			
41	Pruner, long handle	1	ea			
42	Scoop Shovels, with drilled holes approx 1/2"	2	ea			
43	Ice Scrapers	2	ea			
44	Bolt cutter	1	ea			
45	Pry Bars, 3 ft	2	ea			
46	Steel rakes	2	ea			
47	Round point shovels	2	ea			
48	Snow Shovels	2	ea			
49	Squeegee with tapered ends	2	ea			
50	Post Driver	1	ea			
51	Steel 6' fence stakes	10	ea			
52	Screened pitchforks/debris	2	ea			
53	Steel stakes, 36" x 1"	6	ea			
54	6' Step Ladder	1	ea			
55	Hand truck with ratchet strap separate	1	ea			
56	Hand truck Extensions	1	ea			
57	Come Along, 1 ton	1	ea			
58	Ratchet Straps, 1 in	16	ea			
59	Ratchet Straps, 2 in	16	ea			
60	5 gallon diesel can-yellow	1	ea			
61	Safety gas can 5 gallon - red	1	ea			
62	Monkey Fist	2	ea			
63	Rags, box cotton	1	ea			
64	Portable light stands 110V with Halogens	2	ea			
65	50 ft. extension cords	2	ea			
66	600 ft spool, 1/4" Manila Line	1	ea			
67	600 ft spool, 1/4 Poly Line	1	ea			
68	600 ft spool, 1/2" Poly Line	1	ea			
69	600 ft spool 1/2" Blue Steel Poly Line	1	ea			
70	Padlocks for Doors, Spare Tire and Ramp	4	ea			
71	Padlock for Hitch	1	ea			
72	1000 watt Honda generator	1	ea			
73	30" life ring	1	ea			
74	48" rescue Can with tow strap	1	ea			
75	2x rescue throw floats c/w 50' of attached line	2	ea			
76	Two eye wash bottles c/w two bottles eye wash solution	2	ea			
77	1x 5.4 liter bottle of fast orange cleanser	1	ea			
78	1 flammable storage cabinet	1	ea			
79	1 48" wind sock c/w pole and accessories	1	ea			
80	Two aluminum seating benches	2	ea			
81	one 21' aluminum articulating ladder	1	ea			
82	1x box FR tyvek	1	box			
83	12x XL and 12x 2XL coveralls	24	ea			

84	6x 36" Traffic cones	6	ea			
85	1 environmental sample kit consisting of 2 coolers of sample bottles					
86	1 sand bag fill scoop c/w 100 sandbags	1	ea			
87	1 Fuel filling station pop up berm	1	ea			
88	1 generator pop up berm	1	ea			
89	1 Trolley line deployment kit C/W:	1	ea			
	1 x Trolley	1	ea			
	' x 4" pulley block	1	ea			
	2 x 12' 2500 lb, ratchet straps	2	ea			
	3 x 3" screw type chain connectors	3	ea			
	2 x 3" swivel safety snap hooks	2	ea			
	3 x 3" shackles	3	ea			
	2 x 15' lengths of 3/8" chain with 3" safety snap hooks each end	2	ea			

	Boat and Equipment Description	Qty per Trailer	Unit			
3	14 ft boat w/9.8 HP engine	1	ea			
5	Oars, Gas Tank, Hose	1	ea			
6	Towing Eyes (Shipped Loose/Not Installed)	1	ea			
7	Tow Bridle (Shipped Loose/Not Installed)	1	ea			

	Equipment Trailer Shelving and Container Description	Qty per Trailer	Unit			
1	4' x 2' Starter with 3 Shelves	1	ea			
2	4' x 3' Starter with 3 Shelves	1	ea			
3	6' x 2' Add-on with 3 Shelves	1	ea			
4	6' x 2' Shelving	1	ea			
5	6' x 3' Add-on with 3 Shelves	1	ea			
6	8' x 2' Add-on with 3 Shelves	1	ea			
7	8' x 3' Add-on with 3 Shelves	2	ea			
8	Shelf (No Decking) 2 x 6	2	ea			
9	Shelf (No Decking) 2 x 8	5.5	ea			
10	Shelf (No Decking) 3 x 4	3	ea			
11	Shelf (No Decking) 3 x 6	2	ea			
12	Stack Tote Bin.L31 1/2,W19 3/4.32 Gal	4	ea			
13	Stack Tote Bin.L39 1/2,W24 1/2.50 Gal	1	ea			
14	Container, Shipping	10	ea			
15	Container, Shipping	8	ea			
16	Container, Shipping	3	ea			

	ment Trailer Miscellaneous	Qty per Trailer	Unit			
	ROC Barrier and Refill in Equipment Trailer	1	ea			
2						
3	Dymo Printer 1/2", 3/4" and 1" Tape	0.25	ea			
4	Boom Trolley	1	ea			
5	Non-Skid Tape	1	ea			
6	D-Rings	2	ea			
7	L-Braces	12	ea			
8	1/4" Stainless Sheet Metal Screws 3/4"	1.5	ea			
9	1/4" Stainelss Sheet Metal Screws 1"	2	ea			
10	1/4" Stainless Sheet Metal Screws 1-1/2"	2	ea			
11	1/4-20 Pan Head Machine Screws 3/4"	0.25	ea			
12	1/4 20 Locknut, Tooth Washer	0.5	ea			
13	1/4" Flat Washer, 9/32ID X 5/8 OD	0.25	ea			
14	1/4" Fender Washer, 9/32ID x 1 1-1/4 OD	2	ea			
15	#3 Phillips Tip 3"	0.5	ea			
16	#3 Phillips Tip 6"	0.5	ea			
17	Drill Bit Set	0.25	ea			
18	Stretch Bungee Adjustable 6" - 40"	8	ea			
19	Bungee Assorted (15 pc)	2	ea			
20	Ratchet Tie Down 1000 lb 1-1/2" x 6', Pk 2	2	ea			
21	Ratchet Tie Down 1000 lb 1-1/2" x 15'	5	ea			
22	All Operaton/Maintenance Manuals and Warranty Cards shipped in bottom drawer in Office	1	set			

	SEACOR Pack List	Qty per Trailer	Unit			
1	Hand-held air horn 5.5 oz marine type	1	ea			
2	5.5 oz air horn refill	1	ea			
3	Cable ties, plastic zip ties 25/pack	2	ea			
4	Polypropylene rope 1/4"x 600	1	ea			
5	Wooden Stakes 2" x 2" x 24"	25	bdle			
	fallet #3	1	ea			
	Mylar Flash Tape 1/2" x 200-300 rolls	20	set			
8	Bird Hazing Assembly	1	ea			
9	Empty Propane gas tank, fiberglass #20	1	ea	Empty	Empty	Empty
10	Scare-eye Ballons, red-blk-yel mix	20	set			
11	Crescent Wrench 10-12"	1	ea			
12	HD Industrail Paper Towels, Roll	2	ea			

13	PPE-KIT, 4Person -Includes: Tyvek suits, Safety glasses, ear plugs	1	ea			
14	Multi-use Scary man, Inflatable scarecrow	1	ea			
15	Hand-Held In-Situ Start Kit	1	ea			
16	Black Half Tote w/Lid	1	ea			

	Signage and Marking	**Qty per Trailer**	**Unit**			
1	Heavy Duty Sign Posts	12	ea			
2	Box wing nuts, plates, and bolts for signs	1	ea			
3	Metal "No Smoking" signs	6	ea			
4	Metal " Smoking Area" signs	6	ea			
5	Metal "TransCanada" double sided signs	6	ea			
6	Metal "TransCanada Incident/ Exercise" double sided signs	6	ea			
7	Metal "Hot Zone" signs	4	ea			
8	Metal "Warm Zone" signs	4	ea			
9	Metal " Cold Zone" signs	4	ea			
10	Large tub Containing:	1	ea			
	Large triangular inflatable marker buoys in dry bags	4	ea			
	flashing 80 hour LED lights for buoys at night	12	ea			
As Part of this assembly;						
	Plastic "TransCanada Incident/ Exercise" double sided signs	12	ea			
	Anchors for marker buoys c/w 50" rope and attachment clips	4	ea			

	General Equiptment	**Qty per Trailer**	**Unit**			
1	95 Gallon overpack drums containing:	2	ea			
	Roll, 150'x36", oil only absorbent pad	1	ea			
	10'x3" oil only absorbent socks	8	ea			
	15"x15" oil only absorbent pillows	10	ea			
2	Large pylons	6	ea			
3	Power air blower for inflating buoys, boom, zodiac, etc.	1	ea			
4	1000 watt Honda portable gas powered generator	1	ea			
5	Rolls poly, 20'x100', 6mil	3	ea			
6	bales 2'x2' oil absorent pads (100 per bale)	12	ea			
7	bales 10'x5" oil absorbent boom (4perbale)	6	ea			
8	35 gallon plastic (overpack/waste/decon) drums c.w lids and ring closures	2	ea			
9	box 6 mil liners for waste drums	1	ea			
10	set large ice tongs	1	set			
11	ice thickness measuring device	1	ea			
12	windstock with 12' pole (mount on side of trailer at top left of ladder)	1	ea			
13	rolls 50' snow fleece	2	ea			
14	roll 50' chicken wire	2	ea			
15	48" aluminum fold down benches	2	ea			
16	16' articulating ladder	1	ea			
17	sand bag scoops c/w 100 sandbags	2	ea			
18	flammable liquids cabinet	1	ea			

	Water Safety	**Qty per Trailer**	**Unit**			
1	40" life saving throw ring	1	ea			
2	36" life saving, life guard can	1	ea			
3	rope bags with 100"rope (tag lines)	4	ea			
4	throw balls with self deploying rope	2	ea			
5	12" pool reach	1	ea			

	Secondary Containment	**Qty per Trailer**	**Unit**			
1	Portable fold down berms, various sizes, in individual, orange, marked bags;					
	skimmer station	1	ea			
	fuel station	2	ea			
	generator station	1	ea			
	pump station	2	ea			

	Initial Environmental sampling kit	**Qty per Trailer**	**Unit**			
1	Large cooler of sampling containers	1	ea			
2	small cooler of sampling containers	1	ea			
3	box of extra sample vials	1	ea			

	Incident Command Equiptment	**Qty per Trailer**	**Unit**			
1	ICS role Kit box	1	ea			
2	ICS go box	1	ea			
3	6' Folding Tables	4	ea			
4	folding 4'x8' status board c/w hooks and clip boards	1	ea			
5	Incident Command Structure Board	1	ea			
6	easels	2	ea			
7	folding chairs	6	ea			
8	electrical surge protector	1	ea			

9	Personal Accountability tags (PAS) 25 BLACK for TC guests and VIP's, 75 RED for Contactors	1	set			

	Modifications to the Trailer	Qty per Trailer	Unit			
1	Continual Roof top, Fold don, Fall protection	1	ea			
2	New Rooftop rear Storage area (this is where the ladders are, PVC 6" pipe, and hose is now stored)	1	ea			
	Tarps cover the boom storage area, and ladder/hose storage area					
	Wind stock mount (at rear top left of ladder)					

Hardisty 20' Boom Trailer Inventory **INVENTORY**

Seacor Environmental Products Trailer #1

	Equiptment Trailer and Component Description	Item #	Quantity per Trailer	Unit	Removed	Returned	Condition of equipment
	`0' Trailer/Model JT820TA2	1TRAIEN820	1	EA			
	Simplex 6"x6"x100"	31100	10	EA			
3	Tow Bridles w/Bullet Floats	540030	4	EA			
4	Anchor Systems 40 lb	510001	4	EA			
5	Anchor Systems 24 lb	510001	10	EA			
6	118 Hydraulic Skimmer, Grooved	0SKIMUN340G	1	EA			
7	Power Pac w.Whhels & Speed count	0POWEYA507	1	EA			
8	Kit Hose Petro 3"x60'	0KIT-HO132	1	EA			
	Includes						
	Hose Discharge 3"x10'	4HOSEDI025	1	EA			
	Hose Discharge 3"x15'	4HOSEDI026	2	EA			
	Hose Discharge 3"x20'	4HOSEDI027	1	EA			
	Float House 3"	4FLOAH048	1	EA			
9	Hose, Return Hyd. 3/4"x 50'	4HOSERE012	1	EA			
10	Hose, Pressure Hyd. 1/2"x 50'	4HOSERPR008	1	EA			
11	Fence Post, U-Style		6	EA			
12	Single Head Tent Stakes		4	EA			
13	Fire Extinguisher, Mounted w/Brac		1	EA			
14	First Aid Kit		1	EA			
15	Package of Absorbent Pads		5	EA			
16	Package of Absorbent Boom 5"x1'		5	EA			
	`ool Box RE: Packing list on Tool						
	Includes						
	Hacksaw		1	EA			
	Screwdriver, #1 Phillips		1	EA			
	Screwdriver, #2 Phillips		1	EA			
	Screwdriver, #1/2"Slotted		1	EA			
	Screwdriver, #3/8" Slotted		1	EA			
	Screwdriver, #5/16" Slotted		1	EA			
	Screwdriver, #3/16 Cabinet		1	EA			
	Wrench, Adjustable		1	EA			
	Diagonal Cutter		1	EA			
	Pliers, Tongue/Groove		1	EA			
	Pliers, Slip Joint		1	EA			
	Pliers, Locking		1	EA			
	Utility Knife		2	EA			
	Measuring Tape		1	EA			
18	Totes RE: Packing list on Totes		2	EA			
19	500 Gal Open Top Tank		1	EA			
20	Diaghram Pump		1	EA			
	Adapter 3" Male	6225214848	2	EA			
	30 Gal Drum w/Lid & Ring		1	EA			
	.6 lb Hammer		1	EA			
23	8 lb Hammer		1	EA			
24	Load Lock w/4 Hoops		2	EA			
25	Safety Cones		2	EA			

26	Ratchet Straps		6	EA			
27	5 Gal Diesel Container		1	EA			
28	D-rings		12	EA			
29	Incident Command GO BOX & Printer		1	EA			
30	Funnel		1	EA			
31	Metal Files		2	EA			
32	Pack of Large Zip ties		1	EA			
33	Emergency air horn		1	EA			
34	Shovels		4	EA			
35	Eye wash bottle		1	EA			
36	Large Traffic Cones		10	EA			
37	6000 Watt diesel Generator		1	EA			
38	Trolley line kit		1	EA			
39	5 Gallon Gasoline jerry ca		1	EA			
40	5 Gallon Diesel jerry can		1	EA			
	Boom Trailer Support Equiptment Kit 1						
1	Pump Spare Parts Kit		1	EA			
2	Anchor Bridles w/alpine Hooks		10	EA			
3	Hand Pump		1	EA			
4	Coupler, Cam loc 3"		3	EA			
5	Plug, 3"		1	EA			
6	Wiper Kit		1	EA			
7	Safety Vest		4	EA			
8	Spool 1/4"x600' Rope		1	EA			
9	Spool1/2"x600' Rope		1	EA			
	Boom Trailer Support Equiptment Kit 2						
1	Wheel chock		4	EA			
2	Banjo Ball Valve/Poly 3"		1	EA			
3	Male Adapters, 3"		2	EA			
4	Nipple, 3"		3	EA			
4	Okit-SP048 Spare filter Kit		1	EA			
6	1/4"x1200' Twine		1	EA			
	Modifications to the Trailer						
1	Axel Upgrades to 5500lbs. Each (11,000 lbs.)						
2	Intereior wall moved to center of trailer						
3	Man door ramp installed from right side						
4	Non slip coating applied to front and rear ramps						
5	Racks for anchors installed						
6	Racks for Motor installed						
7	Shelving for tools and absorbents installed						
8	Hooks for Buoys and ropes installed						
9	Tie downs for large equipment installed						
10	5 Rope reels installed						
	Boom and Associated Equipment						
1	700' of new fast water boom						
2	Shoreline Straight Pin Anchors		5	EA			
3	Shoreline Auger Anchors		5	EA			
4	Shoreline Wing Anchors		5	EA			
5	Yellow Metal Buoys		3	EA			
6	Tow Bridles C/W floats		4	EA			

7	Paravane tow assemblies		2	EA			
8	Spare boom connectors		4	EA			
9	Hand line bridles with plastic spacer bars		15	EA			
10	Hand line bridles with metal spacer bars		5	EA			
	400' of 25' x 1" rope with end quick connectors on rope reel						
	00' of 50' x 1" rope with end quick connectors on rope reel						
13	1000' of 100' x 1" rope with end quick connectors on rope reel						
14	1000' of 200' x 1" rope with end quick connectors on rope reel						
15	600' of 300' x 1" rope with end quick connectors on rope reel						
16	50' Grey rope for rope reels		7	EA			
17	Hand cranks for rope reels		2	EA			
18	12' Zodiac		1	EA			
19	20hp Honda 4 Stroke for Zodiac		1	EA			
20	Gas tank for Zodiac		1	EA			
21	Bag of Zodiac parts, and repair kit		1	EA			
	Secondary Containment						
1	Portable Fold Down berms, various sizes, in individual sizes, orange, marked bags						
2	Skimmer station		1	EA			
3	Fuel Station		1	EA			
4	Generator Statotion		1	EA			
5	Pump Station		1	EA			

EQUIP TYPE	EQUIP ID	VIN / SER#	REGION	LOCATION	REGISTRATION	INSURANCE	TITLE NUMBER
ER TRAILER, 34'	ERT34-001			Yankton, SD			
DRUM SKIMMER	DS-34-001			Yankton, SD			
POWER PACK	PP-34-001			Yankton, SD			
PUMP, 3"	PU-34-001			Yankton, SD			
BOOM, RIVER 8"	BM8-34-001			Yankton, SD			
ER TRAILER, 34'	ERT34-002			St. Joseph, MO			
DRUM SKIMMER	DS-34-002			St. Joseph, MO			
POWER PACK	PP-34-002			St. Joseph, MO			
PUMP, 3"	PU-34-002			St. Joseph, MO			
BOOM, RIVER 8"	BM8-34-002			St. Joseph, MO			
ER TRAILER, 34'	ERT34-003			Middletown, MO			
DRUM SKIMMER	DS-34-003			Middletown, MO			
POWER PACK	PP-34-003			Middletown, MO			
PUMP, 3"	PU-34-003			Middletown, MO			
BOOM, RIVER 8"	BM8-34-003			Middletown, MO			
ER TRAILER, 20'	ERT20-001			Valley City, ND			
DRUM SKIMMER	DS-20-001			Valley City, ND			
POWER PACK	PP-20-001			Valley City, ND			
PUMP, 3"	PU-20-001			Valley City, ND			
BOOM, RIVER 8"	BM8-20-001			Valley City, ND			
ZODIAK	ERT20-001-ZK			Valley City, ND			
ER TRAILER, 20'	ERT20-002			Roxana, IL			
DRUM SKIMMER	DS-20-002			Roxana, IL			
POWER PACK	PP-20-002			Roxana, IL			
PUMP, 3"	PU-20-002			Roxana, IL			
BOOM, RIVER 8"	BM8-20-002			Roxana, IL			
ZODIAK	ERT20-002-ZK			Roxana, IL			
ER TRAILER, 20'	ERT20-003			Fairbury, NE			
DRUM SKIMMER	DS-20-003			Fairbury, NE			
POWER PACK	PP-20-003			Fairbury, NE			
PUMP, 3"	PU-20-003			Fairbury, NE			
BOOM, RIVER 8"	BM8-20-003			Fairbury, NE			
ZODIAK	ERT20-003-ZK			Fairbury, NE			
ER TRAILER, 20'	ERT20-004			Wichita, KS			
DRUM SKIMMER	DS-20-004			Wichita, KS			
POWER PACK	PP-20-004			Wichita, KS			
PUMP, 3"	PU-20-004			Wichita, KS			
BOOM, RIVER 8"	BM8-20-004			Wichita, KS			
ZODIAK	ERT20-004-ZK			Wichita, KS			
ER TRAILER, 20'	ERT20-005			Ponca City, OK			
DRUM SKIMMER	DS-20-005			Ponca City, OK			
POWER PACK	PP-20-005			Ponca City, OK			
PUMP, 3"	PU-20-005			Ponca City, OK			
BOOM, RIVER 8"	BM8-20-005			Ponca City, OK			
ZODIAK	ERT20-005-ZK			Ponca City, OK			
OPEN TRAILER, 20'	OT-001			Yankton, SD			
BOOM, RIVER 10"	BM10-OT-001			Yankton, SD			

OPEN TRAILER, 20'	OT-002			St. Joseph, MO			
BOOM, RIVER 10"	BM10-OT-002			St. Joseph, MO			
OPEN TRAILER, 20'	OT-003			Ponca City, OK			
BOOM, RIVER 10"	BM10-OT-003			Ponca City, OK			
BOAT TRAILER	TMUN-001			Yankton, SD			
OSRV - MUNSON	MUN-001			Yankton, SD			
BOAT TRAILER	TMUN-002			St. Joseph, MO			
OSRV - MUNSON	MUN-002			St. Joseph, MO			
BOAT TRAILER	TMUN-003			Tyler, TX			
OSRV - MUNSON	MUN-003			Tyler, TX			
BOAT TRAILER	TMUN-004			Tyler, TX			
OSRV - MUNSON	MUN-004			Tyler, TX			
BOAT TRAILER	TWB-001			Valley City, ND			
WORK BOAT, 20'	WB-001			Valley City, ND			
BOAT TRAILER	TWB-002			Yankton, SD			
WORK BOAT, 20'	WB-002			Yankton, SD			
BOAT TRAILER	TWB-003			Fairbury, NE			
WORK BOAT, 20'	WB-003			Fairbury, NE			
BOAT TRAILER	TWB-004			St. Joseph, MO			
WORK BOAT, 20'	WB-004			St. Joseph, MO			
BOAT TRAILER	TWB-005			Middletown, OH			
WORK BOAT, 20'	WB-005			Middletown, OH			
BOAT TRAILER	TWB-006			Roxana, IL			
WORK BOAT, 20'	WB-006			Roxana, IL			
BOAT TRAILER	TWB-007			Wichita, KS			
WORK BOAT, 20'	WB-007			Wichita, KS			
BOAT TRAILER	TWB-008			Ponca City, OK			
WORK BOAT, 20'	WB-008			Ponca City, OK			

Storage of equipment will be at Durant, OK - Tyler, TX – Liberty, TX – Nederland, TX

Each location will have the following kits.

- **Sandbag Kit**
  - 50 Sandbags
  - 5 Supersaks
  - 3 Spade Shovels
  - 2 Flat Shovels
  - 1 Pry Bar
  - 2 Sets Hip Waiters
  - 20 Rebar
  - 1 Large Sledgehammer
  - 1 Small Sledgehammer
  - 100' Poly Rope
  - 1 Safety Throw Line
  - 2 PFD's
- **Underflow Dam Kit** (Various size PVC based on local geography)
  - 10 6' Sections of PVC pipe
  - 5 PVC Elbows
  - 5 PVC Ball Valves
  - 5 Cargo Straps
  - Sawzall
  - 300' Poly Rope
  - 2 PFD's
- **Boom/Sorbent Kit**
  - 50' 6" Creek Boom
  - 100' Sausage Boom
  - 4 Bales of Sorbent Pads
  - 2 Bags of Snare
  - 200' Poly Rope
  - 2 Sets Hip Waiters
  - 1 Safety Throw Line
  - 1 Roll Sweep Boom
  - 100' Orange Fence
  - 2 PFD's
- **Culvert Blocking Kit**
  - Various size Plugs
  - 50 Rebar
  - Sawzall
  - 1 Large Sledgehammer
  - 1 Medium Sledghammer
  - 2 Sets Hip Waiters
  - 2 Safety Throw Line
  - 100' Poly Rope
  - 5 Sheets 4x8 Plywood (Stored at Shop)
  - 2 PFD's

Additional Sorbent Materials and assorted PPE will be stored at each location and available for response.
Information accurate as of 7/30/13

FIGURE A.2

RESPONSE RESOURCES

Zone : Hardisty Pump Station/ Regina Pump Station

COOPERATIVES
Western Canadian Spill Services Ltd.
Albert - Area U and S Oil Spill Cooperatives
Saskatchewan - Area 3 and 6 Oil Spill Cooperatives
National Response Corporation (OSRO, not a Cooperative)

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Zone : Regina Pump Station / Haskett Pump Station

COOPERATIVES
National Response Corporation (OSRO, not a Cooperative)
Western Canadian Spill Services Ltd.
Saskatchewan - Area 6 and 4 & 5 Oil Spill Cooperatives

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Zone : North Dakota, South Dakota, Nebraska

Area : North Dakota, South Dakota, Nebraska

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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Zone : Kansas, Missouri, Illinois

Area : Kansas, Missouri, Illinois

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore	X	X	X	X
		Near Shore	X	X	X	X
		Great Lakes				

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Zone : Cushing Extension

Area : Cushing Extension Area

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore				
		Near Shore	X	X	X	X
		Great Lakes	X	X	X	X

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Zone : Gulf Coast

Area : Gulf Coast

OSRO Name	Contract Number	Environment Type	Facility Classification Level			
			MM	W1	W2	W3
National Response Corporation	TBD	River/Canal	X	X	X	X
		Inland	X	X	X	X
		Open Ocean	X	X	X	X
		OffShore				
		Near Shore	X	X	X	X
		Great Lakes	X	X	X	X

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FIGURE A.3

USCG OSRO CLASSIFICATIONS

The USCG has classified OSROs according to their response capabilities, within each Captain of the Port (COTP) zone, for vessels and for facilities in four types of environments. Response capabilities are rated MM, W1, W2, or W3 as described below:

MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	Resource Quantity Guidelines	Maximum Facility Response Times	Maximum Vessel Response Times
Rivers/Canals			
MM	Protective Boom: 4,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 25,000*ft EDRC: 1,875 bbls TSC: 3,750 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC: 3,750 bbls TSC: 7,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC: 7,500 bbls TSC: 15,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 6,000*ft EDRC: 1,250 bbls TSC: 2,500 bbls	All Ports: 6 hours	All Ports: 12 hours
W1	Protective Boom: 30,000*ft EDRC: 6,250 bbls TSC: 12,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,000 bbls	All Ports: 36 hours	All Ports: 42 hours
W3	Protective Boom: 30,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	All Ports: 60 hours	All Ports: 66 hours

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Inland			
MM	Protective Boom: 6,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 25,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 25,000*ft EDRC: 50,500 bbls TSC: 100,500 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Great Lakes			
MM	Protective Boom: 8,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 30,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 12 hours Other Ports: 24 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 30,000*ft EDRC: 25,500 bbls TSC: 50,500 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 30,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours (for open ocean, plus travel time from shore)	High Volume Ports: 60 hours Other Ports: 72 hours (for open ocean, plus travel time from shore)

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MINIMUM EQUIPMENT REQUIREMENTS FOR OSRO CLASSIFICATIONS			
Classification	**Resource Quantity Guidelines**	**Maximum Facility Response Times**	**Maximum Vessel Response Times**
Offshore			
MM	Protective Boom: 6,000*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 15,000*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 24 hours Other Ports: 48 hours	High Volume Ports: 24 hours Other Ports: 48 hours
W2	Protective Boom: 15,000*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 15,000*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours
Open Ocean			
MM	Protective Boom: 0*ft EDRC: 1,200 bbls TSC: 2,400 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W1	Protective Boom: 0*ft EDRC: 12,500 bbls TSC: 25,500 bbls	High Volume Ports: 6 hours Other Ports: 12 hours	High Volume Ports: 12 hours Other Ports: 24 hours
W2	Protective Boom: 0*ft EDRC: 25,000 bbls TSC: 50,000 bbls	High Volume Ports: 30 hours Other Ports: 36 hours	High Volume Ports: 36 hours Other Ports: 48 hours
W3	Protective Boom: 0*ft EDRC: 50,000 bbls TSC: 100,000 bbls	High Volume Ports: 54 hours Other Ports: 60 hours	High Volume Ports: 60 hours Other Ports: 72 hours

1. Rivers/canals include bodies of water, including the Intracoastal Waterway and other bodies artificially created for navigation, confined within an inland area and having a project depth of 12 feet (3.66 meters).
2. EDRC stands for "effective daily recovery capacity," or the calculated recovery capacity of oil recovery devices determined by using a formula that takes into account limiting factors such as daylight, weather, sea state, and emulsified oil in the recovered material.
3. TSC stands for "temporary storage capacity," meaning sufficient storage capacity equal to twice the EDRC of an OSRO. Temporary storage may include inflatable bladders, rubber barges, certified barge capacity, or other temporary storage that can be utilized on scene at a spill response and which is designed and intended for the storage of flammable or combustible liquids. It does not include vessels or barges of opportunity for which no pre-arrangements have been made. Fixed shore-based storage capacity, ensured available by contract or other means, will be acceptable.

* In addition, 1,000 feet of containment boom plus 300 feet per skimming system.

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FIGURE A.4

AGREEMENTS/CONTRACTS

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SPILL RESPONSE CONTRACT CERTIFICATION

National Response Corporation (NRC) certifies that **TransCanada USA Operations Inc.** has "ensured, by contract or other approved means, the availability of private personnel and equipment necessary to respond, to the maximum extent practicable, to a worst case or medium case discharge" for the below named Facilities. NRC agrees that the Client has the right to name NRC and its resources, including those within its Independent Contractor Network (ICN) for Oil Pollution Act of 1990 (OPA) coverage for the below named Facilities. NRC has filed its Spill Response Plan Appendix with the U.S. Coast Guard, and that the Client is authorized to reference this Appendix in their Facility Response Plan. This Appendix presently covers all ports in the U.S. East, West, Inland Region, Gulf Coasts, Great Lakes and the U.S. Caribbean. NRC reserves the right to rescind this authorization in the event of termination of its contractual arrangements with the Facilities.

Entered Facilities & Pipeline Systems:

TransCanada Keystone Pipeline System

Acknowledged by: Date: **August 16, 2013**

National Response Corporation

President

MASTER SUPPLY AGREEMENT – FIELD SERVICES No. 11935

This Agreement for the provision of services is entered into this 1st day of April 2013 (**"Effective Date"**) between:

TransCanada USA Operations, Inc.
a Corporation formed under the laws of Delaware and having an office at 717 Texas Street, Houston, Texas 77002
(**"Company"**)

- and -

National Response Corporation,
a Corporation formed under the laws of Delaware and having an office at 3500 Sunrise Highway, Suite T103,
Great River, NY 11739
(**"Supplier"**).

1. REPRESENTATIVES

1.1 The Company's Representative is Michael O'Neill or such other individual or individuals as may be named by the Company from time to time in a Work Authorization or Change Order or otherwise upon notice to the Supplier. The Company's Representative shall have the authority to give any notices, approvals and directions that may be given by the Company pursuant to this Agreement.

1.2 The Supplier's Representative is Deborah Wick. The Supplier shall not change its Representative, except with the prior approval of the Company. The Supplier's Representative has the authority to bind the Supplier on all matters relating to the Work and this Agreement. A communication to or with the Supplier's Representative shall be deemed **to** be communications to or with the Supplier.

2. TERM

2.1 The term of this Agreement shall commence on April 1, 2013 and subject to adjustment as provided in this Agreement, shall terminate on April 1, 2014 (the "Term").

3. MASTER AGREEMENT

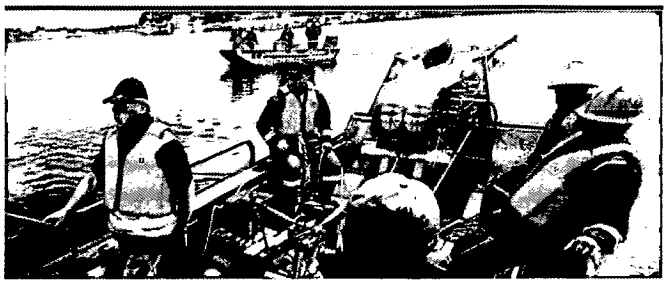
3.1 Contractor's Federal Tax ID number, applicable State Tax ID and State License number(s) are to be provided on each Release Order entered into by the Parties.

3.2 The Parties agree that any entity that is a Company may issue a Release Order to have Work performed for it by the Contractor under this Master Agreement, and that both Parties will be bound by the terms of this Master Agreement.

3.3 Where Work is performed by the Contractor for the Company, the Contractor will look solely to the entity named in the Release Order for the performance of those obligations of the Company that arise out of or are related to such Work and Release Order, including, without limitation, payment and indemnification obligations.

4. NOTICES

4.1 Notices and other communications pursuant to this Agreement shall be in writing and sent by first class, certified or registered mail (postage prepaid), facsimile, electronic (E-mail) or courier to the Representative at the address tor the Company or the Supplier noted below. Notices shall be deemed delivered when received (or when receipt is refused) or if sent by facsimile or courier, on the first business day following the date of transmission.



WESTERN CANADIAN SPILL SERVICES LTD.

24 HOUR EMERCENCY CONTACT 1-866-541-8888

MEMBERSHIP CHARTER

PURPOSE

The purpose of Western Canadian Spill Services Ltd. (WCSS) is to provide spill preparedness and response support services that meet regulatory requirements for licensees of wells and pipeline that are members in good standing of WCSS oil spill cooperatives in Alberta, NE British Columbia and Area 1 in Saskatchewan.

MEMBERSHIP

Membership is available to all upstream petroleum licensees in Alberta, NE British Columbia and in the Saskatchewan portion of the VR1 Oil Spill Cooperative for the following types of operations:

- Licensed wells - including gas wells that produce > 2m3 liquid hydrocarbon/month
- Licensed pipelines/km

MEMBERSHIP OBLIGATION

- WCSS members must pay their annual membership fees based on a flat fee, well counts and kilometres of licensed pipelines.
- WCSS members are required to sign an equipment use agreement prior to utilizing WCSS spill equipment for training purposes and/or spill response activities. In the event that the member is unable to sign the agreement prior to dispatching the equipment to the site; that member will be held responsible (same conditions as WCSS Equipment Use Agreement) for the equipment until such time as that member signs the equipment use agreement.

WCSS members should:

- Strive to be in compliance with regulatory requirements related to spill preparedness; including training requirements (i.e. attending annual Oil Spill Cooperative exercises).
- Conduct a spill risk assessment for their operations and implement adequate risk control measures where required.
- Maintain a copy of the WCSS Oil Spill Contingency Manual that is specific to each of the Oil Spill Cooperatives where that member operates; area updates are available on the WCSS website (www.wcss.ab.ca).
- Familiarize themselves with oil spill control points in surface water downstream from potential uncontrolled release sites.
- Identify local external spill response resources that may be required to supplement internal resources and those provided by WCSS.
- Participate in Oil Spill Cooperative activities where possible

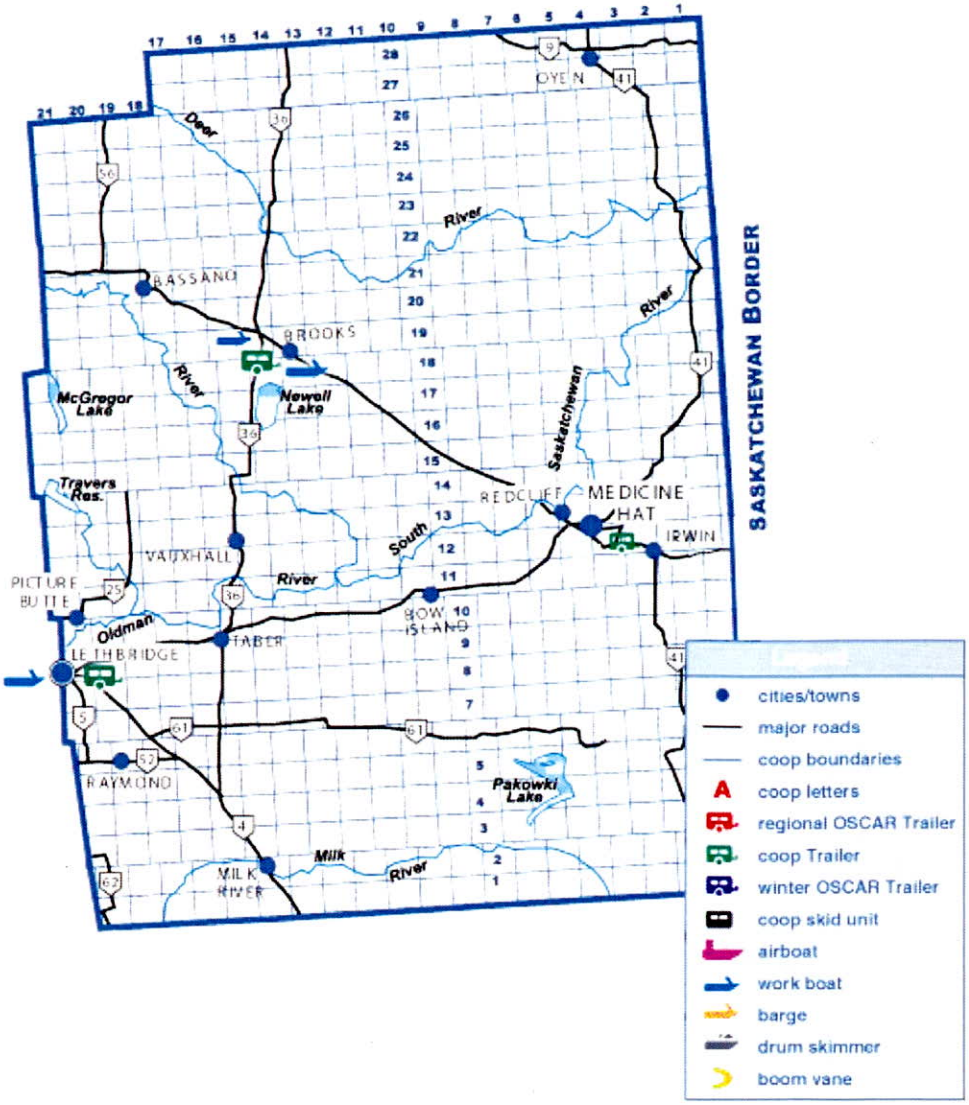
TransCanada (Annual) Membership Renewed March 3, 2013

Albert Area 1S Oil Spill Cooperative

The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 1S means area S of zone 1. The TransCanada Keystone Pipeline system traverses the north east corner of this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

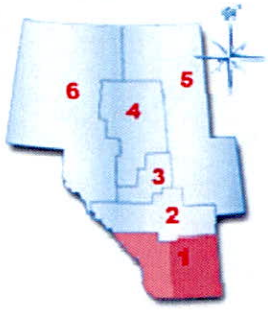
Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.



Zone 1 - Coop Area S

Regional Custodian



Adrian Schuurman
Mid-West Pumps (90) Ltd.
Ph: (403) 329-0427
24-HR:(403) 329-0427
Fax: (403) 327-4660

Ed Carpenter

Equipment Location
Lethbridge

Equipment Summary

- Mini-OSCAR (3/4-ton truck with 2 5/16" ball hitch)
- Muskrat (1/2-ton truck with 2" ball hitch)
- Marathon Workboat (1/2-tin with 2" ball hitch)

Coop Custodian

Equipment Location
NE 34-18-15 W4M Brooks, AB

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Summary

- 45' Trailer (Tractor Truck)
- Muskrat Workboat (1/2-ton with 2" ball hitch)

Directions
From Brooks, take Castle Road heading west towards Hwy 36 for 5 kms. Yard is located on south side of road, or Junction of Hwy 1 and Hwy 36. Head south of Hwy 36 until you reach Castle Road , yard is located on south side.

Mike Wenner
P&H Oilfield Maintenance
24-HR Ph: (403) 362-6551
Fax: (403) 362-0107
Cell: (403) 793-1420

Equipment Location
15-7-13-5-W4 Enerplus site North of Medicine Hat, AB

Equipment Summary

- C-Can Skid Unit (Bed Truck)

Albert Area 2U Oil Spill Cooperative

The Province of Alberta is divided into 6 oil spill cooperative zones. Each zone is then divided into areas. The designation 2U means area U of zone 2. The TransCanada Keystone Pipeline system begins and travels south through this area. The cooperative is run by a managing committee with custodians who are responsible for storage and maintenance of the response equipment.

Through the preceding agreement TransCanada Keystone Pipeline system will have the ability to use the cooperatives equipment, if available, during an incident.

The equipment list, contact information and maps are included in this document.

Zone 2 - Coop Area U

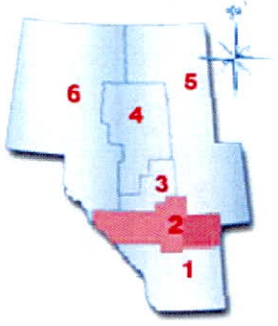
COOP Custodian

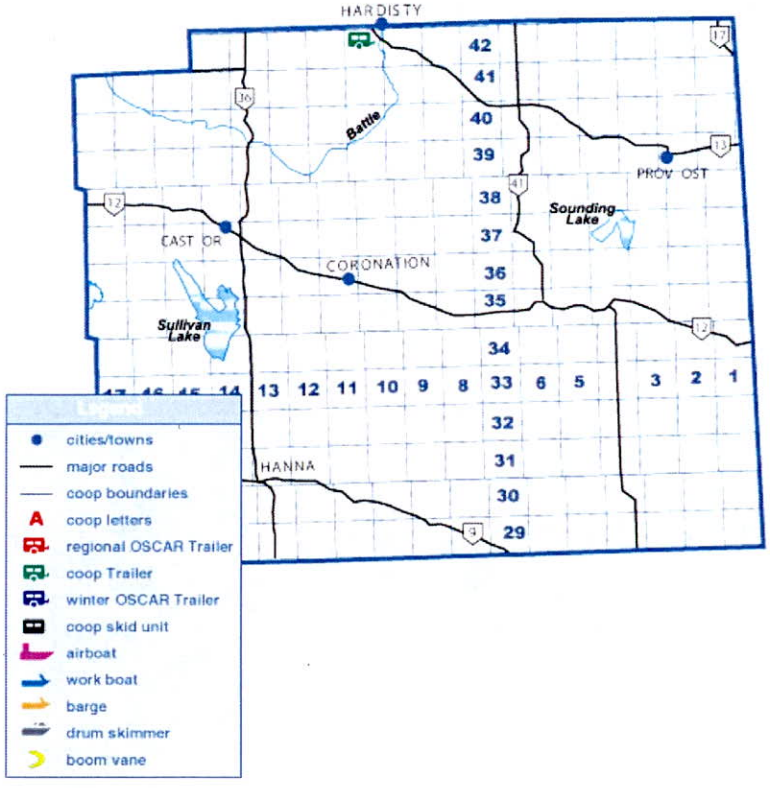
Greg Schmidt/Trevor Bitzer
Greg's Contracting Services Ltd.
Ph : (780) 888-3845
After Hours: Max Devey
(780) 209-7363

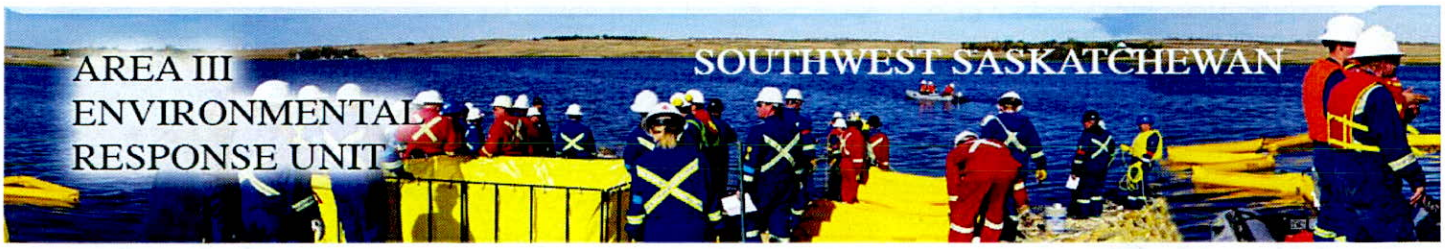
Equipment Location
Greg's Contracting Services Ltd. Box 29 4616A 47 Street
Hardisty, AB T0B 1V0

Equipment Summary

- OSCAR Trailer







AREA III
ENVIROMENTAL RESPONSE UNIT
CONSTITUTION

1.0 NAME:
This organization shall be known as the Area III Environmental Response Unit.

2.0 MANDATE:
2.1 To develop a system of mutual aid among the members for initial response to an unknown or known member's pipeline emergency, until the member company is in a position with its own resources to control the emergency.
2.2 To facilitate collective interaction and support between industry, government agencies, emergency services and the community in emergency preparedness.
2.3 To assure that the mutual aid system is functional through yearly emergency exercises and communication tests with the objective to improve any deficiencies.
2.4 To collectively communicate to the public the safety achievements and goals of the industry.

3.0 MEMBERSHIP:
3.1 Members will be admitted with the approval of the membership at large and payment of annual dues.
3.2 Resource Groups: Government agencies and emergency services may become members upon approval of the membership. These members have no voting privileges and may not hold any office position. There will be no membership dues charged.
3.3 Resignation: Any member may resign at any time by notifying the chairperson in writing.
3.4 Interested Parties: Certain parties may attend meetings upon approval of the executive.

Membership entitles use of the trailers and the equipment contained within for a period of 1 week following deployment. Equipment cleaning, replacement of supplies and us of the equipment for a period longer than 1 week will be billed at an additional cost.

The Area #3 ERU has one fully equipped trailer located in Gull Lake, Saskatchewan ready for emergency response to all companies who are members in good standing and located within the Area #3 ERU boundaries. A second trailer was recently purchased and the membership fees will be used in part to purchase additional equipment to supply the second trailer. Both trailers are stored at the **Karis Contracting Ltd. (306. 672.3333) compound located at 5th St. and Conrad Avenue in Gull Lake, Saskatchewan.**

TransCanada (Annual) Membership Renewed March 3, 2013

AREA 3 Emercency Response Unit

Trailer Location:

06-08-011-18w3 Bench Oil Battery – Husky Energy Inc.

Steering Committee:

Title	Name	Office	Phone
CHAIRMAN:	Gilbert Cadrain	Husky Energy Inc.	773-0234 741-8922
SECRETARY:	Gary Hammer	Plains Marketing	773-9381
TREASURER:	Garry Zinger	Focus Energy	741-6778
COMMITTEE:	Ron Dolter	S.I.R	778-8252
	Darcy Thoreson	Equipment Custodian	672-3723
	Dave Knipfel	Huskey Energy	741-2772
	Jeff Seffern	Talisman Energy Inc.	297-2601
	Rob Forester	Crescent Point	626-3557
	Tim Stevenson	Penn West	672-3875
	Blake Barsness	Acclaim Energy	

Boundry Map:

AREA III ENVIRONMENTAL RESPONSE TRAILER UNIT

The following equipment is stored in a 8' x 28' tandem axle trailer c/w pintle hitch.

EMERGENCY RESPONSE TELEPHONE NUMBERS

EMERGENCY 911

COMPANY	CONTACT	PHONE
Ambulance (non-emergency)	Swift Current	(306)773-2666
	Cabri	(306)587-2552
	Gull Lake	(306)672-4704
	Shaunavon	(306)297-2644
Air Ambulance		1-888-782-8247
	Saskatoon (Information)	(306)933-5255
Fire Department (non-emergency)	Swift Current	(306)778-2760
	Cabri	(306)587-2200
	Shaunavon (Kevin)	(306)297-2424 (306)297-3870 hor
	Gull Lake	(306)672-3200
Hospitals		
Cabri Health Centre	Cabri	(306)587-2623
Gull Lake Health Centre	Gull Lake	(306)672-4700
S. C. Union Hospitz	Swift Current	(306)778-9400
Shaunavon Union Hospital	Shaunavon	(306)297-2644
Royal Canadian Mounted Police	Swift Current	(306)778-5550
	Gull Lake	(306)672-3140
	Shaunavon	(306)297-5550
	Cabri	(306)587-2667
Saskatchewan Pow Corporation Elec. Swift Current	Emergencies 24 Hour	310-2220 1-888-757-6937
Gas		
Swift Current	24 Hour	(306)773-9098
Shaunavon	24 Hour	1-888-757-6937
Cabri	24 Hour	1-888-757-6937

Website Address for Spill Cooperatives:

www.area3eru.com
http://areatwo.sasktelhosting.net/
http://www.saskoilspill.com/
http://www.saskoilspill.com/main.htm
http://www.area6sask.com/

INITIAL SPILL REPONSE FLOW CHART

SPILL OBSERVED ? RESPONSE

1. ASSESS THE SPILL OCCURRENCE:

- ASSESS IMMEDIATE HAZARDS TO:
  - PERSONAL SAFETY
  - PUBLIC SAFETY
  - PROPERTY
  - ENVIRONMENTAL

2. ASSESS THE SPILL OCCURRENCE:

- ASSESS AND REPORT SOURCE
- ASSESS AND REPORT SPILL TYPE
  - OIL
  - SALT WATER
  - CHEMICAL
- ASSESS AND REPORT SPILL SIZE
- ASSESS SPILL AND REPORT FLOW DIRECTION AND FURTHER CONTAMINATION

3. NOTIFY IMMEDIATE SUPERVISOR:

- IDENTIFY LOCATION OF SPILL
- NOTE TIME SPILL DISCOVERED
- NOTE ADVERSE WEATHER CONDITIONS
  - WEATHER
  - TERRAIN
  - DOWNSTREAM WATER USERS
- POTENTIAL TO STOP FLOW FROM SOURCE
- POTENTIAL TO CONTAIN SPILL FLOW
- COMMUNICATE ON SITE RESPONSE ACTION PLAN

SPILL REPORTED ? IMMEDIATE SUPERVISOR IS NOW THE INTERIM ON-SCENE COMMANDER.

1. ACTIVATE OIL SPILL CONTINGENCY PLAN

- SET THE RESPONSE UNIT INTO MOTION
- ESTABLISH THE ON-SCENE COMMANDER

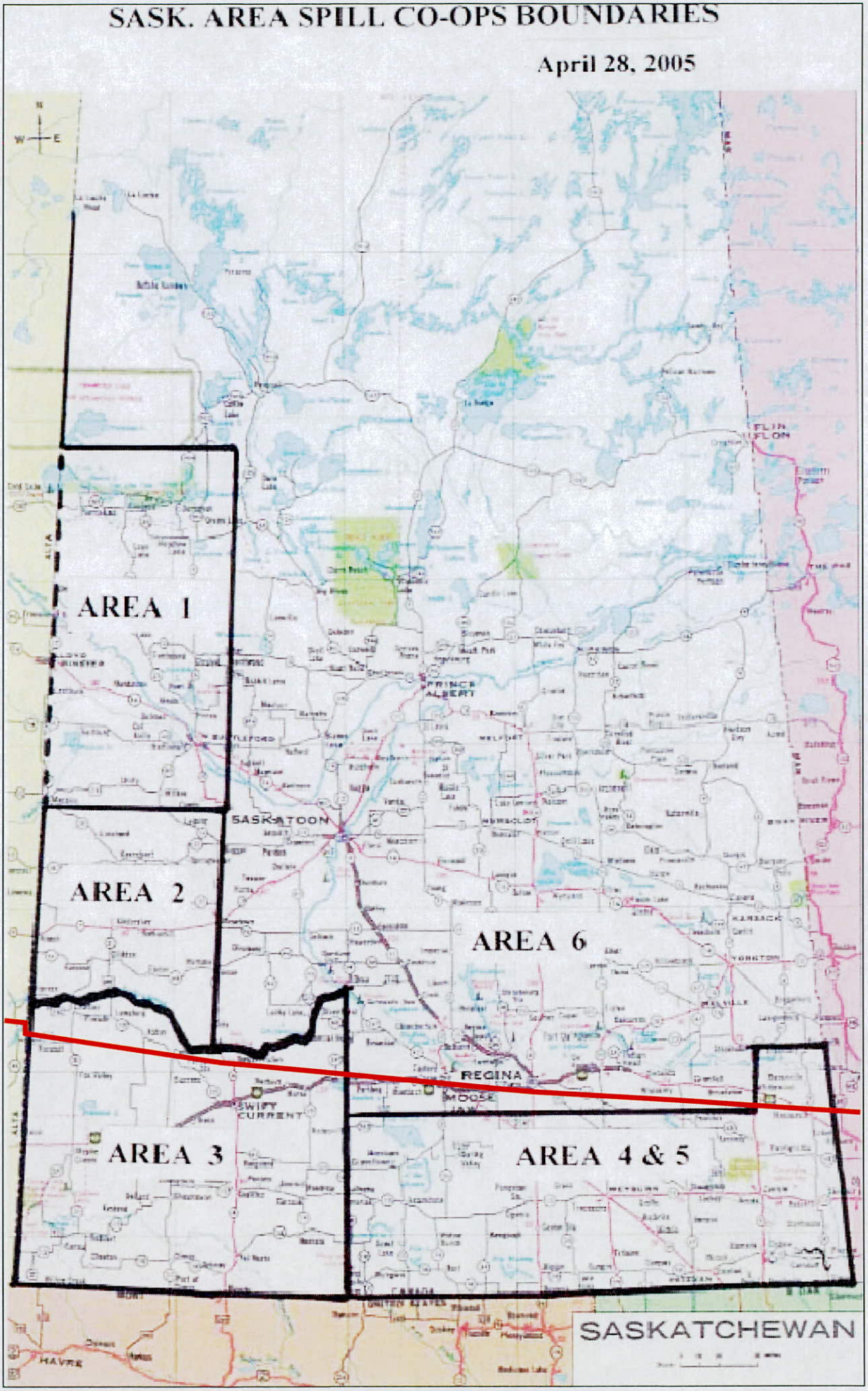
AREA III MOBILIZATION TO SPILL SITE ? ON-SCENE COMMANDER

1. ESTABLISH AND MAINTAIN COMPLETE CONTROL OF THE OPERATION:

- SET UP A COMMAND POST FOR OPERATIONS
- DISPATCH FIELD STAFF TO SPILL SITE TO VERIFY THE SPILL LOCATION, THE EXTENT OF THE SPILL AND PROCEED WITH SHUT-IN PROCEDURES
- MOBILIZE THE AREA III EQUIPMENT ?(COMBINATION #1, 2, 3, 4.)
- CALL KEY PERSONNEL AND REGULATORY AGENCIES
- ORGANIZE AND ACTIVATE CONTINGENCY PLAN AS PER AREA III SPILL CONTINGENCY MANUAL FOR CONTAINMENT AND CLEANUP OF SPILL.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



014906

Oil Spill Contingency Groups #4 & #5
Box 267
Estevan, Sask. S4A 2A3
Phone 306-634-6277
chairperson@sasktel.com
contact@saskoilspill.com
www.saskoilspill.com

The Oil Spill Contingency Groups #4 & #5 mandate is to provide instruction towards training and contingency planning to minimize risks and environmental damage in the event of an oil spill. The Groups have two trailers: trailer one is fully equipped and trailer two is equipped with booms and skimmers. The trailers are located in Weyburn, Saskatchewan, readily available for emergency response to all member companies located in Areas #4 and #5 (see area boundaries on home page of web site: www.saskoilspill.com). The Oil Spill Contingency Groups #4 & #5 provide a two-day training session in the Weyburn area and a two day training session in the Alameda area. Registration is free for the training seminars.

According to the Ministry of Energy and Resources of Saskatchewan, it is a standard condition of all facility licenses that the licensee of the facility be a member in good standing with the local spill response unit. If the licensee fails to uphold their membership, any facilities licensed to them can be suspended for noncompliance with the license conditions. As well, under Section 2.3 of the Saskatchewan Upstream Petroleum Industry Storage Standards, S-01, all operators must maintain their membership with the area spill response unit and participate in the annual spill training exercise(s).

OIL SPILL CONTINGENCY AREA 4 & 5 CALL OUT SCHEDULE

Below is a list of 7 committee members that have agreed to take calls on behalf of the Oil Contingency Group Area #4 and Area #5.

The first four members need to be called first. When you call these 4 numbers please call their cell phones and leave a message. If you do not get a call back in 15 minutes, please continue down the list.

It was decided that we would just include everyone's cell numbers in this list because it will be the quickest way to get a response.

1. Darren Delorme, Longview Oil Corporation- 861-8228 cell – Executive Member (Equipment questions)
2. Daryl McFadden, Dino Mite Consulting - 861-2320 cell – Custodian (Equipment questions)
3. Jonas Fenn, Matrix Solutions – 861-4532 cell – Executive Member (Equipment questions)
4. Laurel Mohl, COR Safety Solutions - 842-8151 – Chairperson (All general inquiries)

Please wait 15 minutes for a response from the first 4 members. Then continue.

5. Wayne Irwin, Plains Midstream Canada – 306 458-7315 (Equipment questions)
6. Chuck, Hignett, Enerplus Corporation – 306 861-3360 – Executive Member (Equipment questions)
7. Marious Erickson, Coast Resources – 306 452-7293 (Equipment questions)
8. Sonja Bush, 306 421-5241 – (Membership questions)

Once you have called all 7 numbers on the list and left a message there is no need to continue calling. Someone will get back to you.

Please give a call back number when you are leaving messages and ensure you document who called (phone number) with the inquiry.

Updated: 01/20/13

TransCanada (Annual) Membership Renewed Jun 5, 2013

EQUIPMENT LOCATION	DATE LAST REVISED: 08-Feb-26
OIL SPILL CONTINGENCY AREA 4&5 FIRST RESPONSE FOR EQUIPMENT/TRAILER AND LOCATION	

OIL SPILL FIRST RESPONSE

Phone: **(306) 634-6277** to notify the Oil Spill Contingency that you will need the trailer and to make arrangements to pick up the trailer.

EQUIPMENT LOCATION

Oil spill equipment is stored in a 32 foot trailer.

TRAILER LOCATION

Redigo Construction Company Limited
44 Hwy 39 East
Estevan, Saskatchewan

DRIVER QUALIFICATION AND VEHICLE RATING REQUIREMENTS

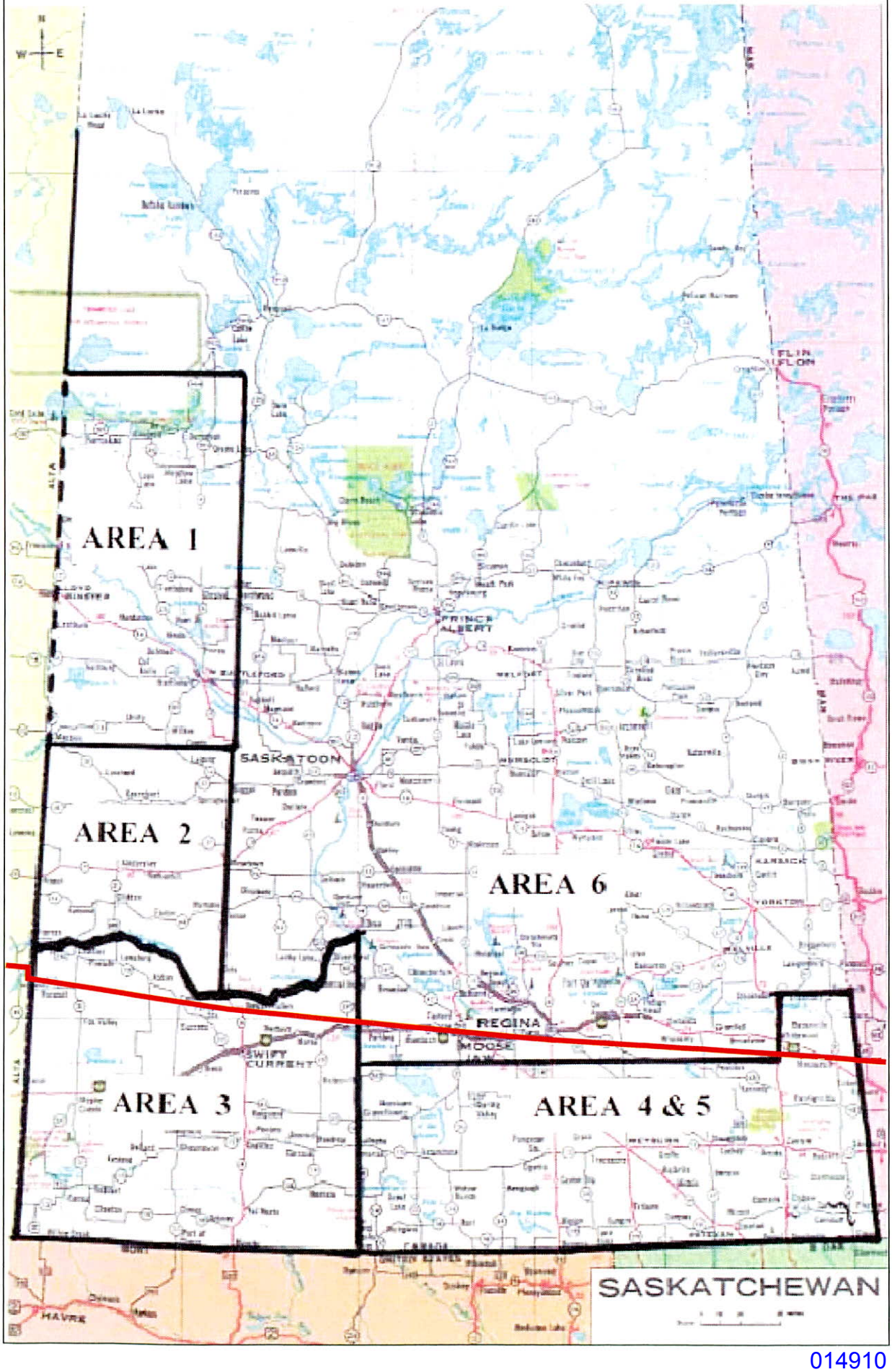
As the trailer is greater than 10,000 lb (actual weight approx. 13,000 lb), drivers must possess a minimum of a Class 1G license, as per SGI requirements. Also, vehicles must be rated accordingly. Below is a list of contractors with qualified drivers and vehicles. Any other contractors with qualified drivers and vehicles may also be used to mobilize and de-mobilize the trailer.

Murray Towing and Boosting Service, Estevan 306-637-2007
Carson Welding & Maintenance , Lampman -306-487-2281
Jerry Mainil Limited, Weyburn- 306-842-5412

The ball for the hitch is located just inside the side door.

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



CONSTITUTION

1.0 NAME:

This organization shall be known as the Area 6 Emergency Response Co-op.

2.0 MANDATE:

2.1 To develop a system of mutual aid among the members for initial response to an unknown or known member's pipeline emergency, until the member company is in a position with its own resources to control the emergency.

2.2 To facilitate collective interaction and support between industry, government agencies, emergency services and the community in emergency preparedness.

2.3 To assure that the mutual aid system is functional through yearly emergency exercises and communication tests with the objective to improve any deficiencies.

2.4 To collectively communicate to the public the safety achievements and goals of the industry.

3.0 MEMBERSHIP:

3.1 Members will be admitted with the approval of the membership at large and payment of annual dues.

3.2 Resource Groups: Government agencies and emergency services may become members upon approval of the membership. These members have no voting privileges and may not hold any office position. There will be no membership dues charged.

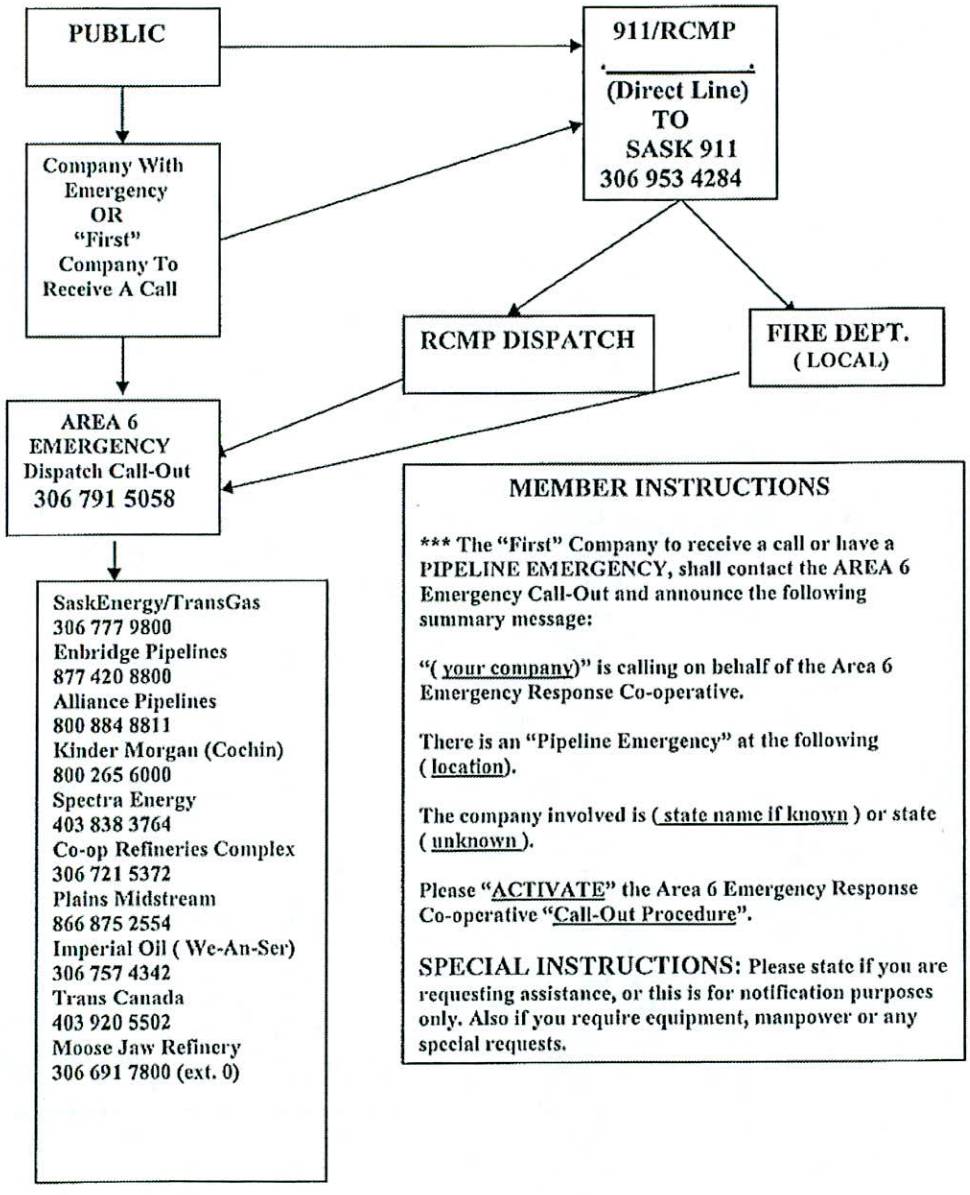
3.3 Resignation: Any member may resign at any time by notifying the chairperson in writing.

3.4 Interested Parties: Certain parties may attend meetings upon approval of the executive.

December 6, 2012

AREA 6 EMERGENCY RESPONSE CO-OPERATIVE

CALL-OUT CHART



MEMBER INSTRUCTIONS

*** The "First" Company to receive a call or have a PIPELINE EMERGENCY, shall contact the AREA 6 Emergency Call-Out and announce the following summary message:

"(your company)" is calling on behalf of the Area 6 Emergency Response Co-operative.

There is an "Pipeline Emergency" at the following (location).

The company involved is (state name if known) or state (unknown).

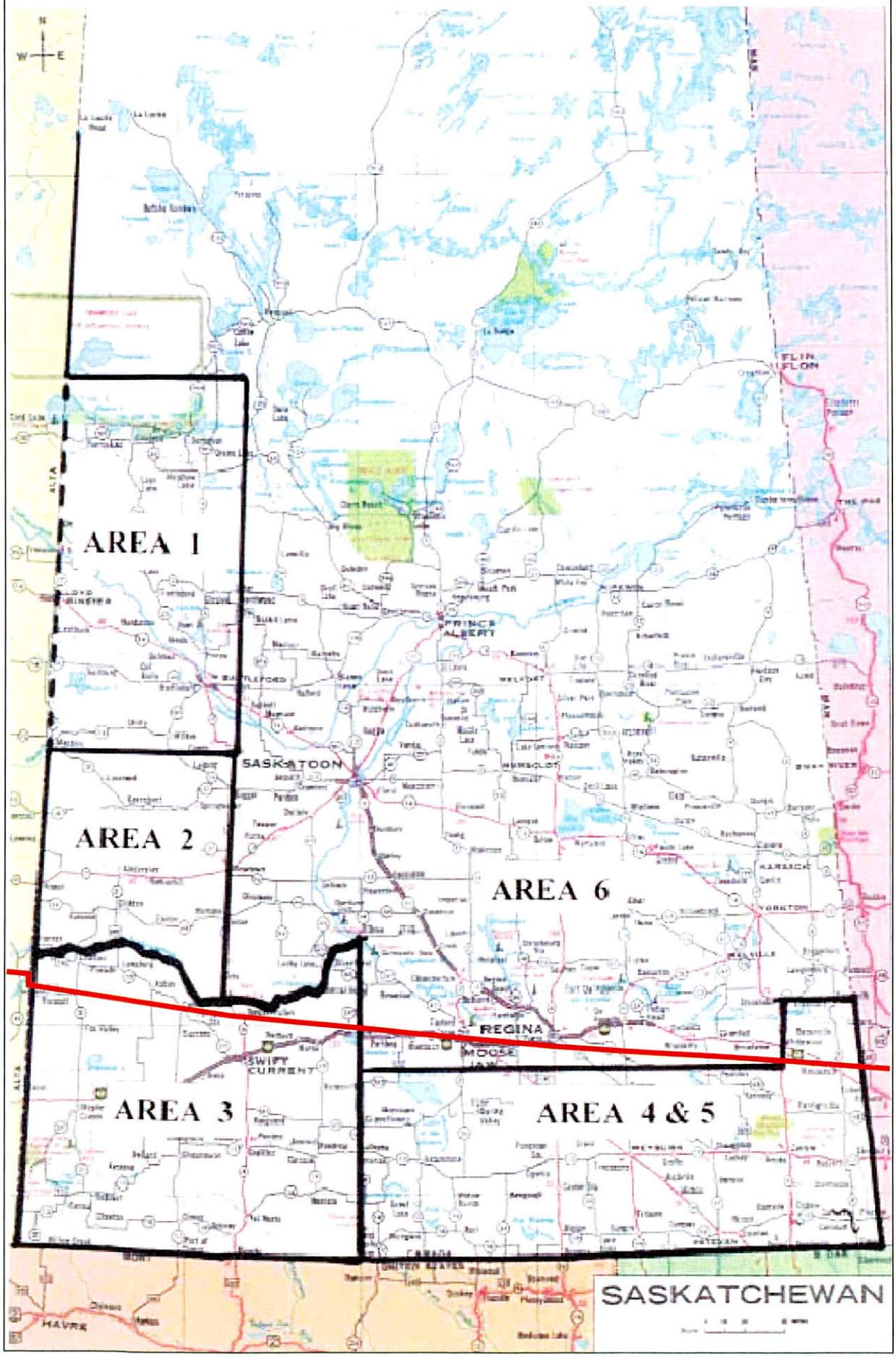
Please "ACTIVATE" the Area 6 Emergency Response Co-operative "Call-Out Procedure".

SPECIAL INSTRUCTIONS: Please state if you are requesting assistance, or this is for notification purposes only. Also if you require equipment, manpower or any special requests.

TransCanada (Annual) Membership Renewed Jan 7, 2013

SASK. AREA SPILL CO-OPS BOUNDARIES

April 28, 2005



Manitoba Producers Oil Spill Cooperative
Box 2302
Virden, Manitoba R0M 2C0

Contact Darwin White (MPOSC Chariperson / Emergency Contact#1)
1-204-748-2886 Home or 1-204-748-7029 Cell

Allan Gevin – Emergency Contact #2
1-204-748-3595 Home or 1-204-851-0441Cell

1. Membership

The mandate and purpose of the MPOSC is to provide oil spill response capability and training for all member companies in the event of an actual spill on water. The cooperative is not an oil spill clean-up service but supplies equipment for cured oil containment and recover under Manitoba conditions.

It is the responsibility of a member company to ensuer that a representative(s) within their company is trained and capable of responding to an event that requires the spill equipment.

The cooperative equipment is not suitable for clean-up of hazardous material or refined petroleum produces.

The current fees for membership in the MPOSC are as follows:

- Members in good standing with the cooperative will continue to pay #300.00 per year
- New members will pay $200.00 to join the cooperative
- Members who do not pay their membership fee by the due date will have their membership cancelled. To rejoin the cooperative, the $200.00 new membership fee would have to be paid plus the outstanding #300.00 for a total of $500.
- The maximum rejoining fee would be $500.00

In 1998 it was decided to invoice for 2 years at a time to make it more convenient for everyone involved.

2. Equipment

The MPOSC has acquired the majority of the equipment that it requires for clean-up of an oil spill on a moving body of water. There were some purchases and upgrades in 2011.

All equipment is available to members of the cooperative, equipment is also available to non members at the following costs:

1. $1,500 for the first day
2. $500.00 for each additional day
3. Replacement cost of consumables and damaged equipment
4. Costs to clean equipment if not returned in satisfactory condition
5. All equipment will be made available at the discretion of the Coop Chairperson.

The MPOSC equipment is contained in mobile trailers located at the Enbridge Pipelines (Sask) Inc. yard just off highway #1 in Virden.

TransCanada (2 Year) Membership Renewal Feb 16, 2013
(Membership fees for 2012 & 2013)

EUROWAY INDUSTRIAL SERVICE CO. LTD.
245 TRANSPORT ROAD, BOX 4, GROUP 582, RR5, WINNIPEG, MANITOBA, R2C 2Z2
TELEPHONE (204)661-0500 FAX = (204) 661-3933

September 24, 2010

Euroway is offering water way response service to the industry by membership.

Membership fees are $3000.00* per year for a minimum three year contract renewed annually and would include:

- Guaranteed no price increase with contract membership.
- No charge for water & land based equipment when required up to 20 days per incident. All other standard charges including tractor rental apply as per rate sheet. Equipment required after 21 days would be charged out at 50% of regular rental rate.
- Priority deployment.
- No charge participation in Euroway's annual spill exercise.

Water way response is also available for ***non member companies***; however the cost of equipment rental is based on the current rate at time of incident. In the event a member requires emergency response and spill equipment, our equipment will be relocated to the member's emergency. Should a *non member company* wish to participate in our annual spill exercise a fee of $100.00 would apply.

*A reduced fee may be available dependant on membership.

TransCanada (Annual) Membership Renewed Apr 1, 2013

TABLE A.5.1

METROPOLITAN AREAS WITH POPULATION GREATER THAN 50,000

STATE	AREA	2000 CENSUS	2010 CENSUS
Iowa	Cedar Rapids	201,853	257,940
Iowa	Davenport-Moline- Rock Island	376,019	379,690
Iowa	Des Moines	481,394	569,633
Iowa	Dubuque	92,384	93,653
Iowa	Iowa City	111,006	152,586
Iowa	Omaha-Council Bluffs	767,041	865,350
Iowa	Sioux City	143,053	143,577
Iowa	Waterloo-Cedar Falls	163,706	167,819
Kansas	Kansas City	1,836,038	2,035,334
Kansas	Lawrence	99,962	110,826
Kansas	Topeka	224,551	233,870
Kansas	Wichita	571,166	623,061
Missouri	Columbia	145,666	172,786
Missouri	Jefferson City	140,052	149,807
Missouri	Joplin	157,322	175,518
Missouri	Kansas City	1,836,038	2,035,334
Missouri	St. Joseph	122,336	127,329
Missouri	St. Louis	2,698,687	2,812,896
Missouri	Springfield	368,374	436,712
Nebraska	Lincoln	266,787	302,157
Nebraska	Omaha-Council Bluffs	767,041	865,350
Nebraska	Sioux City	143,053	143,577

FIGURE A.5.1

POPULATION CHANGE - IOWA

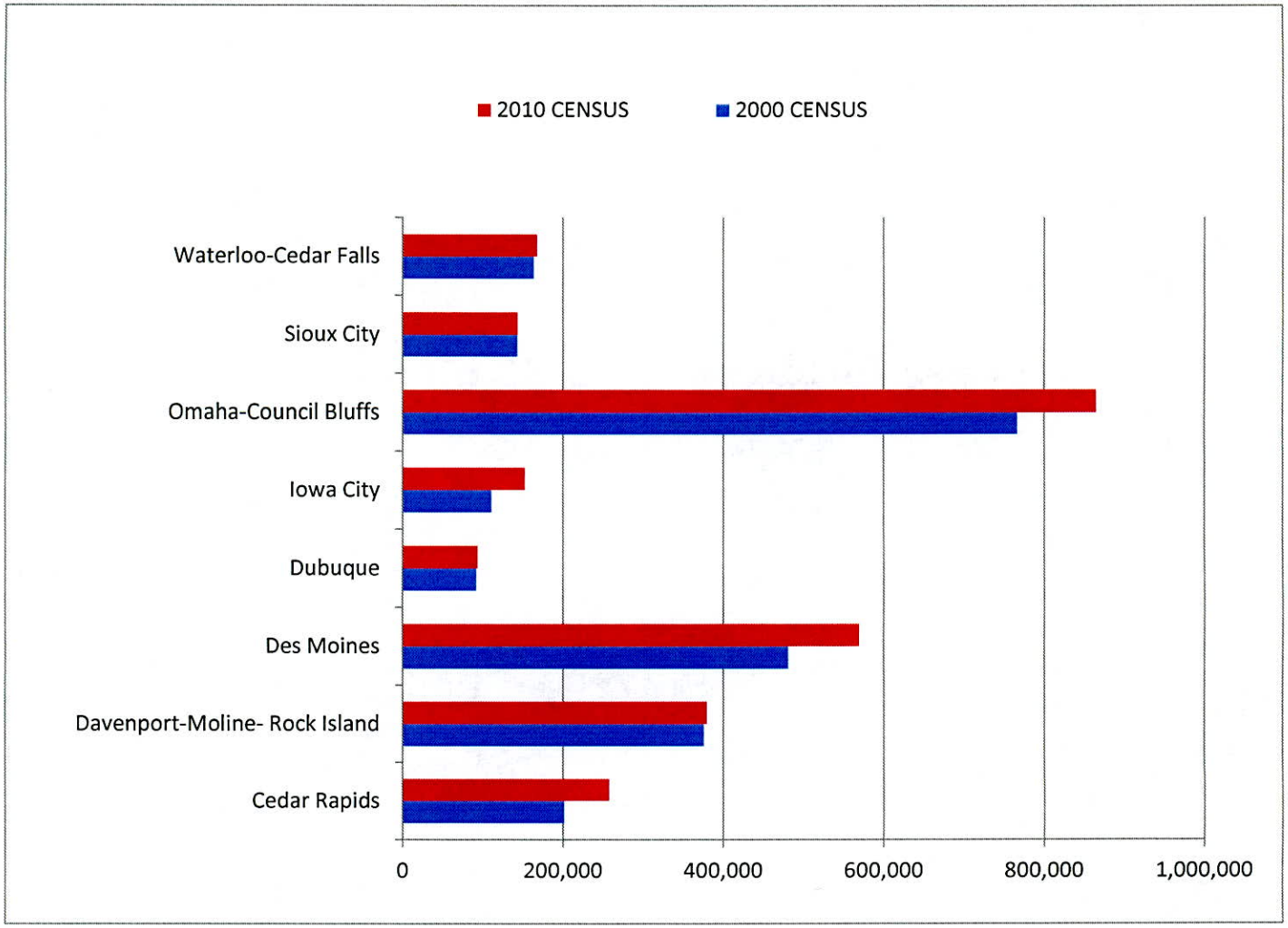


FIGURE A.5.2

POPULATION CHANGE - KANSAS

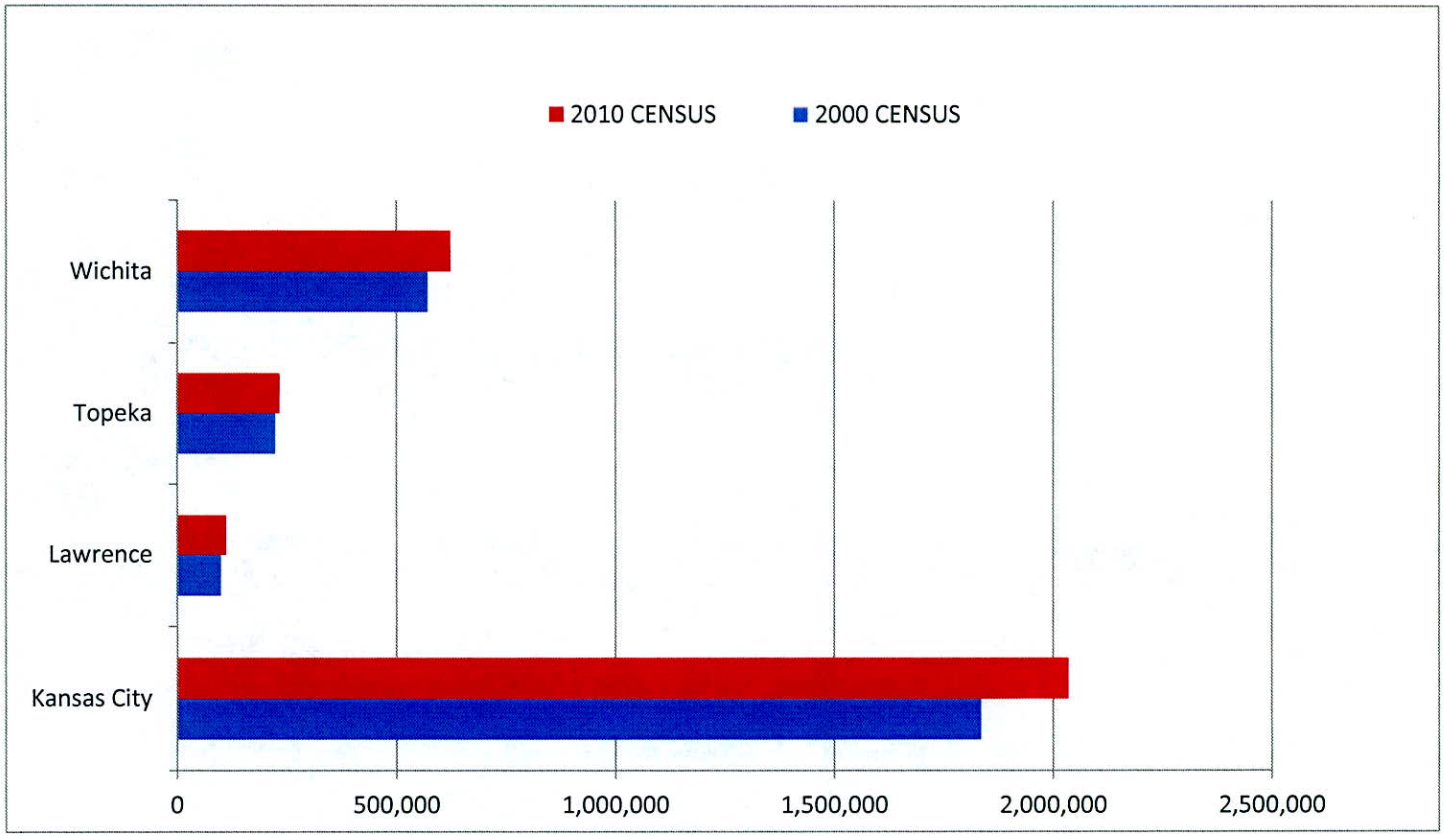
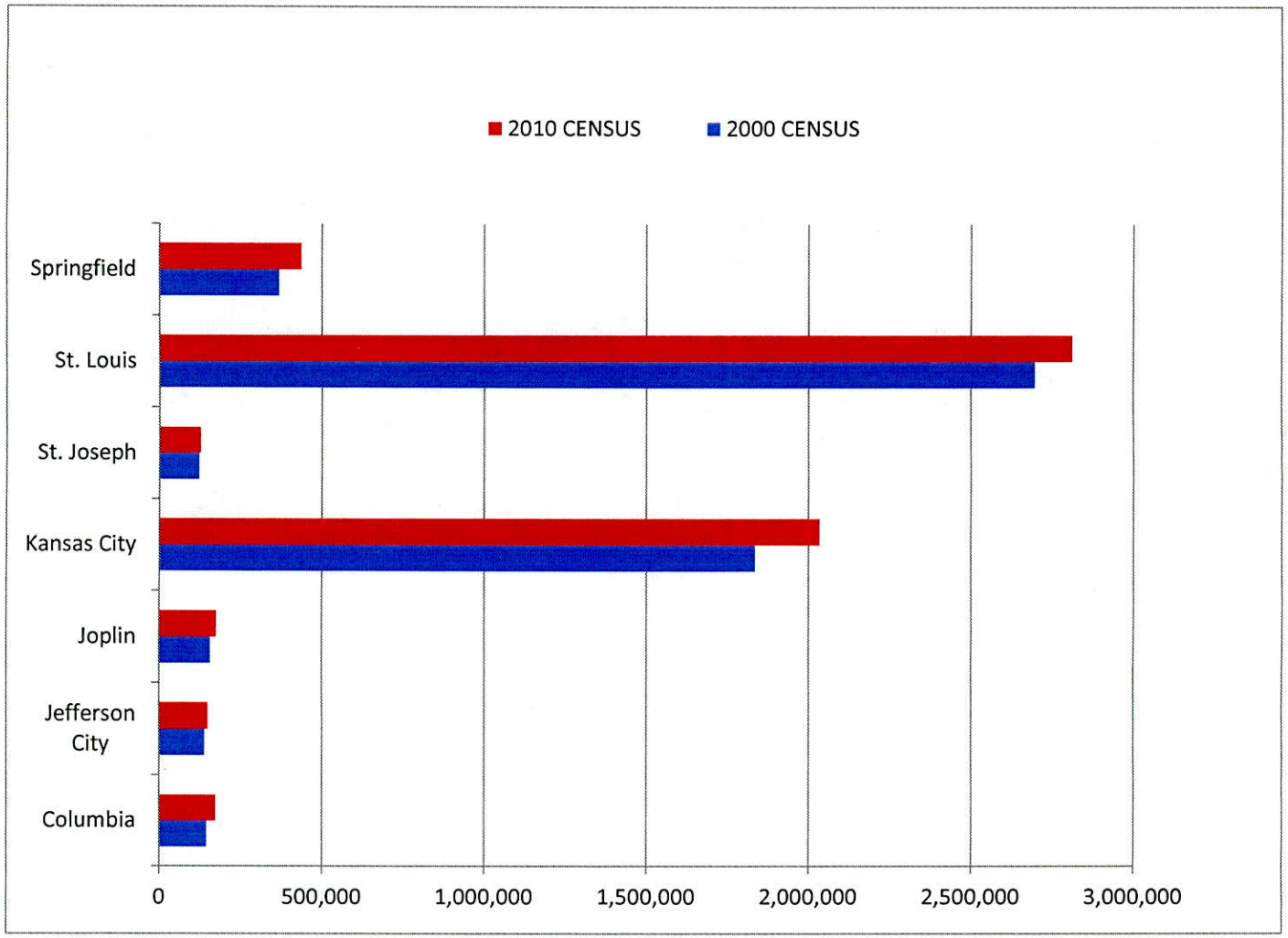


FIGURE A.5.3

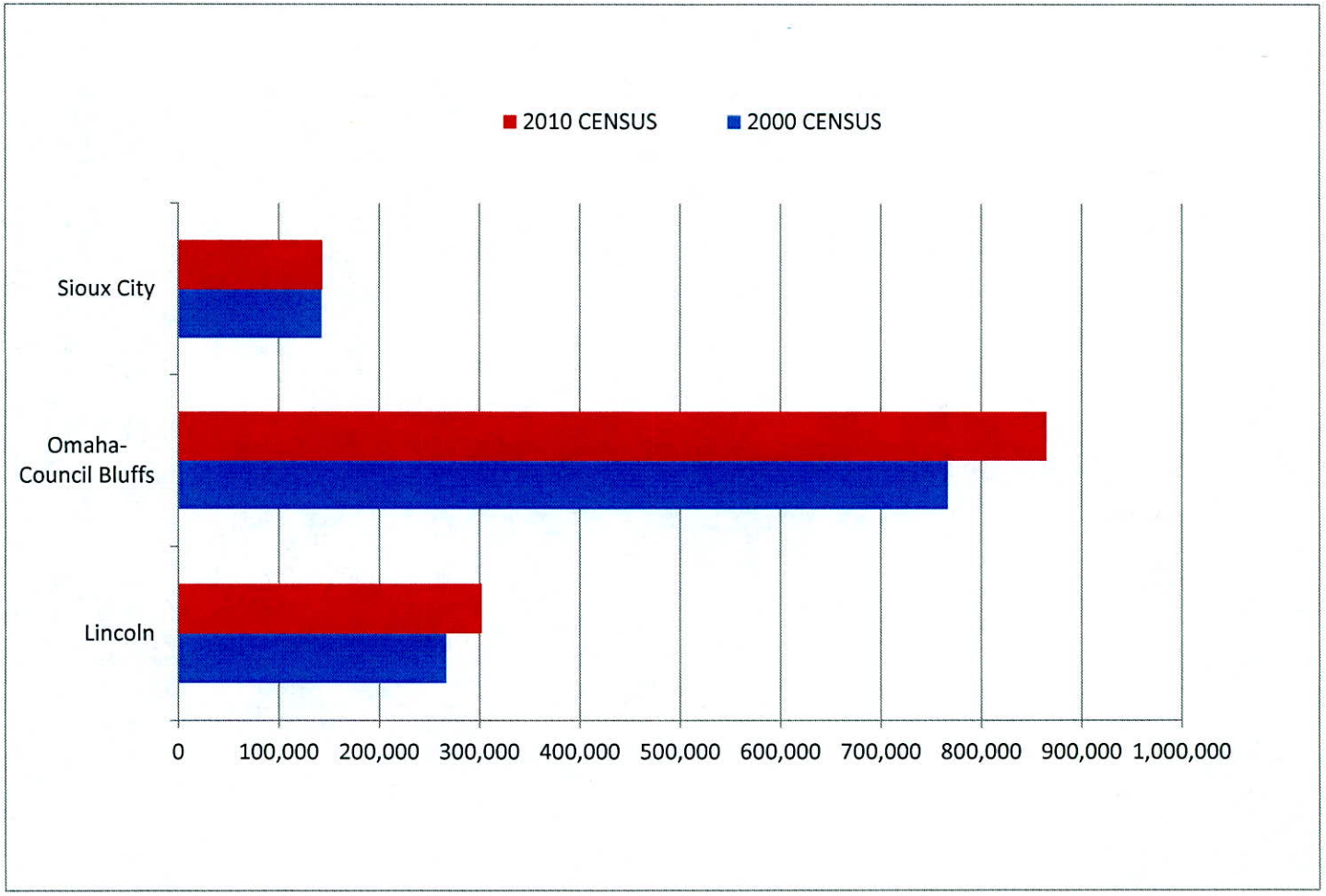
POPULATION CHANGE - MISSOURI



014919

FIGURE A.5.4

POPULATION CHANGE - NEBRASKA



014920

August 26, 2013

TransCanada Pipelines
450-1 Street SW
Calgary, Alberta
T2P 5H1

Attention: Niki Affleck

RE: Emergency Response Coverage - Keystone

This letter is to confirm that Quantum Murray LP is presently in negotiations with TransCanada Pipelines Ltd. to solidify a contract for Emergency Response Services. QMLP continues to provide services under the RFI submitted on November 4, 2010.

QMLP's services offered under this RFI are for the Emergency Response and Remediation services required following an incident on their Keystone Pipeline. QMLP is trained and equipped to work within TransCanada Pipeline's Incident command structure to fulfill operational goals in the following areas:

- On water and on land protection
- On water and on land collection
- Decontamination
- Waste management
- Shoreline cleanup
- Water remediation
- Soil remediation
- ICS Facilitation

If there are any questions or if 3rd parties need additional information beyond what has been provided please do not hesitate to contact me at the numbers below.

Best regards,

Mark Jasper
Vice President – Emergency response
Quantum Murray LP

APPENDIX B

WORST CASE DISCHARGE ANALYSIS AND SCENARIOS

Introduction

Hardisty Pump Station/ Regina Pump Station

Worst Case Discharge
Planning Volume Calculations

Regina Pump Station / Haskett Pump Station

Worst Case Discharge
Planning Volume Calculations

North Dakota, South Dakota, Nebraska

Worst Case Discharge
Planning Volume Calculations

Kansas, Missouri, Illinois

Worst Case Discharge
Planning Volume Calculations

Cushing Extension

Worst Case Discharge
Planning Volume Calculations

Gulf Coast

Worst Case Discharge
Planning Volume Calculations

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INTRODUCTION

This Appendix identifies potential causes for oil discharges and discusses the response efforts that are necessary for successful mitigation. Included in this Appendix are hypothetical scenarios for various types of spills that have the potential to occur along the system. It is anticipated that the Company will respond to spills in a consistent manner regardless of the location. Therefore, the guidelines discussed in this appendix will apply to all spills whenever possible.

United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Discharge Volume Calculation

- **Worst Case Discharge**

  The largest volume (Bbls) of the following:

  - *Pipeline's maximum release time (hrs), plus the maximum shutdown response time (hrs), multiplied by the maximum flow rate (bph), plus the largest line drainage volume after shutdown of the line section.*

  --OR--

  - *Largest foreseeable discharge for the line section is based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective action or preventive action taken.*

  --OR--

  - *Capacity of the single largest breakout tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system.*

Scenario Types

The occurrence of a Worst Case Discharge (WCD) could be the result of any number of scenarios along the pipeline system including:

- Piping rupture.
- Piping leak, under pressure and not under pressure.
- Explosion or fire.
- Equipment failure (e.g. pumping system failure, relief valve failure, or other general equipment relevant to operational activities associated with internal or external facility transfers).

The response actions to each of these scenarios are outlined in Section 3.1 and Figure 3.1. The response resources are identified in a quick reference format in Figure 2.5. Pipeline response personnel list/telephone numbers and other internal/external resources telephone numbers are detailed in Figures 2.2 and 2.5.

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014923

RESPONSE CAPABILITY SCENARIOS

Hardisty Pump Station/ Regina Pump Station

PHMSA Worst Case Discharge = 39,723 Bbls

A worst case discharge for the Hardisty Pump Station/ Regina Pump Station is considered to be discharge that does not exceed 39,723 barrels.

Pipeline Worst Case Discharge = 39,723 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 18,768.506 meters downstream of valve BELPL+06_4-A0-MLV-001 (MLV 15-1).

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as accurate as-built elevation profile data. The outflow is modeled as a full bore rupture located on the bottom side of the pipe which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation
Phase 2 - Pump Shutdown
Phase 3 - Valve Closure
Phase 4 - Gravity Drainage

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes).

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is modeled as a decrease from 100% flow rate and pressure to 0% flow rate and pressure in 9 minutes.

During this isolation phase, the valves travel from fully open to fully closed. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. The valves were modeled on an individual basis to reflect their individual valve closure profiles.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Hardisty Pump Station/ Regina Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			39,723
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			39,723
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			19,862
Shoreline Recovery Volume (bbls)			19,862
Shoreline Cleanup Volume (bbls)			39,724
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	5,958	9,931	15,889
Shallow Water Resp Cpblty (bbls/day)	1,192	1,986	3,178
Storage Capacity (bbls/day)	11,916	19,862	31,778
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Regina Pump Station / Haskett Pump Station

PHMSA Worst Case Discharge = 47,782 Bbls

A worst case discharge for the Regina Pump Station / Haskett Pump Station is considered to be discharge that does not exceed 47,782 barrels.

Pipeline Worst Case Discharge = 47,782 Bbls

Description

The pipeline-based Worst Case Discharge is projected as a scenario 4.98 meters upstream of valve MOSMI+30_0-A0-MLV-001.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as accurate as-built elevation profile data. The outflow is modeled as a full bore rupture located on the bottom side of the pipe which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation
Phase 2 - Pump Shutdown
Phase 3 - Valve Closure
Phase 4 - Gravity Drainage

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes).

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is modeled as a decrease from 100% flow rate and pressure to 0% flow rate and pressure in 9 minutes.

During this isolation phase, the valves travel from fully open to fully closed. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. The valves were modeled on an individual basis to reflect their individual valve closure profiles.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls

Description

There are no breakout tanks in the Response Zone.

Volume

No reductions were calculated into the Worse Case Discharge for the breakeout tanks in the response zone. Therefore, the WCD volume is 0 Bbls.

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Regina Pump Station / Haskett Pump Station

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			47,782
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			47,782
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			23,891
Shoreline Recovery Volume (bbls)			23,891
Shoreline Cleanup Volume (bbls)			47,782
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	7,167	11,946	19,113
Shallow Water Resp Cpblty (bbls/day)	1,433	2,389	3,823
Storage Capacity (bbls/day)	14,334	23,892	38,226
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

North Dakota, South Dakota, Nebraska

PHMSA Worst Case Discharge = 33,058 Bbls

A worst case discharge for the North Dakota, South Dakota, Nebraska is considered to be discharge that does not exceed 33,058 barrels.

Pipeline Worst Case Discharge = 33,058 Bbls

Description

This response zone is considered a non-High Volume Area. The pipeline-based Worst Case Discharge is projected as a scenario 20,897.055 feet downstream of valve LUDDE+23_8-A0. After comparing this with the worst historical release of 450-500 barrels, NRC #975573, the pipeline based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 34 bbls
Phase 4 - Gravity Drainage 24,316 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 30 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 6 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for Non-High Volume areas (Tier 1 = 12 hours; Tier 2 = 36 hours; Tier 3 = 60 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls

Volume

There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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North Dakota, South Dakota, Nebraska

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			Non-High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			33,058
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			33,058
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			16,529
Shoreline Recovery Volume (bbls)			16,529
Shoreline Cleanup Volume (bbls)			33,058
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	4,959	8,264	13,223
Shallow Water Resp Cpblty (bbls/day)	992	1,653	2,645
Storage Capacity (bbls/day)	9,918	16,528	26,446
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	12	36	60

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RESPONSE CAPABILITY SCENARIOS

Kansas, Missouri, Illinois

PHMSA Worst Case Discharge = 28,787 Bbls

A worst case discharge for the Kansas, Missouri, Illinois is considered to be discharge that does not exceed 28,787 barrels.

Pipeline Worst Case Discharge = 28,787 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Missouri River at St. Joseph, Missouri. The pipeline-based Worst Case Discharge is projected as a scenario 93,205 feet downstream from Centralia Pump Station. After comparing this with the worst historical release of less than 10 barrels, NRC # 977695, the pipeline based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 885 bbls
Phase 4 - Gravity Drainage 19,194 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 30 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Kansas, Missouri, Illinois

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			28,787
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			28,787
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			14,394
Shoreline Recovery Volume (bbls)			14,394
Shoreline Cleanup Volume (bbls)			28,788
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	4,318	7,197	11,515
Shallow Water Resp Cpblty (bbls/day)	864	1,439	2,303
Storage Capacity (bbls/day)	8,636	14,394	23,030
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	6	30	54

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RESPONSE CAPABILITY SCENARIOS

Cushing Extension

PHMSA Worst Case Discharge = 105,000 Bbls

A worst case discharge for the Cushing Extension is considered to be discharge that does not exceed 105,000 barrels.

Pipeline Worst Case Discharge = 50,253 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Smokey Hill River at the Abilene, Kansas. The pipeline-based Worst Case Discharge is projected as a scenario 1,283,000 (242.99 miles) feet downstream of Station Steele City. After comparing the calculations with the worst historical release of 12 barrels, NRC # 970232, the breakout tank based Worst Case Discharge will be used.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 4,583 bbls
Phase 2 - Pump Shutdown 4,125 bbls
Phase 3 - Valve Closure 18,476 bbls
Phase 4 - Gravity Drainage 23,069 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 660,000 bbls per day, with a pipeline diameter of 36 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4 hours (manual) was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 105,000 Bbls

Description

This size discharge would most likely occur due to a natural disaster or catastrophic event. Examples may include, but not limited to: a) Tank Fire, b) Catastrophic tank shell failure. The type of material that could be discharged is Crude Oil.

Volume

The worst case discharge scenario involving breakout tankage uses the single largest volume tank in the response zone, adjusted for the size of the secondary containment system. Applicable adjustment(s) for the largest tank include:

Spill Prevention Measures	Percent Reduction Allowed
Built Repaired to API standards	10%
Overfill protection standards	5%
Testing/cathodic protection	5%
Secondary containment capacity greater than 100% capacity of tank and designed according to NFPA 30	50%

The maximum level of the largest tank allows for a maximum fill volume of 350,000 barrels. Thus, a 70 % reduction yields a Worst Case Discharge amount of 105,000 Bbls.
A catastrophic discharge can orignate from a line section. However, the maximum amount does not exceed the amount that could be released from the largest storage tank.

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Cushing Extension

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			105,000
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			105,000
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			52,500
Shoreline Recovery Volume (bbls)			52,500
Shoreline Cleanup Volume (bbls)			105,000
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	15,750	26,250	42,000
Shallow Water Resp Cpblty (bbls/day)	3,150	5,250	8,400
Storage Capacity (bbls/day)	31,500	52,500	84,000
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	3,250	1,250	0
Response Time (hrs)	6	30	54

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RESPONSE CAPABILITY SCENARIOS

Gulf Coast

PHMSA Worst Case Discharge = 34,539 Bbls

A worst case discharge for the Gulf Coast is considered to be discharge that does not exceed 34,539 barrels.

Pipeline Worst Case Discharge = 34,539 Bbls

Description

This response zone is considered a High Volume Area because it crosses the Red River near Bonham, Texas. The pipeline-based Worst Case Discharge is projected as a scenario 194,389.76 ft. downstream from Corrigan Pump Station. This response zone has no historical releases.

Volume

The Worst Case Discharge for this response zone was calculated using relevant pipeline and product properties as well as issued for construction profile data. The outflow is modeled as a full bore rupture which is equal in size to that of the internal diameter of the pipeline. The Worst Case Discharge Volume calculation is divided into four distinct phases:

Phase 1 - Full Operation 2,778 bbls
Phase 2 - Pump Shutdown 2,500 bbls
Phase 3 - Valve Closure 1,464 bbls
Phase 4 - Gravity Drainage 27,617 bbls

The Full Operation Phase accounts for the time required for the controllers to detect the leak, react and initiate shutdown procedures. During this phase, the system is under full operating conditions, and for conservatism it is assumed that this phase will last 10 minutes, before pump shutdown initiates. The discharge volume for this phase is calculated by multiplying the flow rate of the system by the duration of time before shutdown is initiated (10 minutes). The flow rate that was used for the full operation phase is 400,000 bbls per day, with a pipeline diameter of 36 inches.

Once this phase is complete, the Pump Shutdown Phase begins, which initiates the flow rate and pressure drop across the line. Pump shutdown is a decrease from 100% flow rate and pressure to 0% flow rate and pressure through the course of 9 minutes. For this calculation, flow rate is calculated at 100% for the full 9 minutes as per PHMSA regulations.

During this isolation phase, the valves travel from fully open to fully closed. During this phase, the drain down volumes are dependent on the elevation profile across the entire pump section. The gravity driven flow of product past the valves is progressively constrained as the valves incrementally close. A valve closure time of 4.6 minutes was used.

Finally, once the valves are closed, the isolated section continues to drain, subject to the formation of vacuum locks at local elevation profile inflections that prevent further flow past these locations. During this phase, the drain down volumes are solely dependent on the elevation of the valve section which the rupture is being modeled with the use of specialized software developed by Dynamic Risk Assessment Systems, Inc. While accounting for these locations where vacuum lock occurs, it is assumed that everything else that can possibly drain will drain.

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Response Requirement

The Company has identified sufficient response resources, by contract or other approved means, to respond to a Worst Case Discharge to the maximum extent practicable. These response resources include:

- Resources capable of arriving at the staging area within the applicable response tier requirements for High Volume areas (Tier 1 = 6 hours; Tier 2 = 30 hours; Tier 3 = 54 hours).
- Resources capable of oil recovery in inclement weather conditions (i.e. heavy rain, snow, ice).

Notes

- Contracted and Company owned equipment and manpower resources are detailed in Figure 2.5 and Appendix A.
- Telephone references are provided in Figures 2.2 and 2.5.

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Breakout Tank Worst Case Discharge = 0 Bbls
Volume
There are no breakout tanks in the Response Zone, therefore there is no volume calculations.

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Gulf Coast

RESPONSE PLANNING VOLUME CALCULATIONS

Location Data			
Location Type			Inland/Near Shore
Port Type			High Volume
WCD Product Type			Crude Oil
Product Group			3
Pipeline and Hazardous Materials Safety Administration WCD Volume (bbls)			34,539
Discharge Volumes/Calculations			
Worst Case Discharge - Based on Pipeline and Hazardous Materials Safety Administration criteria (bbls)			34,539
Selected Calculation Factors (Based on USCG Tables)			
Removal Capacity Planning Volume - Percent Natural Dissipation			30%
Removal Capacity Planning Volume - Percent Recovered Floating Oil			50%
Removal Capacity Planning Volume - Percent Oil Onshore			50%
Emulsification Factor			2
Tier 1 - On Water Oil Recovery Resource Mobilization Factor			15%
Tier 2 - On Water Oil Recovery Resource Mobilization Factor			25%
Tier 3 - On Water Oil Recovery Resource Mobilization Factor			40%
Response Planning Volume Calculation			
On-Water Recovery Volume (bbls)			17,270
Shoreline Recovery Volume (bbls)			17,270
Shoreline Cleanup Volume (bbls)			34,540
	Tier 1	Tier 2	Tier 3
On-Water Recovery Cpcty (bbls/day)	5,181	8,635	13,816
Shallow Water Resp Cpblty (bbls/day)	1,036	1,727	2,763
Storage Capacity (bbls/day)	10,362	17,270	27,632
On-Water Response Caps (bbls/day)	12,500	25,000	50,000
Additional Response Req'd (bbls/day)	0	0	0
Response Time (hrs)	6	30	54

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APPENDIX C

EMERGENCY PRE-PLANNING

C.1 Release Detection

C. 2 Leak Detection Systems

C. 3 Discharge Prevention Systems

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EMERGENCY PRE-PLANNING

Leak detection and discharge prevention is accomplished through safe operating procedures and maintenance procedures outlined in the Company Operations and Maintenance (O&M) Manual. The Company Operations and Maintenance Manual is designed to meet the requirements found in Statory Orders and Regulations /99-294 S27, National Energy Board, Operation and Maintenance Manuals, and Title 49, US Code of Federal Regulations, Part 195, Transportation of Hazardous Liquids by Pipeline.

C.1 RELEASE DETECTION

- The Keystone Oil Control Center and Company Field Employees are responsible for ensuring the integrity of facilities and detecting releases.
- There are four primary types of indications that a release may be occurring:
    - An unexplained hydraulic upset condition observed in the Pipeline system operating data.
    - A consistent unexplainable Pipeline system shortage occurring over several check time periods.
    - An alarm from a Supervisory Control and Data Acquisition-based leak detection system.
    - A report of a direct observation of a release or released product received from an employee or the public.
- All indications, including supposedly direct observation, are subject to confirmation; however, the Company policy is to shut down if any doubt exists as to the integrity of the Pipeline system. The simultaneous occurrence of two or more of the indicators above greatly increases the probability that the Pipeline system has lost integrity.
- Specific guidance for response to abnormal operating conditions and determining the location of a suspected pipeline release may be found in the Company's Operations and Maintenance Manual, maintained separately.
- A form for recording conversations with an observer who reports an emergency is located in Appendix F of this Plan. Copies of this form should be kept readily accessible at telephones.
- Routine actions to be taken by Company Field Employees to ensure facility integrity and detect releases are listed as follows:
    - OCC Monitors Pressures using Supervisory Control and Data Acquisition
    - Routine Station/ROW Checks Performed
    - Routine Aerial Surveillance
    - 24 Hour Emergency Reporting Phone Number Monitored

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C.2 LEAK DETECTION SYSTEMS

Leak detection systems utilized along the Pipeline include:

- System-level indication is accomplished through usage of a Supervisory Control and Data Acquisition (SCADA) system. This system is capable of monitoring flow rates, pressure, metering information (delivery / receipt volumes), temperature, and valve positions. The Supervisory Control and Data Acquisition system is monitored on a 24-hour per day basis by both the centralized Pipeline Control Center and Secondary Control points.

The location of a spill caused by a catastrophic break, which may be indicative of a Worst Case Discharge, can be inferred by Supervisory Control and Data Acquisition personnel down to a Pipeline section between operating pump stations. This inference is based upon rapid and abrupt changes in operating conditions.

C.3 DISCHARGE PREVENTION SYSTEMS

Pipeline pump stations are designed in a manner that maximizes the containment of leaks on-site and deters the migration of leaks off-site. Discharge prevention is accomplished through the following measures:

- Pipelines and related structures have grounding systems to reduce the possibility of accidental ignition due to lightning.
- Discharge prevention is also accomplished through the use of general housekeeping procedures and leak inspection system.

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APPENDIX D

TRAINING AND DRILLS

D.1 Response Team Training

Emergency Response Plan Review
Oil Control Center Training and Procedures
Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
Incident Command System
Training Records Maintenance
Contractor Training
Training Qualifications

D.2 Response Team Exercises

Quarterly QI Notification Exercise
Annual Equipment Deployment Exercise
Annual Response Team Tabletop Exercise
Government-Initiated Unannounced Exercise
Area Exercises
Exercise Documentation

D.3 Purpose of Review and Evaluation

Outline of Review
Detection
Notification
Assessment/Evaluation
Mobilization
Response - Strategy
Response - Resources Used
Response - Effectiveness
Command Structure
Measurement
Government Relations
Public Relations

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D.1 RESPONSE TEAM TRAINING

The Company provides training related to discharge prevention, testing and response, including measures to repair Pipeline ruptures and mitigate discharges. The training methods address oil discharges from the Pipeline from several perspectives: human health and safety, rupture control and repair operations, pollution control, and overall (crisis) management of the emergency.

The competency of each training program is closely monitored by the Training Section through observation of and/or participation in actual training sessions.

Through the various training methods described below the Company's training program is intended to ensure the following results:

That all personnel know:

- Their responsibilities under the Plan.
- The name, address and procedures for contacting the operator on a 24-hour basis.
- The name of and procedures for contacting the Qualified Individual on a 24-hour basis.

That all reporting personnel know:

- The Pipelines and Response Zone details for the affected area (Response Zones Annexes).
- The telephone number of the Federal Provincial/State and local agencies and other required notifications (Section 2.0).
- The notification process. (Section 2.0).

That all response personnel know:

- The characteristics and hazards of the oil discharged (Section 3.0 and Appendix G - MSDS).
- The conditions that is likely to worsen emergencies, including the consequences of pipeline malfunctions, and the appropriate corrective actions.
- The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity or environmental damage (Section 3.0).
- The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus (Section 3.0). Only trained persons will be utilized. Company personnel are only trained on the use of handheld Ansul 30# fire extinguisher units for small incipient fires.

Emergency Response Plan Review

All Response Team Members should review their Emergency Response Plan whenever their job position or responsibilities change under the Plan. A copy of this Plan will be available at all times to Team Members.

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Oil Control Center Training and Procedures

- Training and certification ensures Controllers recognize all manners of pipeline operation, including start-up and shutdown, steady state and transient operations and leak detection operations. Controllers are not permitted to operate the system on their own until they have successfully achieved the necessary competency and have been appropriately certified. Regular re-training and re-certification ensures skills and awareness of procedures are maintained;
- Training takes place on a state-of-the-art simulator that fully represents the pipeline and includes a fully integrated leak detection system; enabling training on real world scenarios, including simulated leaks. Any significant changes to the actual pipeline system are first implemented in the simulator and Controllers are fully trained on the change prior to pipeline system implementation;
- A dedicated leak detection controller with responsibility for monitoring the leak detection system and making decisions regarding response to leak indications, including line shutdown. Two other controllers are also in the control room at all times; one dedicated to pipeline operation and one dedicated to terminal and delivery facility operation. Controllers are adjacent to one another and are in constant communication. Team training and a team culture within the control room ensures a collaborative response to anomalous events;
- The line is to be immediately shutdown when an anomaly suggesting a leak event that cannot be definitively evaluated and explained as a non-leak event within 10 minutes;
- Controllers are empowered to shut down the pipeline at their discretion. All non-routine alerts or concerns are investigated immediately by pipeline controllers and field staff. Line start up after an anomaly is identified cannot occur until the anomaly is explained and re-start is approved by the Control Center manager.

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HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (29 CFR 1910.120)

Federal and State regulations require that Response Team Members maintain up-to-date Hazardous Waste Operations and Emergency Response training necessary to function in their assigned positions. At a minimum, team members will receive "First Responder Awareness Level" training. All personnel responding to an incident must satisfy the applicable Hazardous Waste Operations and Emergency Response training requirements of 29 CFR 1910.120.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE TRAINING REQUIREMENTS

Responder Classification	Required Training Hours	Refresher
29CFR 1910.120(q) Emergency Response		
First Responder - Awareness Level	2-4 hrs demonstration of competency	same
First Responder - Operations Level	8 hrs	8 hrs
Hazardous Materials Technician	24 hrs plus competency	8 hrs
Hazardous Materials Specialist	24 hrs plus competency in specialized	8 hrs
Incident Commander	areas	8 hrs
	24 hrs plus competency	
29CFR 1910.120(e) Clean Up Sites		
General Site Workers	40 hrs / 3 days on the job training	8 hrs
Occasional Workers (Limited Tasks)	24 hrs / 1 day on the job training	8 hrs
General Site Workers (Low Hazard)	24 hrs / 1 day on the job training	8 hrs
Supervisors	8 hrs supervisor training	8 hrs
* Previous work experience and/or training certified as equivalent by employer.		

Incident Command System

Response Team Members will receive Incident Command System training and may also receive supplemental training in other related general topics.

Training Records Maintenance

Emergency response training records are maintained at the Company's office. Training records for response personnel will be maintained for as long as personnel have duties in this Emergency Response Plan.

Contractor Training

The Company also recognizes that contract personnel must also have sufficient training to respond emergency response situations. The Company communicates this training need to its key contractors during contract negotiations and often specifically spells out this requirement in its contracts. The Company also tends to use well-known spill response contractors whose reputation and experience levels help ensure personnel who respond will be trained to appropriate levels.

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Training Qualifications

As no formalized method of certifying training instructors has been provided by Occupational Safety and Health Administration, the Company ensures the competency of its instructors and training organizations by selecting trainers and/or organizations with professional reputations and extensive hands-on and classroom experience in their subject matter. The Company personnel with responsibility to coordinate the training program also conduct periodic informal audits of training courses selected for the Company training program to ensure their suitability for the program.

D.2 RESPONSE TEAM EXERCISES

Spill Management Team members, government agencies, contractors, and other resources must participate in response exercises required by Federal, State, or local regulations and as detailed in the "National Preparedness for Response Exercise Program (PREP) Guidelines." The Company (through the Community, Safety and Environment Department) will conduct announced drills to maintain compliance, and each plan-holder must participate in at least one exercise annually. The following table lists the triennial exercise cycle for facilities (see National Preparedness for Response Exercise Program Guidelines for full details).

TRIENNIAL CYCLE		
Total Number	**Frequency**	**Exercise Type/Description**
12	Quarterly	Qualified Individual Notification Exercise
3	Annually	Equipment Deployment Exercise *(Facility-owned equipment)*
3	Annual	Response Team Tabletop Exercise
3	Annual	Equipment Deployment Exercise *(facilities with Oill Spill Removal Organization-owned equipment)*
3	3 per Triennial Cycle	Unannounced Exercise *(not a separate exercise)* Actual response can be considered as an unannounced exercise. Credit can also be given for unannounced equipment deployment and Response Team tabletop exercises.
NOTES: 1) All Emergency Response Plan components must be exercised at least once in the Cycle.		

Quarterly QI Notification Exercise

- **Scope:**Exercise communication between Pipeline personnel and the Qualified Individual(s) and/or designated alternate(s). At least once each year, one of the notification exercises should be conducted during non-business hours.
- **Objective:**Contact must be made with a Qualified Individual or designated alternate, as identified in the Plan.
- **General:**All personnel receiving notification shall respond to the notification and verify their receipt of the notification. Personnel who do not respond should be contacted to determine whether or not they received the notification.

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Annual Equipment Deployment Exercise (for operator and/or Oill Spill Removal Organization equipment)

- **Scope:**Demonstrate ability to deploy spill response equipment identified in the Emergency Response Plan.

  May consist entirely of operator owned equipment, or a combination of OSRO and operator equipment.
  The number of equipment deployment exercises conducted should be such that equipment and personnel assigned to each Response Zone are exercised at least one a year. If the same personnel and equipment respond to multiple zones, they need only exercise once per year. If different personnel and equipment response to various Response Zones, each must participate in an annual equipment deployment exercise.

- **Objective:**Demonstrate personnel's ability to organize and to deploy and operate response equipment. Ensure that the response equipment is in proper working order.

- **General:**The Facility may take credit for actual equipment deployment to a spill, or for training sessions, as long as the activities are properly documented.

Annual Response Team Tabletop Exercise

- **Scope:**Exercise the response team's organization, communication, and decision-making in managing a spill response. Each team identified within the Plan must conduct an annual Response Team Tabletop Exercise.

- **Objective:**Exercise the response team in a review of the following:

  - Knowledge of the Plan;
  - Ability to organize team members to effectively interface with unified command;
  - Communications capability; and
  - Coordination for response capability as outlined in the response plan.

- **General:** A minimum of one Response Team Tabletop Exercise in a triennial cycle will involve a Worst Case Discharge scenario.

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Government-Initiated Unannounced Exercise

- **Scope:** Demonstrate ability to respond to a Worst Case Discharge spill event.
- **Objectives:** Designated Emergency Response Team Members should demonstrate adequate knowledge of their Emergency Response Plan and the ability to organize, communicate, coordinate, and respond in accordance with that Plan.
- **General:** Annually, the Pipeline and Hazardous Materials Safety Administration may conduct up to 20 unannouced exercises throughout the U.S. for the pipeline industry as a whole. A single owner or operator will not be required to participate in a PHMSA-initiated unannounced exercise if they have already participated in one within the previous 36 months.

Area Exercises

- **Objective:** The purpose of the area exercise is to exercise the entire response community in a particular area. An area is defined as "that geographic area for which a separate and distinct Area Contingency Plan has been prepared, as described in Oil Pollution Act 90." The response community includes the Federal, State, and local government and industry. The area exercises are designed to exercise the government and industry interface for spill response.
- **General:** The goal is to ensure that all areas of the country are exercised triennially. All of the area exercises will be developed by an exercise design team. The exercise design team is comprised of representatives from the Federal, State, and local government and industry. A lead plan holder would lead each area exercise. The lead plan holder is the organization (government or industry) that holds the primary plan that is exercised in the area exercise. The lead plan holder would have the final word on designing the scope and scenario of the exercise.

Exercise Documentation

- All exercises should be documented and maintained at the Company office; documentation should specify:
    - The type of exercise;
    - Date and time of the exercise;
    - A description of the exercise;
    - The objectives met in the exercise;
    - The components of the response plan exercised; and
    - Lessons learned.
- Exercise documentation should be kept on file for the required length of time depending on the regulating agency (three (3) years for the U.S. Coast Guard and five (5) years for the Pipeline and Hazardous Materials Safety Administration and the U.S. Environmental Protection Agency).

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D.3 PURPOSE OF REVIEW AND EVALUATION

This Section provides procedures and information useful to responders for post incident/exercise review and evaluation. Post incident/exercise reviews should be conducted in a timely manner following an incident/exercise. The Plan should be evaluated to determine its usefulness during the incident/exercise and appropriate revisions should be made. All incident/exercise documentation should be included in the Plan evaluation process.

Outline of Review

Given below are items a team composed of outside people knowledgeable in spill response and key members of the response teams should examine. These questions are intended as guidelines only; many other questions are likely to be appropriate at each stage of a critique.

Detection

- Was the spill detected promptly?
- How was it detected? By whom?
- Could it have been detected earlier? How?
- Are any instruments or procedures available to consider which might aid in spill detection?

Notification

- Were proper procedures followed in notifying government agencies? Were notifications prompt?
- Was management notified promptly/response appropriate?
- Was the Pipeline owner/operator notified promptly? If so, why, how, and who? If not, why not?

Assessment/Evaluation

- Was the magnitude of the problem assessed correctly at the start?
- What means were used for this assessment?
- Are any guides or aids needed to assist spill evaluation?
- What sources of information were available on winds and on water currents?
- Is our information adequate?
- Was this information useful (and used) for spill trajectory forecasts? Were such forecasts realistic?
- Do we have adequate information on product properties?
- Do we need additional information on changes of product properties with time, i.e., as a result of weathering and other processes?

Mobilization

- What steps were taken to mobilize spill countermeasures?
- What resources were used?
- Was mobilization prompt?
- Could it have been speeded up or should it have been?
- What about mobilization of manpower resources?
- Was the local spill cooperative used appropriately?
- How could this be improved?

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- Was it appropriate to mobilize the Pipeline owner/operator resources and was this promptly initiated?
- What other resources are available and have they been identified and used adequately?

Response - Strategy

- Is there an adequate Spill Response Plan for the location?
- Is it flexible enough to cope with unexpected spill events?
- Does the Plan include clear understanding of local environmental sensitivities?
- What was the initial strategy for response to this spill?
- Is this strategy defined in the Spill Plan?
- How did the strategy evolve and change during this spill and how were these changes implemented?
- What caused such changes?
- Are there improvements needed? More training?

Response - Resources Used

- What resources were mobilized?
- How were they mobilized?
- How did resource utilization change with time? Why?
- Were resources used effectively?
    - Contractors
    - Government agencies
    - Company resources
    - Cooperatives
    - Volunteers
    - Consultants
    - Other (e.g., bird rescue centers)
- What changes would have been useful?
- Do we have adequate knowledge of resource availability?
- Do we have adequate knowledge of waste disposal capabilities?

Response - Effectiveness

- Was containment effective and prompt?
- How could it have been improved?
- Should the location or the local cooperative have additional resources for containment?
- Was recovery effective and prompt?
- How could it have been improved?
- Should the location or the local cooperative have additional resources for recovery of spilled product?
- Was contaminated equipment disposed promptly and safely?
- Was there adequate in-house product separation, recovery, and disposal?
- How could it have been improved?
- Was there adequate outside disposal resources available?

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Command Structure

- Who was initially in charge of spill response?
- What sort of organization was initially set up?
- How did this change with time? Why?
- What changes would have been useful?
- Was there adequate surveillance?
- Should there be any changes?
- Were communications adequate?
- What improvements are needed? Hardware, procedures, etc.
- Was support from financial services adequate? Prompt?
- Should there be any changes?
- Is more planning needed?
- Should financial procedures be developed to handle such incidents?

Measurement

- Was there adequate measurement or estimation of the volume of product spilled?
- Was there adequate measurement or estimation of the volume of product recovered?
- Was there adequate measurement or estimation of the volume of product disposed?
- Should better measurement procedures be developed for either phase of operations?
- If so, what would be appropriate and acceptable?

Government Relations

- What are the roles and effects of the various government agencies which were involved?
- Was there a single focal point among the government agencies for contact?
- Should there have been better focus of communications to the agencies?
- Were government agencies adequately informed at all stages?
- Were too many agencies involved?
- Are any changes needed in procedures to manage government relations?
- Examples of affected U.S. agencies (there may be others):
    - U.S. Coast Guard
    - Environmental Protection Agency
    - National Oceanic and Atmospheric Administration
    - Dept of Fish and Wildlife
    - State Parks
    - Harbors and Marinas
    - States
    - Cities
    - Counties
- Was there adequate agreement with the government agencies on disposal methods?
- Was there adequate agreement with the government agencies on criteria for cleanup?
- How was this agreement developed?
- Were we too agreeable with the agencies in accepting their requests for specific action items (e.g., degree of cleanup)?
- Should there be advance planning of criteria for cleanup, aimed at specific local environmentally sensitive areas? (Such criteria should probably also be designed for different types of product.)

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Public Relations

- How were relations with the media handled?
- What problems were encountered?
- Are improvements needed?
- How could public outcry have been reduced? Was it serious?
- Would it be useful to undertake a public information effort to "educate" reporters about product and effects to it if spilled?
- These areas should be investigated shortly after the incident to assure that actions taken are fresh in peoples' minds.

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APPENDIX E

DISPOSAL PLAN

E.1 Overview

E.2 Waste Classification

E.3 Waste Handling

E.4 Waste Storage

E.5 Waste Disposal

Figure E.1 Temporary Storage Methods

Figure E.2 Oily Waste Separation and Disposal Methods

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E.1 OVERVIEW

A major oil spill response would generate significant quantities of waste materials ranging from oily debris and sorbent materials to sanitation water and used batteries. All these wastes need to be classified and segregated (i.e., oily, liquid, etc.), transported from the site, and treated and/or disposed at approved disposal sites. Each of these activities demands that certain health and safety precautions be taken, which are strictly controlled by Federal and State Laws and Regulations. This Section provides an overview of the applicable State Regulations governing waste disposal, and a discussion of various waste classification, handling, transfer, storage, and disposal techniques. It is the responsibility of the Environmental Unit to manage waste disposal needs during an oil spill cleanup.

E.2 WASTE CLASSIFICATION

Oily- Liquid Wastes

Oily liquid wastes (i.e., oily water and emulsions) that would be handled, stored, and disposed during response operations are very similar to those handled during routine storage and transfer operations. The largest volume of oily liquid wastes would be produced by recovery operations (e.g., through the use of vacuum devices or skimmers). In addition, oily water and emulsions would be generated by vehicle operations (e.g., spent motor oils, lubricants, etc.), and equipment cleaning operations.

Non-Oily - Liquid Wastes

Response operations would also produce considerable quantities of non-oily liquid wastes. Water and other non-oily liquid wastes would be generated by the storage area and stormwater collection systems, equipment cleaning (i.e., water contaminated with cleaning agents), and office and field operations (i.e., sewage, construction activities).

Solid Wastes

A solid waste is defined as any discarded material provided that it is not specifically excluded under the regulations. These exclusions cover materials such as domestic sewage and mixtures of sewage discharged through a sewer system or industrial wastewater point source discharges.

A discarded material is any material which is abandoned (disposed, burned or incinerated) or accumulated, stored or treated prior to being abandoned. A discarded material is also any material recycled or any material considered inherently wastelike. Recycled material is considered solid waste when used in a manner constituting disposal, placed on land or burned for energy recovery.

A solid waste may be considered a hazardous waste. A solid waste, as defined above, may be a hazardous waste if it is not excluded from regulation and is either a listed hazardous waste or exhibits the characteristics of a hazardous waste. A solid waste exhibits the characteristics of a hazardous waste if it exceeds the thresholds established in determining the following:

1. ignitability
2. corrosivity
3. reactivity
4. toxicity

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A solid waste may also become a hazardous waste if it is mixed with a listed hazardous waste or, in the case of any other waste (including mixtures), when the waste exhibits any of the characteristics identified above.

Oily - Solid / Semi-Solid Wastes

Oily solid/semi-solid wastes that would be generated by containment and recovery operations include damaged or worn-out booms, disposable/soiled equipment, used sorbent materials, saturated soils, contaminated beach sediments, driftwood, and other debris.

Non-Oily - Solid / Semi-Solid Wastes

Non-oily solid/semi-solid wastes would be generated by emergency construction operations (e.g., scrap, wood, pipe, and wiring) and office and field operations (i.e., refuse). Vessel, vehicle, and aircraft operations also produce solid wastes.

E.3 WASTE HANDLING

A primary concern in the handling of recovered oil and oily debris is contaminating unaffected areas or recontaminating already cleaned areas. Oily wastes generated during the response operations would need to be separated by type and transferred to temporary storage areas and/or transported to incineration or disposal sites. Proper handling of oil and oily wastes is imperative to ensure personnel health and safety.

Safety Considerations

Care shall be taken to avoid or minimize direct contact with oily wastes. All personnel handling or coming into contact with oily wastes shall wear protective clothing. A barrier cream can be applied prior to putting on gloves to further reduce the possibility of oily waste absorption. Safety goggles shall be worn by personnel involved in waste handling activities where splashing might occur. Any portion of the skin exposed to oily waste should be washed with soap and water as soon as possible. Decontamination zones should be set up during response operations to ensure personnel are treated for oil exposure.

Wastes Transfer

During response operations, it may be necessary to transfer recovered oil and oily debris from one point to another several times before the oil and oily debris are ultimately recycled, incinerated or disposed at an appropriate disposal site. Depending on the location of response operations, any or all of the following transfer operations may occur:

- From portable or vessel-mounted skimmers into flexible bladder tanks, storage tanks of the skimming vessel itself, or a barge.
- Directly into the storage tank of a vacuum device.
- From a skimming vessel or flexible bladder to a barge.
- From a vacuum device storage tank to a barge.
- From a barge to a tank truck.
- From a tank truck to a processing system (e.g., oil/water separator).
- From a processing system to a recovery system and/or incinerator.
- Directly into impermeable bags that, in turn, are placed in impermeable containers.
- From containers to trucks.

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There are four general classes of transfer systems that may be employed to affect oily waste transfer operations:

- **Pumps:** Rotary pumps, such as centrifugal pumps, may be used when transferring large volumes of oil, but they may not be appropriate for pumping mixtures of oil and water. The extreme shearing action of centrifugal pumps tends to emulsify oil and water, thereby increasing the viscosity of the mixture and causing low, inefficient transfer rates. The resultant emulsion would also be more difficult to separate into oil and water fractions. Lobe or "positive displacement" pumps work well on heavy, viscous oils, and do not emulsify the oil/water mixture. Double-acting piston and double acting diaphragm pumps are reciprocating pumps that may also be used to pump oily wastes.
- **Vacuum Systems:** A vacuum truck may be used to transfer viscous oils but they usually pick up a very high water/oil ratio.
- **Belt/Screw Conveyors:** Conveyors may be used to transfer oily wastes containing a large amount of debris. These systems can transfer weathered debris laden oil either horizontally or vertically for short distances (i.e., 10 feet) but are bulky and difficult to set up and operate.
- **Wheeled Vehicles:** Wheeled vehicles may be used to transfer liquid wastes or oily debris to storage or disposal sites. These vehicles have a limited transfer volume (i.e., 100 barrels) and require good site access.

E.4 WASTE STORAGE

Interim storage of recovered oil, oily and non-oily waste would be considered to be an available means of holding the wastes until a final management method is selected. In addition, the segregation of wastes, according to type, would facilitate the appropriate method of disposal. The storage method used would depend upon:

- The type and volume of material to be stored.
- The duration of storage.
- Access.

During an oil spill incident, the volume of oil that can be recovered and dealt with effectively depends upon the available storage capacity. Typical short-term storage options are summarized in Figure E-1. The majority of these options can be used either onshore or offshore.

If storage containers such as bags or drums are used, the container must be clearly marked with the proper Canadian Transport Dangerous Goods/United States Department of Transportation marking to indicate the type of material/waste contained and/or the ultimate disposal option.

Fuel barges may be the best option for temporary storage of oil recovered in open waters and frac tanks for inland spills. Depending on size, these vessels may be able to hold up to 6,000 barrels of oil and water and frac tanks may hold up to 500-550 barrels. The barge deck can be used as a platform for operating oil spill clean-up equipment and storing containment boom.

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Steel or rubber tanks can be used to store oil recovered near the shoreline. To facilitate offloading, demulsifiers may be used to break emulsions prior to placing the recovered substance into the barges or storage tanks.

Use of any site for storage is dependent on the approval of the local authorities. The following elements affect the choice of a potential storage site:

- Geology.
- Ground water.
- Soil.
- Flooding.
- Surface water.
- Slope.
- Covered material.
- Capacity.
- Climatic factors.
- Land use.
- Toxic air emissions.
- Security.
- Access.
- Public contact.

E.5 WASTE DISPOSAL

Techniques for Disposal of Recovered Oil

Recovery, reuse, and recycling are the best choices for remediation of a spill, thereby reducing the amount of oily debris to be bermed onsite or disposed of at a solid waste landfill. Treatment is the next best alternative, but incineration and burning for energy recovery have more options within the state. There are some limitations and considerations in incinerating for disposal. Environmental quality of incineration varies with the type and age of the facility. Therefore, when incineration becomes an option during an event, local air quality authorities would be contacted for advice about efficiency and emissions of facilities within their authority. Approval of the local air authorities is a requirement for any incineration option. Landfilling is the last option. Final disposal at a solid or dangerous waste landfill is the least environmentally sound method of dealing with a waste problem such as oily debris.

Note: Prior to the disposal of ANY waste products, the Incident Commander or his designee must contact the Keystone / TransCanada Community, Safety and Environmental Department to receive direction and guidence on the proper disposal methods and procedures.

During an oil spill incident, the Company would consult with the proper regulating agency to identify the acceptable disposal methods and sites appropriately authorized to receive such wastes. The Company maintains a list of approved disposal sites that satisfy local, Province/State, and Federal Regulations and Company requirements. This identification of suitable waste treatment and disposal sites would be prepared by the Environmental Unit in the form of an Incident Disposal Plan which must be authorized by the USCG and/or the EPA or NEB and any authorizing state agency.

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An Incident Disposal Plan would include predesignated interim storage sites, segregation strategies, methods of treatment and disposal for various types of debris, and the locations/contacts of all treatment and disposal site selections. Onsite treatment/disposal is preferred.

In order to obtain the best overall Incident Disposal Plan, a combination of methods should be used. There is no template or combination of methods that can be used in every spill situation. Each incident should be reviewed carefully to ensure that an appropriate combination of disposal methods is employed.

The different types of wastes generated during response operations would require different disposal methods. To facilitate the disposal of wastes, they should be separated by type for temporary storage, transport and disposal. Figure E-2 lists some of the options that would be available to segregate oily wastes. The figure also depicts methods that may be employed to separate free and/or emulsified water from the oily liquid waste.

The following is a brief discussion of some disposal techniques available for recovered oil and oily debris.

Recycling

This technique entails removing water from the oil and blending the oil with uncontaminated oil. Recovered oil can be shipped to refineries provided that it is exempt from hazardous waste regulations. There it can be treated to remove water and debris, and then blended and sold as a commercial product.

The Company's designated Disposal Specialist is responsible for ensuring that all waste materials be disposed at an internally approved disposal site.

Incineration

This technique entails the complete destruction of the recovered oil by high temperature thermal oxidation reactions. There are licensed incineration facilities as well as portable incinerators that may be brought to a spill site. Incineration may require the approval of the local Air Pollution Control Authority. Factors to consider when selecting an appropriate site for onsite incineration would include:

- Proximity to recovery locations.
- Access to recovery locations.
- Adequate fire control.
- Approval of the local air pollution control authorities.

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In Situ Burning / Open Burning

Burning techniques entail igniting oil or oiled debris and allowing it to burn under ambient conditions. These disposal techniques are subject to restrictions and permit requirements established by federal, province/state and local laws. They would not be used to burn Polychlorinated biphenyls, waste oil containing more than 1,000 parts per million of halogenated solvents, or other substances regulated by the Environmental Protection Agency or Environment Canada. Permission for in situ burning may be difficult to obtain when the burn takes place near populated areas.

As a general rule, in situ burning would be appropriate only when atmospheric conditions will allow the smoke to rise several hundred feet and rapidly dissipate. Smoke from burning oil will normally rise until its temperature drops to equal the ambient temperature. Afterwards, it will travel in a horizontal direction under the influence of prevailing winds.

Landfill Disposal

This technique entails burying the recovered oil in an approved landfill in accordance with regulatory procedures. Landfill disposal of free liquids is prohibited by Federal Law in the United States.

With local health department approval, non-burnable debris, which consists of oiled plastics, gravel and oiled seaweed, kelp, and other organic materials, may be transported to a licensed, lined, approved municipal or private landfill and disposed of in accordance with the landfill guidelines and regulations. Landfill designation would be planned only for those wastes that have been found to be unacceptable by each of the other disposal options (e.g., waste reduction, recycling, energy recovery). Wastes will be disposed only at Company-approved disposal facilities. The Disposal Specialist is responsible for ensuring that all waste materials are disposed at a Company internally approved disposal site. Disposal at a non-approved facility would require approval by the Disposal Specialist prior to sending any waste to such a facility.

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FIGURE E-1

TEMPORARY STORAGE METHODS

CONTAINER	ONSHORE	OFFSHORE	SOLIDS	LIQUIDS	NOTES
Barrels	x	x	x	x	May require handling devices. Covered and clearly marked.
Tank Trucks	x	x		x	Consider road access. Barge-mounted offshore.
Dump/Flat Bed Trucks-Roll-offs	x		x		May require impermeable liner and cover. Consider flammability of vapors at mufflers.
Barges		x	x	x	Liquids only in tanks. Consider venting of tanks.
Oil Storage Tanks	x	x		x	Consider problems of large volumes of water in oil.
Bladders	x	x		x	May require special hoses or pumps for oil transfer.
Frac Tanks	x			x	Consider road access.

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FIGURE E-2

OILY WASTE SEPARATION AND DISPOSAL METHODS

TYPE OF MATERIAL	SEPARATION METHODS	DISPOSAL METHODS
LIQUIDS		
Non-emulsified oils	• Gravity separation of free water	• Incineration • Use of recovered oil as refinery/production facility feedstock
Emulsified oils	• Emulsion broken to release water by: o heat treatment o emulsion breaking chemicals o mixing with sand o centrifuge o filter/belt press	• Use of recovered oil as refinery/production facility feedstock
SOLIDS		
Oil mixed with sand and soil	• Collection of liquid oil leaching from sand during temporary storage • Extraction of oil from sand by washing with water or solvent • Removal of solid oils by sieving	• Incineration • Use of recovered oil as refinery/production facility feedstock • Direct disposal • Stabilization with inorganic material • Degradation through land farming or composting
Oil mixed with cobbles or pebbles	• Screening • Collection of liquid oil leaching from materials during temporary storage • Extraction of oil from materials by washing with water or solvent	• Incineration • Direct Disposal • Use of recovered oil as refinery/production facility feedstock
Oil mixed with wood and sorbents	• Screening • Collection of liquid oil leaching from debris during temporary storage • Flushing of oil from debris with water	• Incineration • Direct disposal • Degradation through land farming or composting for oil mixed with seaweed or natural sorbents

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APPENDIX F

MISCELLANEOUS FORMS

Forms and Exercise Documentation File Maintenance Procedures
• Forms and exercise documentation records should be maintained in a separate file in the Facility's office filing system. • These files must be available for presentation upon request by regulatory agency personnel.

F 7000-1

Click to view the file

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Date: _____ NRC Incident No. #_____

PHMSA F 7000-1 Accident Report – Hazardous Liquid Pipeline Systems Form

© Response Management Associates, Inc.

Date: _____ NRC Incident No. #_____

NOTICE: This report is required by 49 CFR Part 195. Failure to report can result in a civil penalty not to exceed $25,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $500,000 as provided in 49 USC 60122 Form Approved OMB No. 2137-0047

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

ACCIDENT REPORT – HAZARDOUS LIQUID PIPELINE SYSTEMS

Report Date _____
No. _____
(DOT Use Only)

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the Office Of Pipeline Safety Web Page at http://ops.dot.gov.*

PART A – GENERAL REPORT INFORMATION

Check: ☐ Original Report ☐ Supplemental Report ☐ Final Report

1. a. Operator's OPS 5-digit Identification Number (if known) /___/___/___/___/___/
   b. If Operator does not own the pipeline, enter Owner's OPS 5-digit Identification Number (if known) /___/___/___/___/___/
   c. Name of Operator _____
   d. Operator street address _____
   e. Operator address _____
   City, County, State and Zip Code

IMPORTANT: IF THE SPILL IS SMALL, THAT IS, THE AMOUNT IS AT LEAST 5 GALLONS BUT IS LESS THAN 5 BARRELS, COMPLETE THIS PAGE ONLY, UNLESS THE SPILL IS TO WATER AS DESCRIBED IN 49 CFR §195.52(A)(4) OR IS OTHERWISE REPORTABLE UNDER §195.50 AS REVISED IN CY 2001.

2. Time and date of the accident
   /___/___/___/___/ /___/___/ /___/___/ /___/___/
   hr. month day year

3. Location of accident
   (If offshore, do not complete a through d. See Part C.1)
   a. Latitude: _____ Longitude: _____
   (if not available, see instructions for how to provide specific location)
   b. _____
   City, and County or Parish
   c. _____
   State and Zip Code
   d. Mile post/valve station O or survey station no. O
   (whichever gives more accurate location)
   _____

4. Telephone report
   /___/___/___/___/___/___/___/ /___/___/ /___/___/ /___/___/
   NRC Report Number month day year

5. Losses *(Estimated)*

Public/Community Losses reimbursed by operator:

Public/private property damage	$_____
Cost of emergency response phase	$_____
Cost of environmental remediation	$_____
Other Costs	$_____
(describe) _____	

Operator Losses:

Value of product lost	$_____
Value of operator property damage	$_____
Other Costs	$_____
(describe) _____	
Total Costs	$_____

6. Commodity Spilled OYes O No
(If Yes, complete Parts a through c where applicable)

a. Name of commodity spilled _____

b. Classification of commodity spilled:
- O HVLs /other flammable or toxic fluid which is a gas at ambient conditions
- O CO_2 or other non-flammable, non-toxic fluid which is a gas at ambient conditions
- O Gasoline, diesel, fuel oil or other petroleum product which is a liquid at ambient conditions
- O Crude oil

a. Estimated amount of commodity involved :
- O **Barrels**
- O **Gallons (check only if spill is less than one barrel)**

Amounts:
Spilled : _____
Recovered: _____

CAUSES FOR SMALL SPILLS ONLY (5 gallons to under 5 barrels) :

(For large spills [5 barrels or greater] see Part H)

O **Corrosion** O **Natural Forces** O **Excavation Damage** O **Other Outside Force Damage**
O **Material and/or Weld Failures** O **Equipment** O **Incorrect Operation** O **Other**

PART B – PREPARER AND AUTHORIZED SIGNATURE

_____ _____
(type or print) Preparer's Name and Title Area Code and Telephone Number

_____ _____
Preparer's E-mail Address Area Code and Facsimile Number

_____ _____ _____ _____
Authorized Signature (type or print) Name and Title Date Area Code and Telephone Number

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014973

Date: _____ NRC Incident No. #_____

PART C – ORIGIN OF THE ACCIDENT (Check all that apply)

1. Additional location information
   a. Line segment name or ID _____
   b. Accident on Federal land other than Outer Continental Shelf O Yes O No
   c. Is pipeline interstate? O Yes O No

Offshore: O Yes O No *(completed if offshore)*
d. Area _____ Block # _____
State / / / or Outer Continental Shelf ☐

2. Location of system involved *(check all that apply)*
   ☐ Operator's Property
   ☐ Pipeline Right of Way
   ☐ High Consequence Area (HCA)?
   Describe HCA_____

3. Part of system involved in accident
   O Above Ground Storage Tank
   O Cavern or other below ground storage facility
   O Pump/meter station; terminal/tank farm piping and equipment, including sumps
   O Other *Specify:* _____
   O Onshore **pipeline**, including valve sites
   O Offshore **pipeline**, including platforms

*If failure occurred on **Pipeline**, complete items a - g:*

4. Failure occurred on

O Body of Pipe	O Pipe Seam	O Scraper Trap
O Pump	O Sump	O Joint
O Component	O Valve	O Metering Facility
O Repair Sleeve	O Welded Fitting	O Bolted Fitting
O Girth Weld		

Other *(specify)* _____

Year the component that failed was installed: / / / / /
5. Maximum operating pressure *(MOP)*
   a. Estimated pressure at point and time of accident: _____ *PSIG*
   b. MOP at time of accident: _____ *PSIG*
   c. Did an over pressurization occur relating to the accident? OYes O No

a. Type of leak or rupture
   OLeak: O Pinhole O Connection Failure *(complete sec. H5)*
   O Puncture, diameter *(inches)* _____
   ORupture: O Circumferential – Separation
   O Longitudinal – Tear/Crack, length *(inches)* _____
   Propagation Length, total, both sides *(feet)* _____
   ON/A
   OOther _____

b. Type of block valve used for isolation of immediate section:
   Upstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve
   Downstream: ☐ Manual ☐ Automatic ☐ Remote Control ☐ Check Valve

c. Length of segment isolated _____ ft
d. Distance between valves _____ ft
e. Is segment configured for internal inspection tools? OYes O No
f. Had there been an in-line inspection device run at the point of failure? O Yes O No O Don't Know
   O Not Possible due to physical constraints in the system
g. If Yes, type of device run *(check all that apply)*
   ☐ High Resolution Magnetic Flux tool Year run: _____
   ☐ Low Resolution Magnetic Flux tool Year run: _____
   ☐ UT tool Year run: _____
   ☐ Geometry tool Year run: _____
   ☐ Caliper tool Year run: _____
   ☐ Crack tool Year run: _____
   ☐ Hard Spot tool Year run: _____
   ☐ Other tool Year run: _____

PART D – MATERIAL SPECIFICATION

1. Nominal pipe size *(NPS)* / / / / / in.
2. Wall thickness / / / / / in.
3. Specification _____ SMYS / / / / / /
4. Seam type _____
5. Valve type _____
6. Manufactured by _____ in year / / / / /

PART E – ENVIRONMENT

1. Area of accident
   O In open ditch
   O Under pavement
   O Above ground
   O Underground
   O Under water
   O Inside/under building
   O Other _____
2. Depth of cover: _____ inches

PART F – CONSEQUENCES

1. **Consequences** ***(check and complete all that apply)***

a.	Fatalities	Injuries
Number of operator employees:		
Contractor employees working for operator:		
General public:		
Totals:		

b. Was pipeline/segment shutdown due to leak? OYes O No
If Yes, how long? _____ days _____ hours _____ minutes

c. Product ignited OYes O No d. Explosion OYes O No
e. ☐ Evacuation *(general public only)* / / / / / people
Reason for Evacuation:
O Precautionary by company
O Evacuation required or initiated by public official

f. Elapsed time until area was made safe:
/ / / hr. / / / min.

2. **Environmental Impact**
   a. Wildlife Impact: Fish/aquatic O Yes O No; Birds O Yes O No; Terrestrial O Yes O No
   b. Soil Contamination O Yes O No
   If Yes, estimated number of cubic yards: _____
   c. Long term impact assessment performed: O Yes O No
   d. Anticipated remediation O Yes O No
   If Yes, check all that apply: ☐ Surface water ☐ Groundwater ☐ Soil ☐ Vegetation ☐ Wildlife

e. Water Contamination: O Yes O No (*If Yes, provide the following*)
   Amount in water _____ barrels

Ocean/Seawater	O No	O Yes
Surface	O No	O Yes
Groundwater	O No	O Yes
Drinking water	O No	O Yes (*If Yes, check below.*)

O Private well O Public water intake

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Date: _____ NRC Incident No. #_____

PART G – LEAK DETECTION INFORMATION

1. Computer based leak detection capability in place? O Yes O No

2. Was the release initially detected by? (check one):
O CPM/SCADA-based system with leak detection
O Static shut-in test or other pressure or leak test
O Local operating personnel, procedures or equipment
O Remote operating personnel, including controllers
O Air patrol or ground surveillance
O A third party O Other (specify) _____

3. Estimated leak duration days ____ hours ____

PART H – APPARENT CAUSE

Important: *There are 25 numbered causes in this Part H. Check the box corresponding to the primary cause of the accident. Check one circle in each of the supplemental categories corresponding to the cause you indicate. See the instructions for guidance.*

H1 – CORROSION

1. ☐ External Corrosion

2. ☐ Internal Corrosion

(Complete items a – e where applicable.)

a. Pipe Coating
O Bare
O Coated

b. Visual Examination
O Localized Pitting
O General Corrosion
O Other _____

c. Cause of Corrosion
O Galvanic O Atmospheric
O Stray Current O Microbiological
O Cathodic Protection Disrupted
O Stress Corrosion Cracking
O Selective Seam Corrosion
O Other _____

d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering accident?
O No O Yes, Year Protection Started: /___/___/___/___/

e. Was pipe previously damaged in the area of corrosion?
O No O Yes ⇒ Estimated time prior to accident: /___/___/ *years* /___/___/ *months* *Unknown* ☐

H2 – NATURAL FORCES

3. ☐ Earth Movement ⇒ O Earthquake O Subsidence O Landslide O Other _____
4. ☐ Lightning
5. ☐ Heavy Rains/Floods ⇒ O Washouts O Flotation O Mudslide O Scouring O Other _____
6. ☐ Temperature ⇒ O Thermal stress O Frost heave O Frozen components O Other _____
7. ☐ High Winds

H3 – EXCAVATION DAMAGE

8. ☐ Operator Excavation Damage (including their contractors/Not Third Party)
9. ☐ Third Party *(complete a-f)*

a. Excavator group
O General Public O Government O Excavator other than Operator/subcontractor

b. Type: O Road Work O Pipeline O Water O Electric O Sewer O Phone/Cable
O Landowner-not farming related O Farming O Railroad
O Other liquid or gas transmission pipeline operator or their contractor
O Nautical Operations O Other _____

c. Excavation was: OOpen Trench O Sub-strata (boring, directional drilling, etc...)

d. Excavation was an ongoing activity (Month or longer) OYes O No If Yes, Date of last contact /___/___/___/

e. Did operator get prior notification of excavation activity?
O Yes; Date received: /___/___/ mo. /___/___/ day /___/___/___/___/ yr. O No
Notification received from: O One Call System O Excavator O Contractor O Landowner

f. Was pipeline marked as result of location request for excavation? O No O Yes *(If Yes, check applicable items i - iv)*
i. Temporary markings: O Flags O Stakes O Paint
ii. Permanent markings: O
iii. Marks were (check one) : O Accurate O Not Accurate
iv. Were marks made within required time? O Yes O No

H4 – OTHER OUTSIDE FORCE DAMAGE

10. ☐ Fire/Explosion as primary cause of failure ⇒ Fire/Explosion cause: O Man made O Natural
11. ☐ Car, truck or other vehicle not relating to excavation activity damaging pipe
12. ☐ Rupture of Previously Damaged Pipe
13. ☐ Vandalism

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Date: _____ NRC Incident No. #_____

H5 – MATERIAL AND/OR WELD FAILURES

Material

14.☐ Body of Pipe ⇒ O Dent O Gouge O Bend O Arc Burn O Other _____
15.☐ Component ⇒ O Valve O Fitting O Vessel O Extruded Outlet O Other _____
16.☐ Joint ⇒ O Gasket O O-Ring O Threads O Other _____

Weld

17.☐ Butt ⇒ O Pipe O Fabrication O Other _____
18.☐ Fillet ⇒ O Branch O Hot Tap O Fitting O Repair Sleeve O Other _____
19.☐ Pipe Seam ⇒ O LF ERW O DSAW O Seamless O Flash Weld
O HF ERW O SAW O Spiral O Other _____

*Complete a-g if you indicate **any** cause in part H5.*

a. Type of failure:
O Construction Defect ⇒ O Poor Workmanship O Procedure not followed O Poor Construction Procedures
O Material Defect

b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site? O Yes O No

c. Was part which leaked pressure tested before accident occurred? O Yes, *complete d-g* O No

d. Date of test: /__/__/__/__/ yr. /__/__/ mo. /__/__/ day

e. Test medium: O Water O Inert Gas O Other _____

f. Time held at test pressure: /__/__/ hr.

g. Estimated test pressure at point of accident: _____ *PSIG*

H6 – EQUIPMENT

20. ☐ Malfunction of Control/Relief Equipment ⇒ O Control valve O Instrumentation O SCADA O Communications
O Block valve O Relief valve O Power failure O Other _____
21. ☐ Threads Stripped, Broken Pipe Coupling ⇒ O Nipples O Valve Threads O Dresser Couplings O Other _____
22. ☐ Seal Failure ⇒ O Gasket O O-Ring O Seal/Pump Packing O Other _____

H7 – INCORRECT OPERATION

23. ☐ Incorrect Operation
a. Type: O Inadequate Procedures O Inadequate Safety Practices O Failure to Follow Procedures
O Other _____

b. Number of employees involved who failed a post-accident test: drug test: /__/__/__/ alcohol test /__/__/__/

H8 – OTHER

24. ☐ Miscellaneous, *describe:* _____
25. ☐ Unknown
O Investigation Complete O Still Under Investigation *(submit a supplemental report when investigation is complete)*

PART I – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT *(Attach additional sheets as necessary)*

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TransCanada
In business to deliver

date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Preliminary Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline at Station/MLV Location, near Town, Province, on date of occurrence

Further to our verbal report of date to Board Staff Member Mr. x, the following is TransCanada's Preliminary Incident Report in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations and Section 5 of the Transportation Safety Board Regulations.

(a) describe the incident, including the events leading up to and following the incident;

(b) list all relevant agencies contacted and persons affected by the incident;

(c) summarize any losses or impacts to people (e.g., injury, fatalities), environment (e.g., terrain, habitats, animals), production (e.g., interruption or reduction in service), and property;

If this were a gas release incident, use the following canned statement:

The environmental impact of this gas release is related to greenhouse gas emissions to atmosphere. This incident resulted in a maximum emission of _____ kt of methane which corresponds to _____ kt of CO_2 equivalents. The gas released from this incident will be included in our annual green house gas emission report to Statistics Canada.

DRAFT

Aside: Following is the formula for calculating kilotonnes of methane and kilotonnes of CO_2:

$$\frac{10^3\ m^3 \times 0.71}{1000} = \text{kt Methane}$$

$$\text{kt Methane} \times 21 = \text{kt } CO_2 \text{ equivalents}$$

(d) identify any unsafe acts or conditions contributing to or causing the incident;

(e) provide details on any emergency response,

(f) state any corrective actions taken or planned to be taken to minimize the effects of the incident.

Yours very truly,
TransCanada PipeLines Ltd.

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(Legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

DRAFT

TransCanada
In business to deliver

date

Transportation Safety Board of Canada
Place du Centre, 4th Floor
200 Promenade du Portage
Hull, Québec
K1A 1K8

Attention: Mr. Larry Gales, P. Eng.

Dear Sir:

Re: Detailed Incident Report involving event type on the TransCanada PipeLines Limited ("TransCanada") Canadian Mainline, Station/MLV Location, near Town, Province, on date of occurrence

The following is TransCanada's Detailed Incident Report, in accordance with the requirements of Section 52 of the National Energy Board's Onshore Pipeline Regulations, 1999 and Section 5 of the Transportation Safety Board Regulations.

Board Staff Member Mr. (name) was notified of the event type on date of occurrence. The Preliminary Incident Report was filed with the Board on date.

a) provide any details regarding the failure mechanism and detailed analysis of the failed component (if necessary);

(b) identify the underlying causes of the incident;

(c) update the progress of any corrective actions taken or planned to be taken to minimize the effects of the incident;

(d) state any actions taken or planned to be taken to prevent a similar incident.

DRAFT

Yours very truly,
TransCanada PipeLines Limited

Original signed

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager)

J. Baggs	(all reports)
K. Black	(all reports)
D. King	(all reports)
B. McConaghy	(if safety, health or environment related)
G. Scaman	(all reports)
J. Scott	(legal review)
D. Wishart	(all reports)

Incident & Issue Tracking No. _____

DRAFT

TransCanada
In business to deliver

450 - 1st Street S.W
Calgary, Alberta, Canada T2P 5H1
tel 403.920-7069
fax 403.920-2319
E-mail roel_lancee@transcanada.com

Date

National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta
T2P 0X8

Attention: Ms. Claudine Dutil-Berry, Secretary

Dear Madame:

Re: Unauthorized event type at TransCanada PipeLines Limited ("TransCanada") Canadian Mainline Station/MLV Location, near Town, Province, on date of occurrence

TransCanada PipeLines Limited ("TransCanada") files this Incident Report to report unauthorized mechanical excavation activities pursuant to the reporting requirements of Section 13 of the National Energy Board's Pipeline Crossing Regulations Part II.

Board Staff Member _____ was initially notified of the unauthorized_____ on date of notification.

a.) Date of Occurrence

b.) Location of occurrence (Legal Land Description, MLV, mileage post, etc)

c.) Indicate whether the activity involved mechanical excavation

d.) Location of pipeline markers with respect to the unauthorized activity

e.) Indicate whether a permit was issued by pipeline company (yes or no)

f.) Name of landowner or facility owner, address and contact information (phone, fax, e-mail if applicable)

DRAFT

g.) Name of excavator or contractor, address and contact information (phone, fax, e-mail if applicable)

h.) Name of Pipeline company representative dealing with violation and contact information (phone, fax, e-mail if applicable)

i.) Concerns the pipeline company may have regarding the safety of the pipeline as a result of the construction or installation or of the excavation

j.) Any action the company intends to take or has taken

Mr. _____ met with Mr. _____ on date and discussed the requirements of notifying Info-Excavation prior to undertaking any mechanical excavation activities within the province and of having a Company Representative present to locate the pipeline and monitor the excavation when excavating on or within 30-metres of the TQM pipeline Right-of-Way. Mr. _____ provided Mr. _____ with a copy of the Integrated Public Awareness Package to remind him of their discussions.

Yours very truly,
TransCanada PipeLines Limited

R.P. Lancée, P. Eng.
Senior Regulatory Compliance Specialist

cc: (appropriate Regional Director)
(appropriate Compliance Manager)
(appropriate Area Manager
(appropriate Land Representative)
J. Baggs
K. Black
D. King
B. McConaghy
G. Scaman
J. Scott
D. Wishart

cc: S. Berthelet National Energy Board

Incident & Issue Tracking No. _____

Project

1.1 SUPPLEMENTAL EMERGENCY RESPONSE AND EQUIPMENT STATEMENT

The purpose of this is to fulfill the South Dakota Department of Environment and Natural Resources request for additional information regarding TransCanada – Keystone Pipeline's ability to respond to a spill specifically in South Dakota

- Detail description of company owned assets is found in appropriately marked Appendix A: RESPONSE EQUIPMENT/RESOURCES. Additional information is linked to Appendix F. The trailer for the Keystone Response Zone 3, North Dakota, South Dakota, and Nebraska is appropriately located in Yankton, South Dakota.

- Keystone Pipeline's primary contractor, National Response Corporation, is strategically aligned with Coteau Environmental based in Watertown, SD. Currently, no other National Response Corporation assets or Sub-Contractors reside inside of South Dakota borders.

- Keystone Pipeline fully expects to have the required assets for a spill within the four (4) hour time frame previously stated in the Response Plan.

Storm: _____

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Phase 1 **Credible Threat to Port of Brownsville Terminal**			
Complete	**Date**	**Time**	
			Terminal Manager and Corporate begin dialogue on storm.
			Notify personnel that the Terminal has moved to Phase 1.
			Notify the Spill Management Team members in case of activation.

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Complete	**Date**	**Time**	
Phase 2 **Category 1, 2 = 58 hours, Category 3+ = 84 hrs ETL 74 mph winds.**			
			Communicate to Terminal personnel that Phase 2 has been initiated and expected timing of further response activities.
			Identify personnel that will serve as the shutdown crew.
			Notify Terminal Manager to release shutdown time.
			Release non-essential personnel.

HURRICANE PREPAREDNESS/RESPONSE CHECKLIST			
Phase 3			
Complete	**Date**	**Time**	
			Send notification that Terminal has moved into Phase 3.
			Confirm storm category for response plan.
			Coordinate shutdown.
			Develop timeline of activities to finish on site based on onset of 39, 58 and 74 mph winds.
			As soon as storm passes develop plans for initial hazard assessment of the Terminal.
			Following initial hazard assessment develop plan for initial damage assessments.
			Evaluate initial hazard and damage assessments. Determine ongoing PPE requirements for outside work.

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HAZARD / DAMAGE ASSESSMENT STATUS FORM

Hazard / Damage Assessment Status Form

INCIDENT NAME: _____

Area	Checklist Complete	Time/ Date	COMMENTS
Tank Farm			
Tank #1			
Tank #2			
Tank #3			
Tank #4			
Tank #5			
Tank #6			
Tank #7			
Tank #8			
Tank Farm Berm			
Debris			
Erosion			
Cinder Block Walls			
Presence of spilled or leaking material			
Terminal Assets			
Transfer Stations			
Security Fencing			
Lighting			

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ANNEX IX

GUIDANCE FOR USING BIOREMEDIATION IN RESPONSE TO OIL SPILLS IN REGION 8

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1.0 INTRODUCTION

Biodegradation is a natural process in which microorganisms (primarily bacteria and fungi) chemically alter and break down organic molecules into other substances such as fatty acids, carbon dioxide, and water in order to obtain energy and nutrients. The basis for this process is relatively simple: microorganisms require minerals and sources of carbon, as well as water and other elements, to survive and function. The process can involve one step or a series of steps that proceed through the formation of molecules with successively fewer carbons. Excluding environmental constraints, the extent to which a particular organic molecule is biodegradable and the rate of degradation depend on the molecule's structural characteristics: chain length, amount of branching, number and arrangement of rings, and stereochemistry (Anderson 1990; Atlas 1981; Portier 1990).

Bioremediation is a treatment technology that utilizes biodegradation to reduce the concentration and/or toxicity of chemical substances such as petroleum products and other hydrocarbons. Because microbes capable of degrading hydrocarbons are commonly found in nature, most untreated hydrocarbon spills eventually are removed from the environment by microbial degradation and other processes. Giving the right conditions and time, bioremediation, however, seeks to accelerate natural biodegradation processes by applying specially chosen nutrients and/or microbes to spilled or released substances.

Bioremediation is only one of several response options that exist for any spill or release situation; the decision of whether or not to use bioremediation relies ultimately on the discretion of the Federal On-Scene Coordinator (FOSC) with approval of the RRT.

1.1 PURPOSE AND SCOPE OF THIS GUIDANCE

The general purpose of this document is to enhance preparedness to use bioremediation in response to oil spills or hazardous substance releases in U.S. Environmental Protection Agency (EPA) Region 8. Specifically, the guidance serves to:

X Outline a process by which FOSCs or Remedial Project Managers (RPMs) in Region 8 may request authorization to use bioremediation in response to oil spills. Procedures for requesting authorization will be consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), state, local and tribal regulations;

X Define the types of information necessary to determine if bioremediation is feasible; and

X Describe how to implement and monitor a bioremediation project.

This guidance is intended to be used primarily by FOSCs and the Region 8 Regional Response Team (RRT). State, local and tribal governments, responsible parties and their contractors, fire departments, and other response managers may also find use for the information outlined in this guidance.

This guidance provides only limited direction on choosing and designing bioremediation systems. It primarily discusses the types of systems that are available for use in terrestrial environments and the process for assessing the general feasibility of using bioremediation. Selecting a bioremediation system to use and optimizing system operating parameters can be complicated and highly technical. [This guidance assumes that such decisions made by the FOSC will most often be based on the site-specific recommendation of technical experts familiar with system design and operation].

1.2 APPLICABLE FEDERAL, STATE, LOCAL, AND TRIBAL REGULATIONS

Legislation and policies at the federal, state, local, and tribal levels may affect the decision to use bioremediation. Section 1.2.1 summarizes applicable federal regulations. Section 1.2.2 discusses state and tribal policies and regulations identified through preliminary research.

1.2.1 Federal Regulations

At the federal level, the primary legislation or regulations governing the use of bioremediation are the NCP and the Resource Conservation and Recovery Act (RCRA).

National Oil and Hazardous Substance Pollution Contingency Plan (NCP)

Subpart J of the NCP, "Use of Dispersants and Other Chemicals", governs the use of chemical and biological agents C which include bioremediation agents C in responding to oil spills in navigable waters or in areas where a spill might affect navigable waters or affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States. Specifically, the Subpart:

X Restricts the use of chemical and biological agents that may affect U.S. waters and/or natural resources to those listed on the NCP Product Schedule;

X Specifies technical product information that must be submitted to EPA for an agent to be added to the Schedule; and

X Establishes conditions for obtaining authorization to use chemical or biological agents in a response action.

Subpart J does not apply to terrestrial related spills if no waters are threatened unless the spill affects federally managed or protected natural resources (e.g., federally administered lands, listed threatened and endangered species and their habitats, migratory birds and their habitats).

The FOSC, with concurrence of the EPA representative to the RRT and the RRT representative(s) from the state(s) affected by the spill, may authorize the use of any agent listed on the NCP Product Schedule. In addition, when appropriate and practicable, the FOSC should consult with the Federal Natural Resource Trustees (U.S. Department of the Interior (DOI), U.S. Department of Agriculture (DOA), U.S. Department of Energy (DOE), or U.S. Department of Defense (DOD)) as well as any other applicable land management agencies and Natural Resource Trustees, before making a decision to bioremediate a spill. The RRT may preauthorize the use of any agent on the NCP Product Schedule in specific locations under specific circumstances with approval by the EPA representative, the RRT representatives from the states affected, and Natural Resource Trustees. If the use of particular products is approved in advance under certain specified circumstances and such pre-approval is specified in the Region 8 Regional Contingency Plan, the FOSC may authorize use of those products for bioremediation without consulting the RRT or the federal Natural Resource Trustees.

Resource Conservation and Recovery Act (RCRA)

RCRA governs the management of newly generated hazardous wastes, including their treatment, storage, and disposal. The Act:

X Prohibits the land disposal of all hazardous wastes by certain dates unless the wastes are treated to certain levels of safety, or unless no migration of the wastes will occur for as long as the wastes remain hazardous; and

X Allows EPA to specify performance levels or methods of treatment that substantially reduce the toxicity or mobility of hazardous wastes based on the performance of the best demonstrated available technology (BDAT).

These provisions of RCRA may affect the use of bioremediation in three ways:

X Bioremediation of contaminated soil performed *in situ* may be limited because the practice may be considered land-disposal.

X Microbial waste treatment, in some instances, may not be able to meet the established BDAT treatment standards.

X A specific technology other than biological treatment may be required for treating particular wastes, thereby excluding microbial waste treatment as an option.

1.2.2 State, Local, and Tribal Regulations and Policies

Each state, local, and tribal government may have its own regulations that affect the use of bioremediation. However, at this time it appears that most states and local governments (including Indian tribes) do not have regulations specifically addressing bioremediation. State, local, and tribal government oversight of bioremediation projects in the Region commonly takes the form of permit requirements. Generally, the RRT representative from the affected state or tribal land will be responsible for coordinating state, local, and tribal requirements with the FOSC. Appropriate tribal officials should be notified and invited to participate in bioremediation activities.

The following is a summary of preliminary research into state regulations and policies that are likely to be relevant to bioremediation projects.

Colorado

Three state agencies maintain oversight for responses to oil spills in Colorado, depending on the source and location of the spill: (1) the Colorado Oil and Gas Conservation Commission oversees responses to spills from oil well sites or equipment operated in conjunction with well sites; (2) the State Oil Inspection Section, Department of Labor, oversees responses to spills at gasoline stations resulting from leaking tanks or pipes; and (3) the Water Quality Control Commission of the Colorado Department of Public Health and the Environment (CDPHE) oversees responses to spills in water. All agencies follow the requirements set forth in the Colorado Water Quality Control Act (25-8-201,204) and the Oil and Gas Conservation Act, 1953 (34-60-106, Sections 1c and 9). References in the Acts to discharges of oil are limited, and neither Act specifically addresses bioremediation. CDPHE, however, has published a guidance document that addresses corrective action and state clean-up levels for soil, surface water, and groundwater contamination resulting from underground storage tank releases.

On-site bioremediation treatment is regulated differently than off-site treatment. Off-site treatment requires a Certification of Designation submitted to CDPHE and approved by the local government. The Certification of Designation is part of the Colorado regulation pertaining to solid waste disposal (6 CCR 1007-2). When the material is treated on site, the Certification of Designation may not be required, but specific issues (such as nuisance conditions and impacts to groundwater) must be addressed.

Montana

Bioremediation is allowed after review and approval by the Montana Department of Environmental Quality, Remediation Division. Approval will be granted on a case-by-case basis upon demonstration of the feasibility of bioremediation at the site. Monitoring of intrinsic characteristics will be required for a length of time determined by the Remediation Division.

North Dakota

North Dakota's water quality standards are defined in the North Dakota Century Code and in Chapter 33-16-02 of the North Dakota Administrative Code. These standards require a permit for bioremediation projects from the North Dakota Department of Health, Division of Water Quality. A NDPES permit is required if the pollutant will be discharged to surface or groundwater. An Underground Injection Control permit may be required if injection of a bioremediation agent(s) is proposed. Division of Water Quality permits will be contingent on showing no impact on the beneficial use of water resources. If there is no discharge, notification to the Division of Water Quality is still required.

A permit may also be required from the North Dakota Department of Health, Division of Waste Management, if ex-situ treatment is proposed. A permit is not required for single-application land farming, but a Land Treatment Variance Application must be provided to the Division of Waste Management prior to treatment. Division of Waste Management requirements for other forms of bioremediation are determined on a case-by-case basis.

South Dakota

South Dakota has no defined state policy regarding bioremediation; however, bioremediation is allowed on a case-by-case basis. The Interstate Technology and Regulatory Cooperation (ITRC) Work Group guidance documents, available through the Western Governors Association, (303) 623-9378, are used as guidance for bioremediation projects.

Utah

Utah's Water Pollution Control Act, Chapter 126, 26-11, can be applied to oil pollution and, by extension, to bioremediation. Utah's "Guidelines for Estimating Numeric Cleanup Levels and Petroleum-Contaminated Soil at Underground Storage Tank Release Sites" specify that in the absence of existing applicable cleanup standards, sites must be characterized by applying "evaluation criteria" so that appropriate cleanup levels can be established. Approval to use bioremediation must be granted by the Office of Underground Storage Tanks for stationary plumes, and by the Utah Department of Environmental Quality, Water Quality Bureau if water is affected.

Wyoming

Chapter 4 of the Wyoming Water Quality Rules and Regulations addresses releases of oil and hazardous substances into waters of the state. Section 4 specifies that "except in cases of extreme fire danger or unique hazardous circumstances, physical removal of the released oil or hazardous substance may be required". Section 7 states that "No chemicals shall be used to disperse, coagulate, collect, sink, or otherwise treat oil or hazardous substances releases except in emergency situations which are a danger to health and welfare. These chemicals must be used in a manner authorized by the Wyoming Department of Environmental Quality in coordination with the U.S. Environmental Protection Agency".

The Wyoming Department of Environmental Quality, Solid and Hazardous Waste Division offers "Solid Waste Guideline #2, Petroleum Contaminated Soils" to describe the treatment and disposal of soils contaminated with petroleum products. Addition of fertilizer and tilling contaminated soils to enhance *in situ* bioremediation is the primary treatment method described in Guideline #2. Regulatory requirements may also be met by other methods (such as addition of bioremediation agents other than fertilizer) with concurrence by the Solid and Hazardous Waste Division. It will be necessary to obtain authorization and/or permits from the Solid and Hazardous Substance Division for treatment and disposal of petroleum-contaminated soils. A one-time authorization to treat and dispose of petroleum contaminated soils on site may be granted by the Solid and Hazardous Waste Division. All state and federal treatment and disposal standards must be met.

2.0 PROJECT SELECTION AND INITIATION

This section describes the steps that must be taken to select and prepare for a bioremediation project. It provides guidelines for assessing the general feasibility of bioremediation for spill/release response in terrestrial environments. Information in this section is organized in three parts: (1) a general discussion of decision tools to assist FOSCs, (2) bioremediation feasibility assessment criteria, and (3) steps to initiate a bioremediation project.

2.1 DECISION TO USE BIOREMEDIATION

Choosing the most appropriate method or technology, such as bioremediation, for cleaning up a spill/release can be a complex process, particularly considering the number of response alternatives

available. In some cases more than one response method may be warranted, further complicating the decision process.

In deciding whether to use bioremediation, the following factors should be considered:

X Any prohibitions or restrictions on the use of bioremediation established by regulations or policies governing cleanup or remedy selection (see Section 1.2 of this plan);

X Characteristics (e.g., nature, type, concentration) of the contaminant that may limit the extent to which the contaminant is biodegradable;

X Geological (e.g. soil matrix) and/or hydrogeological factors that may complicate implementation and success of bioremediation treatment;

X Presence of indigenous flora and/or fauna that may be affected by bioremediation implementation and impacts due to bioremediation use; and

X Availability of personnel, equipment, facilities, and coordinating infrastructure necessary to conduct a proper operation.

In assessing the appropriateness of bioremediation versus other, more traditional cleanup technologies such as excavation and subsequent landfill disposal or incineration, or when assessing various bioremediation systems, the following issues should be considered and incorporated into the decision process:

X Desirability and feasibility of on-site treatment;

X Removal efficiencies;

X Cleanup levels determined by state, local, tribal, or federal agencies;

X Depth of contaminants;

X Relative cost (actual costs of treatment may vary depending on the concentration of contaminants, amount of contaminated soil or water, whether treatment is performed on site, and the distance contaminated material must be transported for disposal);

X Burden to water resource availability (if applicable);

X Impacts to natural resources; and

X Time available for performing treatment (the average time frame for an *ex-situ* bioremediation project is from 60 to 90 days, whereas the average time frame for an *in situ* bioremediation project is 12 to 24 months) (Calabrese 1989).

The following tools have been developed to assist FOSCs and the RRT in evaluating spills/releases for bioremediation treatment and to document the basis for response decision making regarding bioremediation:

X A flow chart outlining the decision process for FOSCs to follow when deciding whether to use bioremediation or to provide concurrence on a plan for implementing bioremediation (see Exhibit 1); and

X A form for applying for authorization to use bioremediation (see Exhibit 4).

A completed application form should be transmitted to the FOSC through the EPA RRT representative, who will forward it to the RRT for review, in requesting authorization to proceed with a bioremediation project.

2.2 FEASIBILITY ASSESSMENT CRITERIA

The most logical first step in evaluating the general feasibility of bioremediation (a baseline "go" or "no go" evaluation) is to consider possible constraints of existing regulations and policies. Assuming there are no regulations forbidding the use of bioremediation, assessing the feasibility of bioremediation should be approached in two stages:

(1) Determine whether characteristics of the contaminant, affected soils, and affected habitats make the spill/release a good candidate for bioremediation treatment.

(2) Determine whether bioremediation can be implemented effectively given various logistical concerns, such as the availability of needed equipment and personnel.

A discussion of these criteria is offered below.

2.2.1 Contaminant Characteristics

The chemical elements that must be considered in the decision to select bioremediation are the extent to which the chemical constituents of the contaminant are biodegradable and the extent to which the contaminants are toxic to microorganisms and pose a threat to other life forms. If, for example, the target contaminant, or one of its components or degradation products, is toxic to microbes, the microbes will likely become ineffective for purposes of bioremediation long before the contaminant is gone. Also, if there is a mixture of contaminants, the effectiveness of bioremediation may be limited because most microbes only degrade particular contaminants. Thus, knowing the identity and characteristics of the targeted contaminant is crucial to predicting the likely success of any bioremediation response strategy.

For oil, the constituents can generally be divided into four categories of hydrocarbons: (1) saturates (which includes *n*-alkanes, branched alkanes, and cycloalkanes); (2) aromatics; (3) asphaltenes; and (4) resins (Atlas 1988). Rates of biodegradation are typically the highest for *n*-alkanes, followed by branched or cycloalkanes, and then low-molecular-weight aromatic compounds; rates for high-molecular-weight aromatic compounds, asphaltenes, and resins tend to be very low (Atlas 1988; Leahy 1990). In addition, many of the low-molecular-weight saturated and aromatic compounds are highly volatile, tending to evaporate quickly, as well as toxic to microorganisms and other forms of life.

Some general characteristics of crude oil and various refined petroleum products are presented below.

Crude oil may vary widely both in physical properties and chemical composition, depending on its source. Crude oil often is designated by its country or region of origin, and specific types of crude generally represent a blend of oils from multiple wells. Although the particular composition of any given crude oil designate, such as South Louisiana crude, may vary from one shipment to the next, crudes from the same area will exhibit some general characteristics that make them unique. Hydrocarbon compounds constitute 50 to 90 percent of crude oil, the remainder of which is composed chiefly of oxygen, nitrogen, or sulfur compounds (McGraw-Hill 1990). A crude oil is typically categorized as light, medium, or heavy based on its specific gravity and viscosity (a heavy crude has a higher specific gravity and is more viscous than a light or medium crude), which are directly related to the composition of the particular crude oil. In general, lighter crudes are better candidates for

bioremediation than are heavier crudes because of their greater proportion of low-molecular-weight and straight-chain hydrocarbons.

Gasoline are typically mixtures of hydrocarbons containing 4 to 12 carbon atoms. Gasoline may evaporate completely in a few hours under temperate conditions. They pose a risk of fire and explosion associated with their high volatility, and are generally more toxic than crude oil because of their high concentration of low-molecular weight compounds. Because of their potential toxicity to microorganisms and high volatility, gasoline and other very light oils may not be good candidates for bioremediation.

Kerosene, often used for jet fuel, primarily contain hydrocarbons with 10 to 16 carbon atoms and tend to evaporate relatively quickly, but slower than gasoline. Kerosene and other light oils can generally be considered as potential candidates for bioremediation.

Diesel fuels and ***bunkering fuels*** contain a greater percentage of hydrocarbons with increasing numbers of carbon atoms. They also contain greater proportions of substances other than hydrocarbons. They have low volatilities and persist in the environment for an increasing period of time as the "weight" of the material increases. These medium to heavy oils can generally be considered as potential candidates for bioremediation; however, they have been reported as less susceptible to biodegradation than lighter oils, particularly if they are weathered (Atlas 1981).

If, based on the analysis of a contaminant's characteristics, the target contaminant is determined not to be a good candidate for microbial treatment, further consideration of bioremediation should be halted at this point.

2.2.2 Soil Characteristics

After evaluating the spilled/released contaminant's susceptibility to and suitability for biotreatment, the types of soils in affected areas should be identified and characterized. Characterizations of soil are based in part on the total organic content of the soil and the size of the mineral particles in the soil. These two factors can dramatically affect the success of a bioremediation system. The size of the soil's mineral particles also affects the availability of oxygen. Soils with larger mineral particles are more permeable by air, as well as water, and thus may be a rather hospitable environment for microbes. For this reason, sandy and loamy soils are often amendable to bioremediation, while soils high in clay concentrations may not be ideally suited to bioremediation without amendments (Bluestone 1986). However, the process control available in some forms of *ex-situ* treatment systems can mitigate some of the effects of soil on the feasibility of bioremediation. The success of in-situ bioremediation as a process is dependent on optimizing soil characteristics thru soil amendments and active soil management program.

2.2.3 Habitat Characteristics

The sensitivity of flora and fauna in the affected habitat should also be assessed, in consultation with the Natural Resource Trustees, relative to other treatment options or the "no treatment" option. Three questions in particular should be considered:

(1) Could the trampling, digging, and other physically disruptive actions often associated with traditional methods of clean-up exacerbate or be worse for the affected habitat than the adverse effects of the contaminant? If so, consider bioremediation and the "no treatment" option. Note that optimizing bioremediation can be very disruptive if land treatment practices are required. Successful bioremediation will likely require active soil management.

(2) Does the affected habitat have a sophisticated and fragile ecosystem that could be seriously disrupted by the introduction and/or stimulation of a microbial strain? If so, *in situ* bioremediation systems are probably not feasible.

(3) Could the potentially physically and/or chemically disruptive activities associated with applying bioremediation agents and monitoring applications, or removing soil

for *ex-situ* treatment, be worse than the "no treatment" option? If so, bioremediation is probably not feasible.

Answers to these questions may be provided in whole or in part by referring to the Region 8 Regional Contingency Plan (RCP) and Sub-Area Contingency Plans, which identify sensitive areas, endangered species, and other relevant information. Efforts to answer these questions should be coordinated with the FOSC, particularly with regard to determining whether a question is relevant to the incident under consideration. Natural Resource Trustees are valuable resources for these habitat-related issues.

2.2.4 Logistical Concerns

The general logistical feasibility of implementing bioremediation should be evaluated before selecting and designing a specific bioremediation system. Questions to consider in evaluating logistical feasibility include the following:

X What is the scale of the proposed bioremediation project in terms of the size of the application area or the amount of contaminated material to be treated, and what role will bioremediation play in the entire cleanup strategy?

X What types of agents and how much of those agents are required to implement bioremediation, and are those agents available in sufficient quantities?

X What application method is best suited for applying agents to the affected area or contaminated material, and are the necessary personnel and equipment resources available for effective application?

X What types of equipment and personnel are necessary to monitor the bioremediation response effort, and are those resources available for the length of time required for the entire bioremediation response effort.

2.3 PLANNING FOR BIOREMEDIATION IMPLEMENTATION

If bioremediation is determined to be a feasible option for treating all or portions of a spill/release (or contaminated material), then the next step is to select, design and implement an appropriate bioremediation system C including selecting any specific bioremediation agents for use as may be appropriate.

2.3.1 Notification of Proposed Bioremediation

The initial request to conduct a bioremediation project according to this guidance must be submitted to the FOSC through the EPA representative to the RRT. The FOSC may also initiate a request to conduct a bioremediation project. The state representative to the RRT will provide notifications to all interested state agencies and coordinate permitting/approval requirements. The form for applying for authorization to use bioremediation can be found in Exhibit 4.

2.3.2 Development of Project Implementation Plan

Application for concurrence to conduct a bioremediation project requires that a project implementation plan, or Action Plan, be developed. Site inspections and other assessment activities will need to be performed by various agencies and potentially responsible parties to collect data in support of preparing this plan. The Action Plan should describe the project in detail and address procedures for site control, agent application, and project monitoring. A site-specific health and safety plan should be prepared in compliance with Occupational Safety and Health Administration (OSHA) and EPA regulations.

2.3.3 Plan Review and Concurrence

The FOSC will coordinate the review of and concurrence on the Action Plan with the appropriate RRT members and other appropriate parties, such as Natural Resource Trustees, the staff of EPA's Environmental Response Team and consulting contractors. Concurrence on the Action Plan by the State/Tribal RRT member(s) will be contingent upon provisions for obtaining necessary authorizations and permits.

2.3.4 Plan Implementation

Once concurrence on the Action Plan has been obtained, the bioremediation project can be initiated. Oversight by several agencies, in addition to the "lead", may occur.

2.3.5 Monitoring

Ongoing monitoring as specified in the Action Plan will be expected throughout the bioremediation project. Section 6.0 of this plan describes the development of a monitoring plan for a bioremediation project.

The basic components of an Action Plan are available from other sources. The remainder of this plan provides a review of the components of the Action Plan and Monitoring Plan that are specific to bioremediation projects.

3.0 BIOREMEDIATION SYSTEMS FOR TERRESTRIAL ENVIRONMENTS

Bioremediation seeks to accelerate natural degradation processes through the application of specially chosen nutrients (biostimulation) and/or microorganisms (bioaugmentation) to contaminated soil, water, or sludge. A number of systems exist for employing the technology, some of which involve treating contaminated material without removing it from its original location. This section presents a discussion of these systems.

3.1 BIOSTIMULATION VS. BIOAUGMENTATION

Biostimulation involves fertilizing (applying nutrients) and/or oxygenating contaminated material in order to increase the concentration of indigenous microbes and to encourage the degradative activity of these microbes by providing the essential elements they need for growth. This strategy may offer convenience because indigenous microbes are already adapted to the environmental conditions of the contaminated material. It may be inefficient, however, for several reasons: (1) the microbes may be poor degraders of the target contaminants, (2) the microbes may need time to become acclimated to the presence of new pollutants in their environment so that they can better consume these pollutants (such as may be the case following a spill), or (3) the microbial population may be small such that initial biodegradation rates will be very low. Any of these conditions may result in a lag in the response, and can lead to spreading of pollution and a longer cleanup period.

Bioaugmentation involves choosing a strain or consortium of commercially-grown microbes that (1) has demonstrated an ability to consume the target contaminants, and (2) thrives in environments similar to the one that must be cleaned. The microbes are then introduced into the contaminated materials or site, and cared for through the provision of water, fertilizer, and/or oxygen (or an oxygen source). The primary advantage to using bioaugmentation rather than biostimulation is that the microbes best suited to degrade a target contaminant can be utilized (Gebhart 1988). One potential drawback of bioaugmentation is that foreign microbes could disturb the ecology of a particular area and have unforeseen pernicious consequences (Bluestone 1986). Another drawback is that the foreign microbes may not compete well with indigenous microbes for nutrients and water. As a result, regular additions of microbes to contaminated material may be required to sustain desired biodegradation rates.

3.2 *IN SITU* VS. *EX-SITU* TREATMENT

In situ treatment refers to treating contaminated material without removing it from the ground. *Ex-Situ* treatment refers to bioremediation systems implemented above ground and involves moving contaminated material from its original location. To be effective, any bioremediation system C whether implemented *in situ* or *ex-situ* C must meet two requirements: (1) nourish microbes with their essentials for life, including oxygen (where appropriate), water, and nutrients such as nitrogen and phosphorous and (2) provide conditions favorable for microbial growth, such as favorable temperature and pH. The ability to meet these two requirements is a major factor in deciding which type of treatment technique to use.

3.3 *IN SITU* SYSTEMS

In situ bioremediation systems generally are best suited to sites where contaminants are near the ground's surface or can easily be accessed from the surface, or where the geography of the site makes removal of materials impossible (Gebhart 1988). There are two principal advantages of *in situ* systems. First, the general physical layout of contaminated sites is not greatly altered. Second, *in situ* systems do not involve excessive movement of contaminated material, so transportation costs may be less than with other methods of clean-up. A disadvantage of *in situ* systems is that they may take more time than either *ex-situ* systems or conventional mechanical means of clean-up.

The three main systems of *in situ* bioremediation are land farming, bioventing, and aquifer renovation. (Note: The descriptions that follow are applicable to both biostimulation and bioaugmentation).

3.3.1 Land farming

Land farming, sometimes called biofarming, shares similarities with conventional farming except that the products being grown are bacteria and/or fungi rather than plants for harvesting. During land farming, contaminated soil is spread over an area of land and adjusted to optimum levels of moisture, pH, and nutrient concentration so as to create an ideal environment for optimizing bacterial growth with simultaneous degradation of soil contaminants. Physical characteristics of the soil are optimized through amendments of organic and inorganic agents e.g. sand, biosolids, wood chips, and chopped straw. The soil is then tilled to promote aeration. Optimum growth conditions are maintained by periodically adjusting soil parameters and tilling the soil over the duration of the treatment period, or until treatment endpoints are reached. To control runoff and leaching of contaminants, the farmed plot may be equipped with water collection or leachate collection facilities. Optimum moisture levels must be maintained via active watering or irrigation.

Land farming is best suited to conditions where (1) the climate is warm enough to promote bacterial growth, (2) the amount of contaminated material is large such that the cost of transporting it would be prohibitive, (3) little or no danger exists that contaminants will migrate over the course of the treatment period, and (4) contamination is concentrated in the top 6 to 12 inches of soil (EPA 1991). It should be noted that land farming does cause some disruption to a contaminated site through the treatment and tilling of the soil. This can alter the vegetation and therefore the habitat available for wildlife. Land farming can also be conducted *ex-situ* by removing soil/sediment to an off-site location.

3.3.2 Bioventing

Bioventing is a system that can be used to treat organic contaminants (such as fuels and solvents) located in the vadose zone (The vadose zone is the part of the earth's crust that holds water but is located above the permanent groundwater level). It attempts to encourage biodegradation of contaminants in the ground while minimizing stripping of volatile constituents. The system is comprised primarily of a series of injection wells through which air is delivered to contaminated soils, where it can be used by indigenous aerobic microorganisms. Water and nutrients also may be pumped into the soil through the injection wells to aid in microbe growth. In some situations, extraction wells may be installed to help draw the air through and then out of the soil.

Air can be delivered mechanically with a compressor or blower, or passively by allowing atmospheric air to pass through the injection wells and into the contaminated zone. Air should be injected at relatively low rates so that it does not simply blow through the contaminated area and lead to cross-media (air or water) contamination with volatile organic compounds. In setting air flow rates, oxygen needs of soil microorganisms need to be balanced with potential production of off gases. This will help to minimize the need for off gas capture and decontamination. If such gases are generated, it may be necessary to use an off gas treatment system.

Bioventing generally is well-suited as a cleanup technique in porous unsaturated soils offering conditions suitable for microbe survival, but where oxygen is a limiting factor.

3.3.3 Aquifer Renovation

Aquifer renovation, also referred to as *in situ* stimulation, is a method of treating contaminated groundwater. This system involves adding oxygen and/or nutrients to the contaminated water in order to enhance microbial degradation of the contaminants. Characteristics of the contaminated site determine how the oxygen and nutrients should be mixed into the water. Mixing generally is accomplished through the use of injection and extraction wells. Extraction wells may be built to draw the groundwater out so that oxygen (often in the form of surface air or hydrogen peroxide) and/or nutrients can be added above ground. The enriched water would then be returned to the aquifer through injection wells. In some cases, the groundwater may be retained in a bioreactor (see Section 3.4.4) containing microbes before being returned to the aquifer. Oxygen may be introduced to the groundwater by injecting a chemical that releases oxygen (such as hydrogen peroxide) or installing a subsurface drain.

An aquifer renovation system's effluent (consisting of clean water, oxygen and nutrients) can either be recirculated or disposed of, depending on the nature of the site.

3.4 EX-SITU SYSTEMS

Ex-Situ bioremediation systems offer greater control over the treatment process than do *in situ* systems. Temperature, environmental conditions, direction of leachate and runoff, the flow of off gases or vapors, and microbial contact with contaminated material can all be manipulated and controlled much more thoroughly in *ex-situ* systems than *in-situ* systems. However, *ex-situ* systems

necessitate at least some physical disruption of contaminated sites as well as some transportation costs.

The four main types of *ex-situ* bioremediation systems are prepared beds, composting, slurry reactors, and bioreactors.

3.4.1 Prepared Bed

Prepared bed treatment is similar in many ways to land farming except the soil to be treated is moved to a lined treatment bed specially designed to collect soil runoff and leachate. The soil is spread on the bed to a depth that facilitates the flow of oxygen as well as the distribution of moisture and nutrients. Ideal or nearly ideal oxygen concentrations, moisture levels, pH, and nutrients levels are maintained throughout the treatment period. Prepared beds may be built under cover or indoors to protect them from the weather and to give operators control over the climate and/or vapors.

Prepared bed systems would be preferable to land farming in colder climates or colder months of the year, or in situations where site and/or contaminant characteristics present the danger of contaminant migration, vapor releases, or uncontrolled runoff and leachate.

3.4.2 Composting

Composting involves mixing contaminated soil with an organic bulking agent, such as straw or wood chips, placing the resulting mix in large piles, and aerating the piles. The compost piles trap heat in while allowing moisture and air to circulate, and thus create a favorable environment for bacteria to grow. One approach to aerating the piles involves placing them onto bases containing perforated pipes attached to blowers; this approach is known as static pile composting (EPA 1991). Another approach is simply to periodically turn the composting material. Roofs may be built over compost piles to protect them from the weather as well as to control climate. Small drains or trenches may be installed to collect runoff.

3.4.3 Slurry Reactor

In a slurry reactor, the contaminated soil is suspended in water in a container or tank to form slurry. The container itself need not be complex: an open or closed basin with an installed liner can suffice (Zitrides 1990). The slurry is oxygenated by moving the container or mixing the slurry, and/or through sparging the slurry with air. Nutrients are typically added to the slurry, and pH and temperature controlled to aid in bacterial growth.

After the period of treatment is complete, the soil and water are separated in a clarifier or settling tank. The clean soil is generally left on site; the water can either be disposed of or reused.

A slurry reactor is an attractive bioremediation system because it enables the operator to have almost complete control over every factor involved. Thus, it can be very effective for degrading particularly difficult contaminants or soils with higher concentrations of contaminants (EPA 1989). Also, slurry reactors can be used when the land space required for land farming or prepared bed treatment is unavailable.

3.4.4 Bioreactor

A bioreactor is used for cleaning contaminated groundwater. Like a slurry reactor is for soil, a bioreactor is a highly effective system for decontaminating water because of the high degree of control it offers the operator. Though there are several different types of bioreactors, including activated sludge, trickling filter, fixed film, and activated carbon, bioreactor systems share many characteristics. Each bioreactor is essentially a container that holds contaminated water while allowing it to be mixed, aerated and maintained at favorable temperatures, pH, and nutrient levels. After treatment is complete, the clean water is separated from the excess biomass within it and then disposed; the biomass consists of a heterogeneous microbial culture and can be disposed or recycled. The proper disposal of the biomass should be evaluated on a case-by-case basis and will depend upon the types of microbes utilized, and the concentration of contaminants that were not degraded.

3.5 SELECTING A BIOREMEDIATION SYSTEM

A number of *in situ* and *ex-situ* systems exist for implementing bioremediation, any of which may be the most practical under certain situations. Some of the issues to consider in selecting a particular bioremediation system for use in response to a spill/release include the following:

Type of contaminant. Certain contaminants may need more carefully controlled conditions (e.g., moisture, oxygen, pH, temperature) to biodegrade efficiently; this control may only be achieved with *ex-situ* systems.

Amount of contaminated material. *In situ* systems may be better suited to treating large volumes of contaminated material.

Available land space. *Ex-situ* systems, particularly slurry reactors, bioreactors, and compost piles, generally require less land space to implement effectively than do *in situ* systems, and therefore may be more practical where land space is limited.

Dryness of the environment. Arid locations and climates may make *in situ* treatment systems less attractive because of the relatively high moisture needs of microorganisms; these needs may be better met with *ex-situ* systems unless provisions for watering are incorporated into the operating plan.

Depth of contamination. Deep contamination may be difficult to excavate for purposes of *ex-situ* treatment; and is also difficult to treat using *in situ* treatment.

Type of contaminated media. Certain fine-particle soils (clays) may restrict the ability to get oxygen to microbes with some *in situ* systems, and groundwater may not be practically treated using certain *in situ* or *ex-situ* systems. Fine sand and other amendment materials may have to be mixed in to optimize the matrix for bioremediation.

Temperature. In situations where external environmental temperatures are extreme, *ex-situ* systems may allow for closer to optimal rates of biodegradation.

Time constraints. Because *ex-situ* systems provide the opportunity to better optimize conditions for biodegradation, they may be preferable to *in situ* systems in situations where faster rates of degradation are needed.

In selecting a bioremediation system, refer to the advisability matrix in Exhibit 5, which indicates some of the conditions under which each type of system may be most appropriate.

3.6 DESIGNING A BIOREMEDIATION SYSTEM

The information above provides an overview of the types of systems available for bioremediation. This overview is insufficient for designing a system for a particular incident. A contractor with relevant experience should be used to design the system and determine operating parameters. Design parameters should then be chosen to optimize the conditions for treating contaminated soil, water, or sludge using bioremediation while simultaneously protecting human health and the environment from adverse effects of the treatment.

4.0 BIOREMEDIATION AGENTS AND AGENT SELECTION

This section describes the various types of bioremediation agents, a procedure for evaluating them, and guidelines for selecting the appropriate agent for use in a particular situation. Because adding bioremediation agents may not be necessary under certain circumstances with some terrestrial bioremediation systems, information in this section is only relevant when the addition of agents is necessary to achieve desired response efficiencies.

4.1 BACKGROUND

Section 311 of the Clean Water Act requires that the EPA prepare a schedule of dispersants and other chemicals that may be used in preparing for and responding to discharges of oil and releases of hazardous substances, as provided for in the NCP, 40 CFR Part 300. This schedule is known as the NCP Product Schedule. The Schedule lists agents that may be authorized for use in accordance with the procedures set forth in Section 300.910 of the NCP. (Authorization of use requires that the FOSC considering the use of a dispersant or other agent, such as a biodegradation-enhancing agent, seek the concurrence of the RRT prior to the agent's application.) Any agent considered for application to a spill or release must be listed on the NCP Product Schedule.

The NCP Product Schedule currently divides chemical and biological agents into six categories: (1) dispersants, (2) surface washing agents, (3) surface collecting agents, (4) bioremediation agents, (5) burning agents, and (6) miscellaneous oil spill control agents. Most bioremediation agents, including those that are solely nutrients, are listed as biological additives, as the designed purpose of these agents is to enhance the rate of contaminant biodegradation by increasing microbial activity. There

are also bioremediation agents listed as dispersants; these agents are water-based products that claim to enhance the rate of oil biodegradation by emulsifying spilled oil thereby making it more "bio-available". Additionally, other products that do not fit a current regulatory definition because of their unique nature may be listed as miscellaneous agents. Use of any of these agents should be consistent with the RRT's general guidelines for their application and use.

4.2 TYPES OF AGENTS

Currently, a variety of agents are available that claim to enhance the rate of biodegradation. Although there are no current regulatory definitions for every type of bioremediation agent, the following are broad definitions for those available:

Microbial agents are concentrated cultures of contaminant-degrading microorganisms grown on a contaminant-containing medium that have been air- or freeze-dried onto a carrier (e.g., bran, cornstarch, oatmeal). In some cases, the microorganisms may be raised in bioreactors at the spill site. All commercially available agents use naturally-occurring microorganisms. Some agents may also contain nutrients to help assure the activity of their microbial cultures. Microbial agents are intended to provide massive inoculums of contaminant-degrading microbes to the affected area thereby increasing the population of microbes to a level whereby the target contaminant will be used as a primary source of food or energy. Microbial agents are designed to enhance the biodegradation of contaminants, particularly hydrocarbons, at any location and are probably most useful in areas where the population of microbes capable of degrading the target contaminant is small.

Nutrients are agents comprised of nitrogen and/or phosphorous (and possibly other chemical substances) that are used as the primary means to enhance the rate of growth of contaminant-degrading microorganisms. The purpose of this type of agent is to provide the nutrients necessary to maintain or increase microbial activity and the natural biodegradation rate of the target contaminant.

Enzymatic agents are bio-catalysts designed to enhance the emulsification and/or dispersion of oil and make it more available to microorganisms as a source of food or energy. These agents are generally liquid concentrates, which may be mixed with surfactants and nutrients that are manufactured through fermentation. This type of agent is intended to enhance biodegradation of contaminants by indigenous microorganisms.

Other agents do not fall under the above definitions, such as application mechanism agents, that are designed to have an affinity for oil and bring together the elements needed for enhanced oil

degradation. Examples of application mechanism agents include time release capsules, liposomes, timed-release fertilizers (e.g., Custom Blend), and agents that make oil more hydrophilic.

4.3 AGENT EVALUATION PROCEDURE

In considering bioremediation agents listed on the NCP Product Schedule, it is important that response decision-makers evaluate the various characteristics of agents, particularly their safety and efficacy. From the perspective of planning for bioremediation use, probably the most appropriate time to evaluate agents is before spills/releases occur. Provided below is a suggested procedure designed specifically to aid in identifying bioremediation agents that will be safe and effective in field applications. There may be circumstances, however, under which there is not adequate time to perform thorough agent evaluations before a decision regarding bioremediation use must be made. In these instances, the procedure below could be used as a guide to determine whether existing information on individual agents is adequate to support further consideration of their use.

The procedure described in this subsection for evaluating bioremediation agents is based on draft protocols developed by a panel of recognized national experts from industry, academia, and government at the request of EPA. The panel was brought together under the auspices of the University of Pittsburgh Trust's National Environmental Technology Applications Corporation (NETAC), which has been working with EPA on the development of bioremediation agent screening protocols since November 1989. A full description of the development process may be found in the NETAC panel's "Oil Spill Bioremediation Products Testing Protocol Methods Manual", dated February 1992.

The evaluation procedure follows a "tiered" approach. Ideally this procedure will be conducted for bioremediation agents during pre-planning, prior to the occurrence of a spill/release. Following the procedure will not assure that a tested agent will be effective in cleanup; however, following the procedure should help to increase the level of confidence that use of a particular bioremediation agent will be effective and safe.

4.3.1 Base Tier "Go" / "No Go" Requirements and Information

Under this tier, information on a bioremediation agent would be collected from the agent vendor and an initial screening of the information performed. Objectives of this screening are to:

X Obtain basic information on a bioremediation agent's makeup;

X Ensure that required regulatory approvals are satisfied;

X Certify that the agent is free of pathogenic, carcinogenic, or hazardous substances or microorganisms normally considered unacceptable for release into the environment; and

X Ensure that the agent is listed on EPA's NCP Product Schedule.

Information needed from the agent vendor to perform this initial screening includes the agent's exact chemical and biological makeup as well as formulation characteristics, and proof of the agent's listing on the NCP Product Schedule.

4.3.2 Tier I - Feasibility Assessment

Under this tier, additional vendor information on a bioremediation agent would be collected to support a preliminary assessment of the feasibility of using a particular agent. The objectives of this tier and assessment are to obtain an understanding of a vendor's capabilities; an agent's availability, contents, and proposed method of use; and an agent's history of use, where applicable. Agent information needed from the vendor to perform this assessment includes the following:

X Application rates and methods;

X Mode of biodegradation and calculated efficiency;

X History of use at previous cleanups, especially for similar situations and environments;

X Chemical properties, fate, and persistence, and potential toxicity to or bio-accumulation by humans, mammals, fish, and birds based on a review of published literature and chemical databases;

X Acute or chronic toxicity to mammalian species, with rodent species recommended to be included; and, where available,

X Effectiveness in enhancing biodegradation over a baseline standard or control demonstrated by descriptions and quantitative analytical results of any laboratory or field studies performed (such as results of gas chromatographic analyses of treated and untreated samples for alkanes and/or aromatics).

A description of the management structure and qualifications of the vendor's organization would also be desirable. A technical bulletin providing the above information is available for each product on the NCP Product Schedule and is available by calling 202-260-2342.

4.3.3 Tier II - Laboratory-Scale Data

The specific objectives of this tier are to (1) evaluate the relative ability of a bioremediation agent to degrade the target contaminant or stimulate the rate of its biodegradation under defined and controlled laboratory conditions, and (2) determine the potential toxicity associated with the agent's use through the performance of standard toxicity tests. In obtaining laboratory-scale data, standard laboratory methods would be used to develop data on an agent's toxicity and its ability to stimulate the biodegradation of a contaminant. In the case of oil, standard oil should be used. Analytical methods developed or approved by EPA should be used to perform these laboratory studies.

The approach to evaluate an agent's relative effectiveness at degrading a target contaminant is intended to:

X Provide sufficient information to indicate with a firm degree of confidence that the agent is degrading oil constituents or another target contaminant;

X Provide an indicator of total microbial activity; and

X Assure the viability of the culture being tested, where applicable.

It would be helpful to include temperature, salinity, and nutrient testing to document the conditions under which an agent's ability to degrade a standard type of oil or other contaminant was determined.

In evaluating an agent's toxicity, a comprehensive review of literature on the avian, aquatic, and mammalian toxicity of the agent, if available, or of its constituents, is recommended. This information would be particularly valuable in determining whether any special precautions need be taken with regard to application methods, rates, or timing to protect persons applying agents as well as indigenous wildlife. Performing actual toxicity tests on appropriate mammalian species is recommended, although these tests are generally more expensive and more time consuming to perform than tests on marine species.

4.3.4 Tier III - Simulated Field Test Demonstration

Based on findings of previous tiers, microcosm systems would be used under this tier to perform simulated field test demonstrations on a bioremediation agent, as appropriate. The objective of this tier is to predict a bioremediation agent's effectiveness at degrading or enhancing the degradation of oil, petroleum products, or other environmental contaminants in specific terrestrial settings or habitats.

Although EPA-approved microcosm systems for performing such simulated field test demonstrations are not available at the time of this writing, the approach for performing these tests is to use microcosm systems that simulate actual biodegradation field kinetics. This approach would aid in determining the relative effectiveness and toxicity of an agent under conditions that cannot be modeled in standard laboratory methods, such as those proposed in Tier II of the procedure. It is recommended that microcosm systems for simulated field test demonstrations of agents consider various soil types in the Region.

4.3.5 Tier IV - Limited Field-Scale Demonstration of the Agent

Depending on the results of the simulated field test demonstration in Tier III, if available, the next tier of the procedure would involve conducting a limited field-scale demonstration of the bioremediation agent. The main objective of this field demonstration is to test the effectiveness and toxicity of the bioremediation agent in actual field tests. Another objective is to verify the accuracy of Tier III laboratory results, if available, in predicting field efficacy using the actual field monitoring data obtained. The approach for performing these demonstrations would be to collect information during active field testing to support an evaluation to confirm the bioremediation agent's estimated environmental safety and efficacy.

At this time, EPA-approved protocols for performing limited field-scale demonstrations in various terrestrial settings are not available. Until such protocols become available, the guidelines suggested in Section 6.0 for monitoring field applications of bioremediation agents in terrestrial environments could be used for evaluating limited field-scale demonstrations of agents.

4.4 AGENT SELECTION

Primarily because specific research and testing standards for bioremediation agents are very limited, selecting a bioremediation agent that will enhance the rate of contaminant biodegradation is going to require the use of professional judgment. For most of the bioremediation agents currently on the NCP Product Schedule, there are only limited comparative data by which to measure their relative efficacy and safety. Until there is widespread access to data from completed bioremediation projects, agent selection should be determined by the answers to the questions below:

(1) Has the target contaminant ever been treated by bioremediation?

- X If so, what type of agent or specific agent was used in each instance?
- X What were the conditions for use?
- X Was a significant level of degradation measured (based on chemical and biological tests) that could be attributed to the treatment?

(2) Is the agent listed on the NCP Product Schedule? Does it contain a known pathogen?

(3) To what Tier-level equivalent has the agent been formally evaluated?

(4) Is there corroborated [laboratory or field] data indicating that the agent enhances biodegradation and that it should be safe to use in the affected spill environment?

(5) Has the agent been used previously?

- X If so, what contaminant was targeted in each instance and what were its characteristics and/or initial concentration levels?

- X Under what conditions or system was the agent employed?

X Was a significant level of degradation measured (based on chemical and biological tests) that could be attributed to use of the agent?

X Is a reference available? (If so, make contact.)

(6) For any agent being considered, what is the recommended application rate for the agent and how frequently would it need to be re-applied?

(7) Is sufficient quantity of agent available, considering potential re-applications, to adequately treat contaminated material?

(8) Is there sufficient contractor support to assist with the initial application and any re-applications if necessary?

(9) What precautions would need to be taken to reduce the likelihood of improper agent handling and application and to reduce potential adverse effects related to the application procedure?

5.0 IMPLEMENTATION OF BIOREMEDIATION IN TERRESTRIAL ENVIRONMENTS

This section contains guidelines for implementing bioremediation treatment systems in terrestrial environments. It assumes that bioremediation has already been determined to be a feasible option for treating spilled/released contaminants. It also assumes that in most cases a contractor will be responsible for addressing most implementation issues.

A bioremediation system should be implemented in accordance with an approved Action Plan. The purpose of the Action Plan is to ensure the safe, coordinated, and well-documented implementation of the selected treatment system (or systems).

Typically, an Action Plan is specific for a particular cleanup project, although Action Plans for any response could have many similar components. The Action Plan should address the following issues:

Public safety. Inform the public in affected areas of response activities, address safety issues related to the presence of hazardous materials in populated areas, and analyze weather data to ensure that there is no chance of agents or hazardous materials drifting into populated areas.

Worker safety. Ensure that all OSHA and EPA regulations are followed.

Site safety. Ensure that operations are conducted in a careful, intelligent manner in accordance with OSHA regulations, equipment manufacturer's suggestions, and common sense.

Desired and/or required cleanup levels. Ensure that any bioremediation system adequately cleans contaminated sites to acceptable levels, or that alternative methods will be employed to achieve these levels.

Documentation requirements. Keep complete written records of all agents applied, size of treated areas, frequency and method of application, personnel involved in response, weather conditions, equipment used, and observed effects of bioremediation agents;

Agent application protocols. Follow protocol suggestions of agent vendor, contractor, and/or response team.

Monitoring requirements. Ensure that appropriate observations are conducted and that samples are taken and analyzed to evaluate the safety and efficacy of the treatment system as well as to support response management decisions (refer to Section 6.0 for guidelines on monitoring).

Environmental protectiveness. Ensure that any biological agent and/or chemical agent proposed does not have the potential to adversely affect fish or wildlife resources or their habitats or other sensitive environments.

6.0 MONITORING BIOREMEDIATION USE IN TERRESTRIAL ENVIRONMENTS

This section presents information that may be used to plan and implement monitoring activities designed to enable objective evaluation of bioremediation use in terrestrial environments. Once a bioremediation technology is selected, a site-specific monitoring plan should be developed. The monitoring plan is intended to determine the effectiveness and impacts of the bioremediation project.

The primary use of monitoring data is to support response-management decisions by the FOSC. Specific uses of monitoring are to:

X Identify and correct problems in the biological treatment process;

X Determine whether bioremediation end-points have been reached; and

X Ensure that biotreatment is less environmentally harmful than the "no action" alternative.

6.1 MONITORING OBJECTIVES

Objectives of monitoring activities and the major elements of each objective include the following:

Objective 1: Determine the efficacy of the selected bioremediation treatment system in enhancing the degradation of spilled/released contaminants.

X If bioremediation agents are used, certify the viability of microorganisms in and/or nutrient composition of agents in a laboratory setting before or concurrent with the initial application.

X If bioremediation agents are used, certify the ability of agents to degrade or enhance the degradation of spilled/released contaminants in a laboratory setting before or concurrent with the initial application (this requirement may be waived after the efficacy of an agent has been thoroughly demonstrated using the procedures described in Section 5.0). Monitoring of bench scale tests is often used to demonstrate the efficiency of an agent.

X Determine the extent to which the bioremediation treatment system has enhanced the rate of contaminant biodegradation as compared to an untreated, contaminated site.

Objective 2: Measure the environmental impact of bioremediation treatment for the duration of the bioremediation project, or another specified time period.

X Determine the extent to which bioremediation agents used, if any, increase or decrease the toxicity of spilled/released contaminants.

X Document adverse physical effects attributable to treatment system implementation and monitoring activities.

X Determine the extent to which bioremediation agents used, if any, alter the nutrient dynamics of the treated habitat.

Objective 3: Ensure the comparability of data collected during the monitoring of bioremediation projects conducted in the Region, for use in a Regional bioremediation data base.

X Employ standard methods and operating procedures when implementing all monitoring plans.

X Conduct sampling both at replicate treated and untreated (control) set aside sites for all bioremediation projects, unless replication is specifically ruled out on the basis of informed judgment by the FOSC or the monitoring Project Director. (Sampling from replicate sites is suggested to establish variance of means among sites.)

6.2 MONITORING PARAMETERS

The type and extent of monitoring for a given project will vary depending on the bioremediation system selected for use. Chemical parameters are the ultimate measure for success.

Suggested parameters for monitoring bioremediation treatment systems are presented in Exhibit 2. Some parameters are noted as "optional" because system design, site characteristics, and/or contaminant characteristics may make monitoring these parameters unnecessary.

The monitoring plan developed for a specific project should describe how each monitoring activity will be carried out to address the project's objectives. In addition, the plan should demonstrate that the scale of the monitoring effort proposed is adequate to produce scientifically and statistically sound results to the extent possible, given the size and/or complexity of the bioremediation project.

6.2.1 Reconnaissance and Assessment

Reconnaissance and assessment of the spill/release site is the initial step in preparing a site-specific monitoring plan, particularly when *in situ* bioremediation systems may be used. It is important to designate uniform treatment and control areas, determine resource needs, and establish baselines for evaluating the effects of bioremediation treatment.

Reconnaissance activities should emphasize the collection of qualitative information on characteristics of a spill/release and the surrounding area. Reconnaissance activities might include:

X Assessing the presence, location, and abundance of spilled oil/released hazardous substances;

X Evaluating movement of the contaminants and potential transport routes;

X Observing and recording the types, abundance, and condition of local vegetation and organisms; and

X Identifying and evaluating potential logistical problems posed by the physical habitat.

Generally, this type of information is collected during the initial response.

Assessment of environmental parameters should focus on weather conditions (e.g., precipitation, wind, weather predictions), soil characteristics (e.g., pH, oxygen concentration, moisture levels, nutrient levels), and/or groundwater or surface water characteristics (e.g., pH, dissolved oxygen concentration, nutrient levels) that may influence the success of bioremediation treatment or the ability to monitor a given project.

6.2.2 Sampling

Sampling refers to the collection of soil, water, and/or soil-water-slurry specimens (or samples) on which to perform various chemical, microbial, and/or toxicity analyses. The purpose of sampling is to collect a relatively small number of samples that once analyzed will yield valid inferences about the characteristics of or activity occurring within the matrix from which they came. The goal of sampling is to address the Monitoring Objectives

A sampling plan should be prepared enumerating the type and number of samples, analytical parameters, sampling objectives, data quality objectives, and specific sample collection techniques to be used.

Control areas should be carefully designated so a comparison can be made between activity in the untreated and treated areas. Treatment and corresponding control areas should exhibit similar chemical and physical characteristics to support their comparability. They should be relatively uniform in their nutrient availability, topographical features, geological and/or hydro-geological features, ecological characteristics, and contaminant concentration and distribution. A number of unique treatment and control areas should be selected for each significantly different habitat intended for bioremediation treatment.

In determining the total number of test samples to collect, the following factors should be considered:

X Number of unique habitats proposed for treatment;

X Number of unique matrices proposed for treatment;

X Variability in the distribution and/or concentration of contaminants in each sample matrix;

X Bioremediation system proposed for use;

X Types and number of analyses that will be performed on samples;

X Types of statistical tests that will be run on the data;

X Desired power for the statistical tests; and

X Cost and time for conducting sampling and sample analyses.

To estimate variability, some initial screening samples should be taken to the extent possible. Alternatively, a review of historical data on similar spills may provide adequate information for assessing the variability present. In some cases, professional judgment and visual inspection can assist in assessing variability, although they are not recommended as the sole determinants because of the possibility of grossly-underestimating the needed number of samples. In general, as variability increases so should the number of samples collected. Beginning and end of the growing season sampling is the minimum for assessing degradation during this period.

Unless otherwise stipulated or requested by the FOSC, only approved sampling procedures should be used. Recommended methods for sampling soil are described in EPA's *Removal Program Representative Sampling Guidance, Volume 1: Soil* (EPA 1991). Optional methods that may be used in monitoring selected matrix parameters for water and other contaminated samples are presented in Exhibit 3.

Sample collection procedures selected for use with various matrices and bioremediation treatment systems should be implemented on a schedule designed specifically to capture evidence of contaminant biodegradation. This schedule should consider the potential lag period of days to months required for growth and/or natural selection of microorganisms capable of degrading target contaminants. A lag period is most common with *in situ* bioremediation treatment systems that involve biostimulation. Samples should be collected over the duration of a bioremediation project, or until endpoints are reached.

The organization or contractor supplying bioremediation agents and/or designing the treatment system should provide a reasonable schedule for collecting samples based on past performance of the treatment system proposed, or an appropriate treatability study.

6.2.3 Laboratory Analysis

In recognition of the varied environments and habitats that can be impacted by oil spills and hazardous material releases, various types of standardized laboratory analyses can be performed on samples to help meet the objectives of a bioremediation project. These analyses can be divided into three categories: (1) chemical analyses, (2) microbial analyses, and (3) toxicity analyses. To evaluate the efficacy of bioremediation treatment systems, a combination of chemical and microbial analyses will provide a more complete evaluation than would result from performing either chemical or microbial analyses alone.

Chemical analyses are performed to measure relative changes in the composition and amount of spilled/released contaminants, as well as nutrient concentrations and other environmental conditions important to obtaining and sustaining desired levels of microbial activity. Examples of chemical analyses include:

X Fingerprinting by gas chromatography (GC) with flame ionization detection;
X Fingerprinting by gas chromatography coupled with mass spectrometry (GC/MS);
X Nitrogen analyses;
X Phosphorous analysis;
X Dissolved oxygen concentration; and
X pH determination.

Microbial analyses are performed to quantify increases in microbial populations and to measure some aspect of the metabolic activity of contaminant-degrading microorganisms. Examples of microbial analyses include:

X Viable cell counts;
X Most probable number;
X Biochemical oxygen demand; and
X Carbon dioxide (CO_2) generation.

Toxicity analyses are performed to assess and/or confirm any acute and chronic toxic effects on native organisms caused by application of bioremediation agents compared the effects caused only by the spilled/released contaminants. These analyses would likely be most applicable to projects in which bioremediation agents are used in the open environment, as opposed to when they are used in closed or well-controlled systems. However, it may be appropriate to conduct an aquatic toxicity test if there are potential pathways to surface water. The toxic potential of agents should have been evaluated during the agent selection and system design processes; so whether toxicity analyses should be performed as part of bioremediation projects needs to be assessed on a project-specific basis. Examples of toxicity analyses used to evaluate toxicity in soil systems include:

X Ames *Salmonella typhimurium* mammalian microsome assay;

X Microtox™ test;

X Seed germination experiments; and

X Plant growth studies.

Standard EPA-approved laboratory protocols or other validated and accepted methods generally are available for performing the types of analyses described above and should be used, unless otherwise directed by the FOSC. All sampling and laboratory analyses, including those of government or contract laboratories, should follow approved methods unless otherwise stipulated or requested by the FOSC.

6.2.4 Other Visual Observations and System Monitoring

For most *in situ* and *ex-situ* bioremediation projects, collection of samples should be accompanied by collection of qualitative information on environmental characteristics through visual observations. This information will assist in evaluating effects associated with implementation of the selected bioremediation treatment system and in ensuring that the spill/release situation and ensuing response are documented thoroughly and completely. Visual observations should assess the following, as appropriate given the design of the proposed bioremediation system:

X Readily discernable effects of spilled/released contaminants and any bioremediation agents used on indigenous biota;

X Physical effects of treatment system implementation and monitoring activities on the environment;

X Presence, location, and abundance of spilled/released contaminants;

X Appearance changes (such as change in color, stickiness, and consistency) in spilled/released contaminants and treated materials;

X Distribution and movement of spilled/released contaminants and bioremediation agents (where applicable); and

X Soil moisture content and temperature.

Visual observations should be conducted and documented over the duration of a bioremediation project. If adverse effects on fish and wildlife resources or other sensitive environments are observed, the bioremediation system should be evaluated expeditiously and, after consultation with the appropriate natural resource trustee, termination of the project should be considered.

Some projects may also require periodic monitoring of various system parameters, such as vacuum pressure (aquifer renovation, bioventing), airflow rates (aquifer renovation, bioventing, and prepared bed), leachate composition (composting and prepared bed), and vapor content (conceivably every non-contained system). Monitoring and, in some cases, controlling these parameters is important to optimizing system performance and determining whether additional treatment activities are necessary. Monitoring of these parameters should be performed and documented as appropriate based on the bioremediation treatment system being proposed.

Water is a common effluent in many of the bioremediation techniques discussed. Water should be tested prior to disposal. Appropriate state, local, tribal and/or federal agencies should be consulted to determine the proper treatment of disposal method and to pursue any required permitting.

6.3 DATA QUALITY REQUIREMENTS

All data collection activities should be conducted to produce data of known and acceptable quality. To help ensure that this goal and the objectives of monitoring are met, all contractors performing work as part of the monitoring effort for a bioremediation project should submit a quality assurance plan to the FOSC prior to sample collection.

Sampling from treatment and control areas, and collection of field replicates and other quality assurance/quality control (QA/QC) samples as part of monitoring are highly recommended to help ensure representativeness and comparability of sample analytical results.

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Exhibit 1
Bioremediation Feasibility Assessment Process

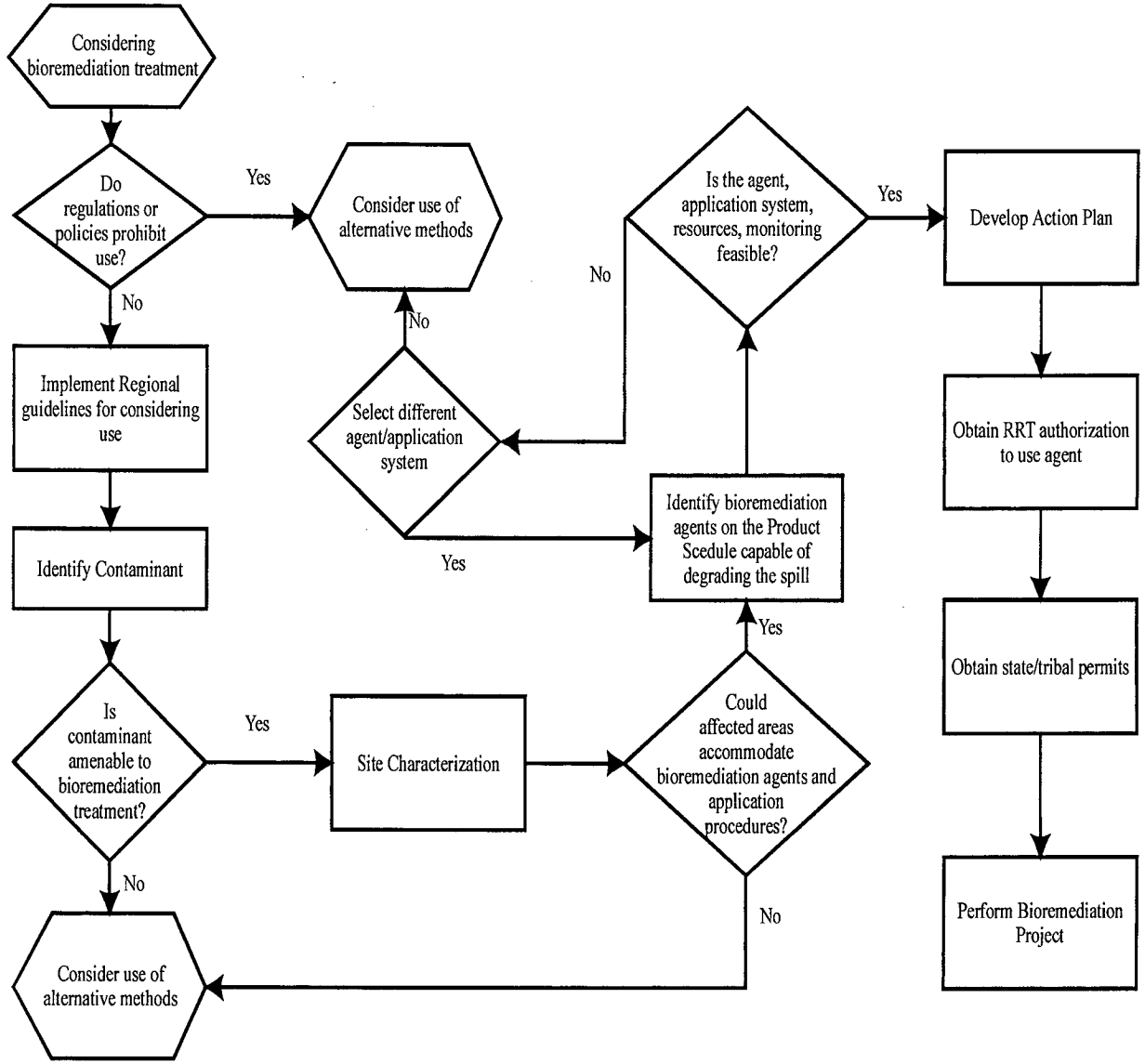

EXHIBIT 2

Suggested Monitoring Parameters for Bioremediation Treatment Systems

Monitoring Parameter	Treatment System						
	Land farming	**Bioventing**	**Aquifer Renovation**	**Prepared Bed**	**Composting**	**Slurry Reactor**	**Bioreactor**
Contaminant Concentration	T	T	T	T	T	T	T
Total Organic Carbon			T			T	T
Microbial Population	T	T	T	T	T	T	T
Nutrient Concentration	T	T	T	T	T	T	T
pH	T	T	T	T	T	T	T
Oxygen Consumption		T		T (optional)	T (optional)	T (optional)	T (optional)
Dissolved Oxygen Concentration			T			T	T
CO_2 Generation		T		T (optional)	T (optional)	T (optional)	T (optional)
Temperature	T			T (optional)	T (optional)	T	T
Moisture Content	T	T		T	T		
Other System Parameters							
Vapors	T (optional)	T		T (optional)	T (optional)	T (optional)	T (optional)
Leachate Composition	T (optional)			T (optional)	T (optional)		
Air Flow Rates		T	T	T	T (optional)		
Vacuum Pressure		T (optional)	T				

EXHIBIT 3

Optional Methods For Monitoring Matrix Parameters for Water Samples

MONITORING PARAMETER	ANALYTICAL METHOD
Contaminant Concentration	
Fingerprinting by GC with IR	ASTM Method D3328
Fingerprinting by GC/MS	ASTM Method D3328
Total Organic Carbon	
Total Petroleum Hydrocarbons Analysis	EPA 600, Method 418.1
Nutrient Concentration	
Nitrate-Nitrogen (Total)	EPA 600, Method 300.0
Nitrogen Ammonia Analysis	EPA 600, Method 350.1-350.3
Total Nitrogen, Kjeldahl	EPA 600, Method 351.1-351.4
Nitrogen Nitrate Analysis	EPA 600, Method 352.1
Nitrogen, Nitrate-Nitrite Analysis	EPA 600, Method 353.1-353.3
Nitrogen Nitrite Analysis	EPA 600, Method 354.1
Phosphorous analysis	EPA 600, Method 365.1-365.4
pH	EPA 600, Method 150.1
Oxygen Consumption	
Biochemical Oxygen Demand	EPA 600, Method 405.1
Dissolved Oxygen Uptake	EPA 600, Method 213A
Dissolved Oxygen Concentration	EPA 600, Method 360.1-360.2

EXHIBIT 4

Bioremediation Use Authorization Form

A. DETAILS OF SPILL/RELEASE -- TO BE PROVIDED AT TIME OF SPILL/RELEASE BY POTENTIALLY RESPONSIBLE PARTY (IF KNOWN), HIS AGENT, OR BY THE FOSC. ATTACH ADDITIONAL SHEETS IF NECESSARY.

1. SPILL/RELEASE DATA
   a. Circumstances (fire, grounding, collision, etc.)
   _____
   _____
   b. Location of spill/release (report all available details)
   Distance and direction from nearest navigable water _____
   Latitude and longitude _____
   Habitats affected _____
   Brief Description of topography _____
   Soil type (i.e., sandy, clay) _____
   c. Time and date of spill/release _____
   d. Potentially responsible party _____
   Name of company _____
   Address _____
   Individual to contact _____
   Telephone_____ Fax _____
   e. Product spilled/released (the name or type of product spilled/released may be useful in establishing answers requested in Sections A.2 and A.3, below)
   Type of product (crude oil, refined product, etc.) _____
   Name of crude or product (if known) _____
   Volume released (if known) _____
   f. Type of release (instantaneous, continuous, intermittent, belching, etc.)
   _____

2. PROPERTIES OF THE SPILLED OIL (IF KNOWN) (NOTE: General oil property information is discussed in Section 4.2.1 of the Bioremediation Guidance document.)
   a. Specific gravity or API gravity _____
   b. Viscosity, cp. _____ at temperature, EF _____
   c. Pour point, EF _____
   d. Sulfur content, %w _____
   PROPERTIES OF THE RELEASED HAZARDOUS SUBSTANCE (IF KNOWN): _____
   _____
   _____

3. IS OIL/HAZARDOUS SUBSTANCE EXPECTED TO BE AMENABLE TO BIOREMEDIATION?
   9 Easily 9 Moderately 9 With difficulty
   How was this estimate made (e.g., from known contaminant properties, from constituent characteristics, from field trials, from laboratory tests, from historical use information)?
   _____
   _____

B. SPILL/RELEASE AND WEATHER -- TO BE PROVIDED AT TIME OF SPILL/RELEASE BY POTENTIALLY RESPONSIBLE PARTY (IF KNOWN), HIS OR HER AGENT, OR BY THE FOSC. ATTACH ADDITIONAL SHEETS IF NECESSARY. (NOTE: Some of this information may be available from the PRP, the FOSC, or other interested parties.)

1. Weather conditions and forecast:
   a. Air temperature: Day _____ Night _____
   b. Other _____
   _____

C. DETAILS OF BIOREMEDIATION PLAN -- TO BE PROVIDED AT TIME OF SPILL BY SPILLER (IF KNOWN), HIS AGENT, OR THE FOSC

1. Specific location proposed for treatment _____
2. Bioremediation agent proposed for use
   Name _____
   Exact chemical and biological makeup and formulation characteristics of the agent
   _____
   _____
   Type of agent (nutrient or microbe) _____
   Potential toxicity or bio-accumulation by humans, mammals, fish, birds, plants, etc.___
   _____
   Specific environmental conditions for optimum results (i.e. Temperature, moisture) __
   _____
   How will the above necessary conditions be achieved _____
   _____
   _____
   Is agent on the NCP Product Schedule? 9 Yes 9 No
   To what Tier-level has it been evaluated? 9 Tier I 9 Tier II 9 Tier III 9 Tier IV
   Source of bioremediation agent _____
   Estimated amount needed _____
   Amount available _____
3. Have you verified that the agent is able to degrade the substance spilled/released? 9Yes 9 No
4. History of use at previous cleanups, especially for similar situations and environments.
5. Equipment to be used for applying bioremediation agent
   Type (backpack spray, sprinkler, etc.) _____
   Available from: Name _____
   Address _____
   Telephone _____
   Name of equipment (if known) _____
   Time (in hours) needed for transport to the spill/release site, after preparation_____
6. Has equipment been calibrated for use with bioremediation agents? _____
7. Planned rate of application _____ gal/acre
   How frequently will agent be reapplied? _____
   Mode of biodegradation and calculated efficiency _____
8. Summarize the bioremediation application/operation plan. Attach copy.
   _____
9. Summarize the monitoring plan. Attach copy.
   _____
   _____
10. Do special precautions need to be taken to prevent improper handling or application of the agent? If so, what are they? _____
    _____
    _____

EXHIBIT 5

Advisability of Various Bioremediation Treatment Systems Given Various Situational Factors

Situational Factor	Treatment System						
	Land farming	Bioventing	Aquifer Renovation	Prepared Bed	Composting	Slurry Reactor	Bioreactor
Recalcitrant contaminants						T	T
Large quantity contaminated material	T	T	T				
Deep contamination		T	T				
Soil contamination	T	T		T	T	T	
Water contamination			T				T
Fine-particle soil	T			T		T	
Extreme temperature				T	T	T	T
Arid environment				T	T	T	T
Extreme pH				T	T	T	T
Danger of contaminant migration				T	T	T	T
Time constraints				T	T	T	T
Limited funds	T				T		

Note: The information contained in this matrix indicates only some of the situational factors that might make one system better suited for use in a response than another system. Ultimately, the particular requirements of a specific spill situation and the judgment of the FOSC will determine which system is chosen.

APPENDIX A.1

FISH AND WILDLIFE AND SENSITIVE ENVIRONMENTS PLAN

FISH AND WILDLIFE AND SENSITIVE ENVIRONMENTS PLAN

APPENDIX A.1 TO REGION 7 INTEGRATED CONTINGENCY PLAN

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1.0 PURPOSE

Oil or hazardous substances spilled into the environment may have a wide range of ecological consequences. The severity of the consequences varies depending on the material spilled and the ability of the ecosystem to degrade or resist the spilled product. Reducing the overall ecological impact of a spill event and the impacts associated with response activities is the goal of this Fish and Wildlife and Sensitive Environments Plan (FWSEP, also referred to as "annex").

The purpose of this annex is to provide the Federal On-Scene Coordinators (OSCs) in U.S. EPA Region 7 (Region 7) with the information he/she needs to identify sensitive environments and provide appropriate response strategies for limiting the overall negative environmental effects of a spill. The annex will also aid in the development of Facility Response Plans required by 40 CFR 112.20. The FWSEP also assists FOSCs and Incident Commanders in protecting threatened and endangered species and their supporting habitats from the effects of response measures, and fulfilling their consultation responsibilities under the Endangered Species Act, implementing regulations, and the *Interagency Memorandum of Agreement Regarding Oil Spill Planning and Response Activities under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act* (ESA MOA, Annex V).

2.0 SCOPE

The Region 7 FWSEP develops a general overview of the sensitive areas and provides the OSC with information to assist in the sensitive environment identification process. Deciding on response techniques before a spill occurs is imperative to provide for a coordinated, immediate and effective response. The FWSEP aids in the selection of the appropriate spill protection, recovery and cleanup techniques that will help to minimize the ecological impacts of a spill.

The task of identifying all the environmentally sensitive areas in Region 7 and prioritizing them is an enormous undertaking, and will be done gradually. The FWSEP helps to identify sensitive environments that could be impacted by spills into water bodies within the Region.

The FWSEP also establishes procedures and policy for meeting the objectives set forth in the National Contingency Plan (NCP); and should be used to aid responders and planners in prioritizing and evaluating response techniques for spills in various freshwater environments and shoreline habitats. This annex aids the Area Committee in identifying special areas of concern. Those special areas of concern will be examined in detail in the Sub-Area planning phase of the Regional Integrated Contingency Plan (RICP)

development. The FWSEP also assists FOSCs and Incident Commanders in protecting threatened and endangered species and their supporting habitats from the effects of response measures, and fulfilling their consultation responsibilities under the Endangered Species Act, implementing regulations, and the Interagency Memorandum of Agreement Regarding Oil Spill Planning and Response Activities under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act (ESA MOA, Annex V).

3.0 OBJECTIVES

The National Contingency Plan (40 CFR 300.210(c)(4)(I)) delineates the objectives of this annex. The objectives have been organized into four general sections:

3.1 IDENTIFY AND ESTABLISH PRIORITIES FOR RESOURCES AT RISK

Natural resources, other sensitive resources, and appropriate resource trustees are identified. Agencies to be notified and consulted in establishing incident-specific priorities for the protection of these resources are provided. Sensitive resources identified include environmentally sensitive lands, freshwater environments, and areas of economic significance (Section 4.0).

3.2 DETERMINE ENVIRONMENTAL EFFECTS OF RESPONSE AND COUNTERMEASURES

The probable impacts of various response methods on general environments and habitats are provided. Methods for determining and approving the appropriate response techniques for specific environments and habitats, and monitoring the effectiveness of response activities are outlined (Section 5.0).

3.3 IDENTIFY FISH AND WILDLIFE RESPONSE CAPABILITIES

State and Federal response capabilities and the contacts for permitting wildlife rescue and rehabilitation are outlined. Prearranging and acquiring the appropriate response equipment, personnel and mutual aid agreements and defining the OSHA training requirements for volunteers assigned to fish and wildlife rescue are also discussed (Section 6.0).

3.4 EVALUATE THE INTERFACE OF THE RICP WITH NON-FEDERAL PLANS

The compatibility of this annex with non-Federal response plans on issues affecting fish, wildlife, their habitats and sensitive environments is evaluated (Section 7.0).

4.0 PRIORITIZATION OF RESOURCES AT RISK

To ensure that proper measures are taken to minimize the impacts of a spill on ecological and economic resources, the OSC or Responsible Party must be aware of sensitive environments and/or important resource areas. Identifying sensitive areas should be accomplished before a spill event occurs. Environmentally sensitive areas were identified by the various Natural Resource Trustees and other natural resource management agencies. Response strategies vary depending on the material spilled and the spill location. It is critical that responders realize that an immediate, but improper response, may be more damaging than waiting for the mobilization of a proper response. Critical to choosing an appropriate response is understanding the aquatic environments and habitats, and their sensitivities. It is also important to recognize the value and importance of any historic properties/sites that may be affected by response activities.

4.1 NOTIFICATION OF AND CONSULTATION WITH NATURAL RESOURCE TRUSTEES

Prompt notification of and consultation with the natural resource trustees and other natural resource management agencies is imperative so that their expertise can be utilized in identifying and protecting sensitive environments. Figure 1 assist with the protection priorities.

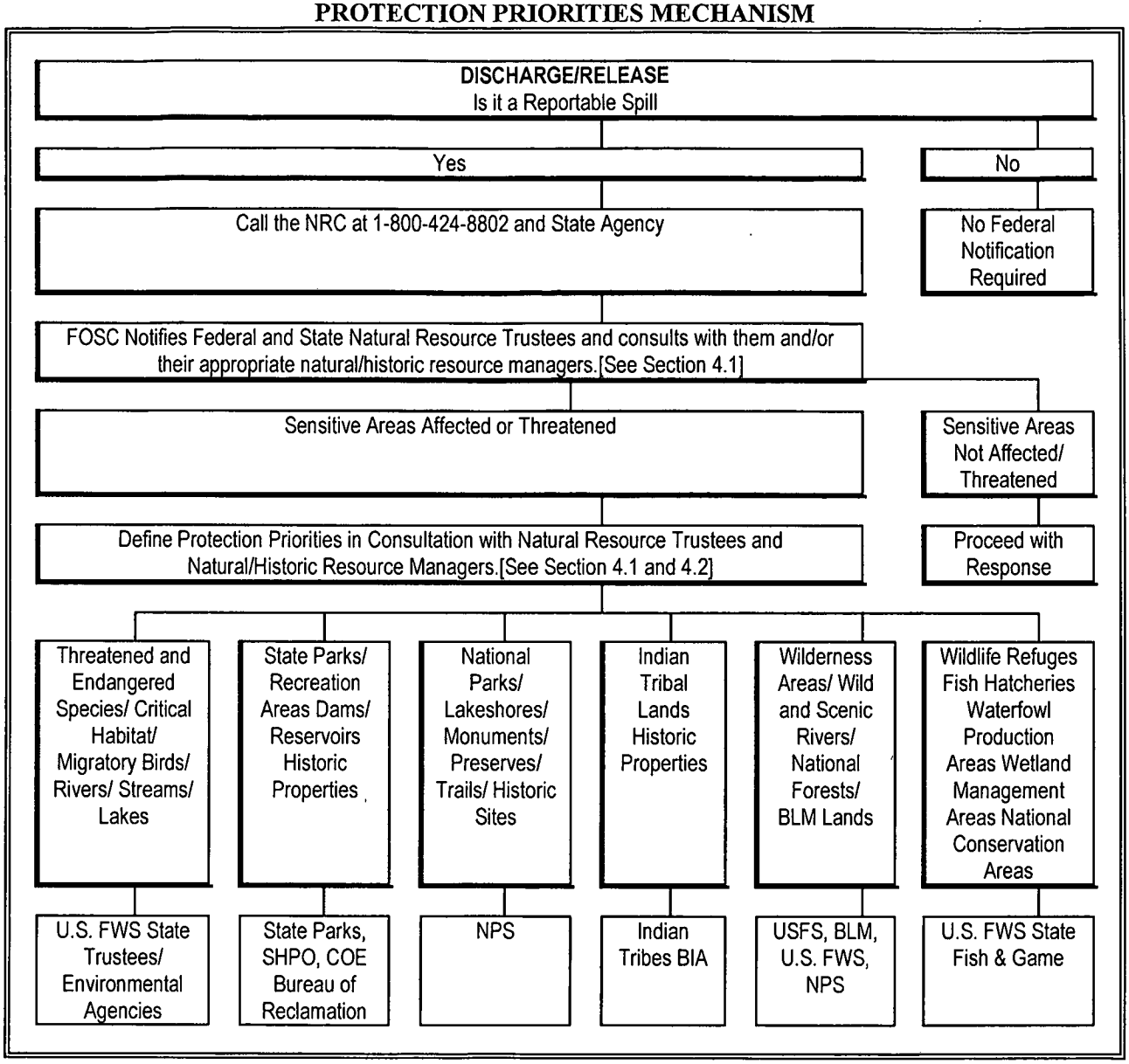
Pursuant to Subpart G of the National Contingency Plan, the following agencies have been designated as trustees for natural resources:

- Department of the Interior
- Department of Agriculture, Forest Service
- Department of Defense
- Department of Energy
- Kansas Department of Health and Environment
- Nebraska Department of Environmental Quality
- Iowa Department of Natural Resources
- Missouri Department of Natural Resources

Appropriate contacts within these agencies are included in Appendix D.

FIGURE A.1.1

PROTECTION PRIORITIES MECHANISM



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4.2 CONSULTATION WITH NATURAL RESOURCE MANAGERS

In addition to the designated natural resource trustees, there are numerous Federal and State agencies with land and resource management responsibilities and/or expertise which need to be consulted regarding removal actions:

- Department of the Interior
- U.S. Fish and Wildlife Service (USFWS)
- National Park Service
- Bureau of Reclamation
- Bureau of Land Management
- Bureau of Indian Affairs
- Department of Agriculture
- Forest Service
- State of Iowa
- Department of Natural Resources
- State of Kansas
- Wildlife and Parks Department
- State of Nebraska
- Game and Parks Commission
- Natural Resources Commission
- Department of Water Resources
- State of Missouri
- Department of Natural Resources
- Department of Conservation

Appropriate contacts within these agencies are included in Appendix D.

4.3 REGIONAL DESCRIPTION AND SENSITIVE AREAS

There are many wildlife refuges, hatcheries, wild and scenic river reaches, water fowl production areas, wetland management areas, national and state parks, monuments, preserves, recreational areas, primitive archaeological and historical sites, heritage program areas and other important resources located on or near the rivers and lakes of Region 7.

Appendix A divides the Region by state and lists threatened and endangered species, critical habitats, environmentally sensitive areas, recreation areas, public and private water intakes. The Natural Resource Trustee or other contact is listed in Appendix D, and the phone numbers for contacts who should be notified and consulted. The appendix can be used by responders to quickly identify the location of sensitive areas.

4.3.1 Threatened and Endangered Species

Threatened and endangered (T&E) species inhabit or are located near, almost every major body of water in Region 7. The U.S. Fish and Wildlife Service (USFWS) provides an updated list of T&E species by county for the Region annually.

Additional information on compliance with the Endangered Species Act, implementing regulations, and the ESA MOA is provided in Section 6.4.

4.3.2 Freshwater Environments

Freshwater environments can be divided into three broad categories: standing water, such as lakes and ponds; and flowing water, which includes streams and rivers; and wetlands.

Lakes and Ponds

The near shore areas of standing freshwater environments usually support large quantities of various animals and plants. Due to the water's relative stillness, spilled oil would tend to collect and not be dispersed by wind, waves or currents. Lakes, ponds and their dependent populations are, therefore, more vulnerable to an oil spill than freshwater environments that are constantly moving, such as streams and rivers.

Streams and Rivers

Oil entering a stream or river will typically move downstream. Oil entering slower flowing streams tends to remain on the surface while oil discharged to a high velocity turbulent stream disperses throughout the entire stream water column. As a result of the turbulent agitation, oil may become trapped in sediment along the stream bed, resulting in increased fatalities of benthic organisms.

Stream reaches can be subdivided into three categories: low gradient; moderate gradient; and high gradient.

- Low gradient portions of a stream are characterized by: meandering channels; moderate currents; wide zones of associated riparian vegetation; sand bars; intermediate oil residence time; numerous collection sites; and restricted mixing into the water column.
- Moderate gradient portions of a stream are characterized by: intermittent rapids; moderately wide channels; associated riparian vegetation; brisk currents; sand and gravel bars; short oil residence time; few collection sites; and significant mixing into the water column.
- High gradient portions of a stream are characterized by: numerous rapids; narrow associated riparian vegetation; strong currents; coarse gravel sediments; short oil residence time; no collection sites; and intense mixing into the water column.

Wetlands

Wetlands are highly sensitive to oil spills. Wetlands such as freshwater swamps, marshes and prairie potholes act as natural hatcheries, nesting areas, food sources, and watering areas for terrestrial and aquatic wildlife. Therefore, they are crucial areas for wildlife support.

The Region's seasonality is a major consideration in preparing and planning for a response. Ice and snow in the winter, fluctuations of river and stream water levels, and the migratory patterns of wildlife all need to be addressed.

Classification

The classification of environmentally sensitive areas, their administering agencies and the statutory authority include, but are not limited to:

- **Critical Areas under the Clean Lakes Program** [EPA, States, section 314 Clean Water Act, (33 USC '1324)];
- **Critical Habitats for Federal Designated Endangered or Threatened Species** [USFWS, Endangered Species ACT, (16 USC '1531, et seq.; 50 CFR 424.02)];
- **Designated Federal Wilderness Areas** [BLM, USFS, NPS, USFWS, National Wilderness Preservation Act (16 USC '1131, et seq.)];
- **Federal Designated or Proposed Endangered or Threatened Species** [USFWS, Endangered Species Act (16 USC '1531, et seq.; 50 CFR 424.02)]
- **Federal and State Designated Wild and Scenic Rivers** [BLM, USFS, NPS, USFWS, States, National Wild and Scenic Rivers Act, (16 USC "1271-1287)];
- **National Conservation Areas** [USFWS, Refuge Recreation Act, (16 USC ' 460k, et seq.)];
- **National Wildlife Refuges** [USFWS, National Wildlife Refuge Administration Act of 1966 (16 USC " 668dd-668ee) or comparable state law];
- **National Parks, National Monuments, National Lakeshore Recreational Areas** [NPS, Act of August 25, 1916 (16 USC '1, et seq.)];

- **Waterfowl Management Areas** are designated for the protection of habitat important to waterfowl and are designated within the states' **Wildlife Management Areas**;
- Other areas of concern are wetlands which generally include swamps, marshes, bogs and similar areas. Wetlands are defined in 40 CFR 230.3 and by USFWS. **Waterfowl Production Areas** administered by the USFWS are crucial habitats for waterfowl production.

[Relevant State statutes to be added.]

4.4 AREAS OF ECONOMIC SIGNIFICANCE

Responders need to identify and protect areas of economic importance. Public drinking water intakes, industrial water users, aquaculture sites and agricultural water users could be adversely impacted by a discharge of oil or other hazardous materials. Water intakes in shallow lakes and rivers are at greatest risk to an oil spill. Timely response procedures which identify water users and notify them of an on coming spill is imperative. With prompt notification, water intakes/diversions can be shut down or boomed off. Water users other than municipal drinking water intakes are still being identified.

Tourism is also of importance with numerous important fishing streams, boating and canoeing areas, and other recreational activities associated with the Region's rivers and lakes. Identifying and protecting these economic resources is critical to response considerations.

4.5 AREAS OF HISTORIC/ARCHEOLOGICAL SIGNIFICANCE

As required under the *Programmatic Agreement on Protection of Historic Properties During Emergency Response under the National Oil and Hazardous Substances Contingency Plan (Programmatic Agreement)*, plans shall ensure the inclusion of information on consideration of historic properties. This should be developed in consultation with the appropriate parties for the immediate and effective protection of, and the minimization of risk of damage to historic properties, that may be jeopardized by a discharge. Specific requirements are outlined in Annex VI.

5.0 DETERMINING THE ENVIRONMENTAL EFFECTS OF RESPONSE AND COUNTERMEASURES

Decisions on appropriate response and countermeasures should take into account the relative impact of response methods on sensitive areas. Using the information collected on downstream sensitive areas and spill response guidelines, informed decisions on appropriate protective measures can be made. When deciding on a method of response, the most important consideration should be the effectiveness of protecting habitats and removing spills of oil or other hazardous materials.

5.1 IMPACTS OF RESPONSE METHODS ON SENSITIVE ENVIRONMENTS AND HABITATS

The American Petroleum Institute and the National Oceanic and Atmospheric Administration (API/NOAA) collaborated on a study for Inland Oil Spills and finalized their findings in May of 1994. This is the first comprehensive guidance on responding to freshwater inland spills. API/NOAA classified specific oil response methods and their relative impacts on given environments and habitats. Physical, chemical and biological response methods are discussed and response impacts on the environment are classified as low impact, moderate impact, high impact and ineffective or inapplicable.

Table A.1.1, taken from the API/NOAA document, includes the findings for response method impacts on water environments and shoreline habitats.

5.2 APPROPRIATE RESPONSE FOR SPECIFIC SENSITIVE ENVIRONMENTS AND HABITATS

Many of the issues dealing with appropriate response methods will be addressed in detail during the Sub-Area Planning. Response sections of Sub-Area plans will include:

- Identifying specific areas of concern throughout the region and pre-planning for the products most commonly spilled and the locations where spills most commonly occur;
- Response methods for habitats and sensitive areas using the API/NOAA guidance, Options for Minimizing the Environmental Impacts of Freshwater Spill Response;
- Pre-approving appropriate removal actions including the use of chemicals and dispersants per 40 CFR Subpart J - Use of Dispersant and Other Chemicals, '300.910.
- Locating access points, staging areas and boom anchor locations.

[Note - Additional guidance on response techniques is under development.]

TABLE A.1.1

RELATIVE IMPACT OF RESPONSE METHODS IN THE ABSENCE OF OIL

	WATER ENVIRONMENT				SHORELINE HABITAT							
RESPONSE METHOD	OPEN WATER	SMALL LAKES/PONDS	LARGE RIVERS	SMALL RIVERS/ STREAMS	BEDROCK	MAN MADE	SAND	VEGETATED SHORES	SAND AND GRAVEL	GRAVEL	MUD	WETLANDS
PHYSICAL RESPONSE METHODS												
Natural Recovery	-	-	-	-	-	-	-	-	-	-	-	-
Booming	L	L	L	L	-	-	-	-	-	-	-	-
Skimming	L	L	L	L	-	-	-	-	-	-	-	-
Barriers/Berms	-	-	-	H	-	-	-	-	-	-	-	-
Physical Herding	L	L	L	L	-	-	-	-	-	-	-	-
Manual Oil Removal/Cleaning	L	H	L	M	L	L	L	H	M	M	H	H
Mechanical Removal	L	H	H	H	-	M	M	H	M	M	H	H
Sorbents	L	L	L	L	L	L	L	L	L	L	M	M
Vacuum	L	L	L	L	L	L	L	M	L	L	H	M
Debris Removal	-	L	L	L	L	L	L	L	L	L	M	M
Sediment Reworking	-	H	-	H	-	-	M	H	M	M	H	H
Vegetation Removal	L	H	M	H	-	-	-	H	-	-	-	H
In-situ Burning	L	M	L	M	L	L	M	M	M	M	H	M
Flooding	-	-	-	-	L	L	L	L	M	L	L	L
Low-Pressure, Cold-Water Flushing	-	-	-	-	L	L	M	L	L	M	H	L
High-Pressure, Cold-Water Flushing	-	-	-	-	L	L	H	H	H	H	H	H
Low-Pressure Hot-Water Flushing	-	-	-	-	M	L	H	H	M	M	H	H
High Pressure, Hot-Water Flushing	-	-	-	-	M	L	H	H	H	H	H	H
Steam Cleaning	-	-	-	-	M	L	H	H	M	M	H	H
Sand Blasting	-	-	-	-	H	M	-	-	-	-	-	-
CHEMICAL RESPONSE METHODS												
Dispersants	L	H	L	H	-	-	-	-	-	-	-	-
Demulsifiers	L	L	L	M	-	-	-	-	-	-	-	-
Visco-Elastic Agents	L	M	L	L	-	-	-	-	-	-	-	-
Herding Agents	L	M	L	H	-	-	-	-	-	-	-	-
Solidifiers	L	L	L	L	L	L	M	M	M	L	M	M
Chemical Shoreline Pretreatment	-	-	-	-	I	I	I	I	I	I	I	I
Shoreline Cleaners	-	-	-	-	M	L	M	I	M	M	M	I
BIOLOGICAL RESPONSE METHODS												
Nutrient Enrichment	L	M	L	L	L	L	L	L	L	L	L	L
Natural Microbe Seeding	I	I	I	I	I	I	I	I	I	I	I	I

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5.3 MONITORING RESPONSE EFFECTIVENESS - MONITORING PLANS

An oil spill is dynamic and cleanup efforts must change as conditions change. Over time, the oil will spread, move downstream, and oil can chemically change due to weathering. Climatic and geographic conditions may also change. A continual monitoring program to ensure the maximum removal of oil and protection of the environment throughout the duration of the cleanup is essential.

The OSC, in consultation with the natural resource trustees and the responsible party, will monitor the effectiveness of response activities in protecting sensitive habitats and removing discharges of oil or releases of hazardous substances. The OSC will consult with natural resource trustees and natural resource agency managers regarding the need for and methods of an incident-specific long-term monitoring plan. Efforts to control, contain and clean up the oil typically involve a number of containment and recovery methods. These methods may include booms, barriers, skimmers, sorbents, chemical agents, and manual recovery. As each of these methods has limitations associated with them, continued monitoring is necessary to ensure a successful cleanup. Monitoring will also be necessary to ensure that ecological impacts associated with the response actions do not cause more harm than good. Monitoring activities may include visual observation, sampling, data collection and evaluation, and replacement of saturated or defective material. Consultation with the natural resource agencies is essential to minimize injury to fish and wildlife and their habitats or other sensitive environments.

5.3.1 Monitoring Plan Outline

Section 300.210(E) of the NCP requires that the FWSEA provide monitoring plan(s) to evaluate the effectiveness of different countermeasures or removal actions in protecting the environment. This is an outline for such plans. Specific plans for each response need to be developed in consultation with natural resource trustees and natural resource agency managers.

5.3.1.1 Objectives and Scope

Determine the effectiveness of the selected countermeasures or removal actions in counteracting the effects of the discharge or release. Evaluate the environmental impact of these activities.

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5.3.1.2 Monitoring Plan Design

5.3.1.2.1 Monitoring Intensity Levels

The intensity of monitoring efforts may be adjusted to the intensity of the response. Field activities consisting of reconnaissance, environmental parameters assessment, sampling and documentation efforts, and laboratory activities should be conducted on a scale appropriate to the response.

5.3.1.2.2 Selection of Treated and Untreated Sites

Treated and untreated (or control) sites should exhibit similar chemical and physical characteristics to support their comparability. The following criteria should be considered: (1) environmental parameters, (2) physical habitat and geological morphology, and (3) degree of contamination with the released substance and probability of further contamination.

5.3.1.3 Monitoring Parameters and Collection Frequency

Sampling at each site, water depth (as appropriate), and time should be performed in triplicate. The size of samples collected should be based on the requirements of the analytical methods to be used for their analysis.

5.3.1.4 Data Quality Requirements and Assessments

All data collection activities must be planned and conducted to produce data of known and acceptable quality. To help ensure that these objectives are met, all contractors performing work as part of the monitoring effort must submit a quality assurance plan. Parameters for defining data quality include appropriateness of analytes, detection limits, precision, accuracy, representativeness, comparability, and completeness. Representativeness and comparability should be designed into the monitoring plan through provisions for replicate sampling from remediated and control areas and the use of standard, approved methods for sampling and laboratory analyses.

5.3.1.5 Sample Custody Procedures

Accurate identification and proper control of samples is important to help ensure the acceptability and usability of the resulting analytical data. Having standard sample custody procedures is particularly important where the individuals performing sample collection may vary and where individuals collecting samples will not be the ones analyzing the samples. Where the monitoring program is conducted by a contractor, the contractor should designate a sample custodian who will ensure tracking of samples and that custody procedures are properly followed.

5.3.1.6 Sampling and Analytical Methods

All sampling and laboratory analyses should be developed in consultation with natural resource trustees and natural resource managers and should follow EPA or other approved methods unless otherwise stipulated or requested by the OSC.

5.3.1.7 Response Organization and Resource Requirements

The decision to implement a monitoring plan is made in accordance with the NCP and the Region 7 RICP. A project manager, under the direction of the OSC, is responsible for implementing the plan.

5.3.1.7.1 Project Manager

Specific responsibilities of the project manager include: obtaining approval from the OSC for the monitoring plan, assembling teams to perform observations and sampling as appropriate, coordinating activities with the OSC to ensure operations do not interfere with response operations, naming a sample custodian to handle sample transfers and chain of custody concerns, ensuring representation from each RRT member agency that wishes to participate, ensuring consultation with the natural resource trustees and natural resource managers, ensuring and documenting data quality, and ensuring the preparation and submission of all required reports. Other personnel required will be dependent on the size of the spill and of the monitoring effort.

5.3.1.7.2 Equipment Requirements

Equipment requirements will be determined by the scope of the monitoring effort. However, sufficient equipment to complete required sampling and photo documentation must be available.

5.3.1.8 Data Validation

All data will be subject to a thorough check by the OSC and the monitoring Project Manager, or their designated representative, for errors in transcription, calculation, or computer input. In addition, the Project Manager will review all incident logs, sample logs, and data forms to ensure that requirements for documentation and data quality assessment have been met.

5.3.1.9 Performance and System Audits

To help ensure that work is being performed - whether by contractor, EPA, or state personnel - is progressing in accordance with the monitoring plan and specified objectives and procedures, the OSC,

through the monitoring project manager, maintains the right to conduct performance or system audits of field and laboratory collection activities. The categories of audits are described below:

Management System Reviews -- Evaluate the Quality Assurance Program of an organization, such as a firm contracted to conduct a monitoring project or a laboratory sample analyses. The purpose of this review is to verify whether the quality assurance management procedures stated by the contractor are in place prior to a contract award.

Data Quality Audits -- Evaluate a data set, or all data sets, of a particular project, by comparing the data set against specified data quality requirements for that data set.

Technical System Audits -- Evaluate the actual environmental measurement data-collection systems and their associated quality control systems. These audits involve on-site auditing of field sampling activities, field measurement activities, and laboratory analytical procedures.

Performance Audits -- Evaluate analytical methods and procedures of a laboratory. These audits are conducted by submitting performance evaluation samples to a laboratory for analysis. The samples should contain specific pollutants in known matrices whose concentration and identity are unknown to the testing laboratory.

5.3.1.10 Documentation and Reporting

During the course of response activities and accompanying monitoring efforts, the following reports should be prepared and submitted to the OSC:

Activity reports - Provide descriptions of the response activity area, weather, unique observations, and activities undertaken, as well as the names, affiliations and signatures of persons on site. Activity reports should be prepared whenever activities on a site are undertaken.

Analytical reports -- Provide laboratory analysis results of environmental and control samples. Analytical reports should be prepared and submitted by the analytical lab within 10 days after receipt of environmental samples for analysis.

After action report -- Provides a description of the overall bioremediation activity and accompanying monitoring effort, including results of both field and laboratory activities.

5.3.1.11 Revising Plans and Procedures

Monitoring plans should include provisions for modifications, including additional consultation with natural resource trustees and natural resource managers.

6.0 FISH AND WILDLIFE RESPONSE CAPABILITIES

In addition to consultation and coordination with natural resource trustees and other natural resource management agencies during the pre-spill planning phase to identify and understand potential natural resource concerns, consultation and coordination with these agencies during the response is also essential. Fish and wildlife response capabilities include:

6.1 TECHNICAL EXPERTISE AND ASSISTANCE

During a response, natural resource trustees and managers will provide technical assistance and expertise on potential effects of oil on fish and wildlife and their habitats or other sensitive environments that can be found in the impacted area. They are familiar with the area or habitats affected and are able to provide recommendations on the best locations for staging areas, access points, or anchor locations. They will recommend specific habitats where protective measures should be taken and provide advice on response actions to be taken. They can assist in the development of a monitoring plan and subsequent collection of data. Finally, the U.S. Fish and Wildlife Service and the State wildlife agency will direct or provide oversight for the protection, rescue, and rehabilitation of fisheries and wildlife.

6.2 WILDLIFE PROTECTION

When an oil spill occurs, natural resource trustees or managers will provide timely advice on the necessary measures to protect wildlife from exposure to oil and the priority and timing of such measures. Protective measures may include all or a combination of the following:

- Prevent the oil from reaching areas where migratory birds and other wildlife are located by either containing or recovering the oil, or
- Deter birds or other wildlife from entering areas already affected by oil by using wildlife hazing devices or methods.

Wildlife hazing devices or methods are generally grouped into visual or auditory, or a combination of both. In an emergency, the USFWS, the State wildlife agency, or a local animal damage control agent may be able to locate and provide these devices.

6.3 WILDLIFE RESCUE AND REHABILITATION

If exposure of birds and other wildlife to oil cannot be prevented, an immediate decision will need to be made whether to capture and rehabilitate oiled birds and other wildlife. The Department of the Interior (DOI) has statutory responsibilities for the protection of migratory birds and Federally-listed threatened and endangered species, which are carried out by the USFWS. If animals other than migratory birds or Federally-listed threatened or endangered species are found injured, the responsible agency would typically be the State wildlife agency. The decision to rescue and rehabilitate oiled wildlife must be made in consultation with the applicable State and Federal natural resource agencies as State and Federal permits are required by law.

State and Federal permits are required to collect, possess, treat and band migratory birds and threatened and endangered species. The laws and regulations that require such permits are as follows:

- **Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. 703 et seq**. No person shall take, possess, import, export, transport, sell, purchase or barter, any migratory bird, or the parts, nests, or eggs of such bird except as permitted under the terms of a valid permit issued by U.S. Fish and Wildlife Service pursuant to the provisions of 50 CFR 21 and 50 CFR 13. Enforcement authority and penalties for violations are provided.
- **Bald Eagle Protection Act of 1940, as amended, 16 U.S.C. 668 et seq**. No person shall take, possess, or transport any bald eagle or any golden eagle, or the parts, nests, or eggs of such birds except as permitted under the terms of a valid permit issued by USFWS pursuant to 50 CFR 22 and 50 CFR 13. Enforcement authority and penalties for violations are provided.
- **Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq**. It is unlawful for any person to commit, attempt to commit, solicit another to commit, or cause to be committed the import or export, take, possession, sale or offer for sale any endangered species except as permitted under the terms of a valid permit issued by the U.S. Fish and Wildlife Service pursuant to 50 CFR 17. Enforcement authority and penalties for violations are provided.

[Relevant State laws are to be added].

If rescue and rehabilitation efforts are deemed worthwhile, one Federal permit is required for oiled migratory birds and one Federal permit is required for oiled threatened and endangered species. Each of these permits may encompass more than one species. If a bird is considered a migratory bird, but is also a threatened or endangered species, it should be listed under the threatened and endangered species permit.

USFWS personnel will handle all federal permit activities through the field office responsible for the area where the spill occurs. State permits must be handled through the applicable state agency office. The offices that should be contacted to initiate the permitting process are:

Iowa	U.S. Fish and Wildlife Service 4469 48th Avenue Court Moline, Illinois 61201	309-757-5800 Fax: 757-5807
	Iowa Department of Natural Resources Licensing Bureau Wallace State Building East 9th and Grand Street Des Moines, Iowa 50319-0035	515-281-8688 Fax 281-6794
Kansas	U.S. Fish and Wildlife Service 2609 Anderson Ave Manhattan, Kansas 66502	785-539-3474 Fax 539-8567
	Division of Fisheries and Wildlife Kansas Dept. of Wildlife, Parks and Tourism 512 Southeast 25th Avenue Pratt, Kansas 67124-8174	620-672-5911 Fax 672-6020
Missouri	U.S. Fish and Wildlife Service 101 Park Drive, Suite A Columbia, Missouri 65203	573-234-2132 Fax 234-2181
	Wildlife Division Missouri Department of Conservation P.O. Box 180 Jefferson City, Missouri 65102	573-751-4115 Ext. 150 Fax 526-4663
Nebraska	U.S. Fish and Wildlife Service 203 West Second Street Federal Building, 2nd Floor Grand Island, Nebraska 68801	308-382-6468 Fax 384-8835
	Law Enforcement Division Nebraska Game and Parks Commission 2200 North 33rd Street Lincoln, Nebraska 68503	402-471-0641 Fax 471-5528

All rescue and rehabilitation efforts will be directed by the USFWS and the State wildlife agency, including the notification of a qualified wildlife rehabilitation organization and obtaining the necessary permits. The following criteria will be used by the USFWS and State wildlife agencies in selecting a rehabilitator.

Guidelines for Selection of Wildlife Rehabilitator

- Wildlife rehabilitator must have, or be able to obtain, the appropriate Federal and State permits and licenses to collect, possess, treat, and band migratory birds or threatened and endangered species.
- Wildlife rehabilitator must demonstrate high standards of practice, treatment, conduct, and ethics as reflected by organization such as the National Wildlife Rehabilitator Association, the American Veterinarian Association and the American Society for Prevention of Cruelty to Animals.
- Wildlife rehabilitator must have adequate liability insurance to protect both staff and volunteers.
- Wildlife rehabilitator should have a proven record and experience in rescue and rehabilitation of oiled wildlife.
- Wildlife rehabilitator must comply with all applicable Federal (Occupational Safety and Health Administration, etc.) and state safety regulations to protect staff and volunteers. Two organizations, International Bird Rescue in Berkeley, California, and Tri-State Bird Rescue and Research, Inc. in Newark, Delaware, have become recognized experts in oiled bird rehabilitation:

Tri-State Bird Rescue and Research, Inc. 110 Possum Hollow Road Newark, Delaware 19711	302-737-9543 (9 am – 5 pm EST daily) Fax: 302-737-9562 24 hr pager 800-710-0695 or 0696
International Bird Rescue Research Center 4369 Cordelia Rd. Fairfield, California 94534	707-207-0380 Fax 707-207-0395

Both organizations have extensive experience in bird rescue and rehabilitation and have worked both with government and industry. In addition, other more local, less well known bird rehabilitation organizations may also have such expertise in this area. Veterinarians and researchers from USFWS, other federal agencies, and state wildlife agencies and universities may also provide assistance and expertise during rehabilitation efforts.

All rescue and rehabilitation efforts will be directed by the USFWS and the State wildlife agency, including the notification of a qualified wildlife rehabilitation organization and obtaining the necessary permits.

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Health and Safety Concerns in Wildlife Rescue and Rehabilitation

Additional information can be found in the USFWS "Best Practices for Migratory Bird Care During Oil Spill Response", which discusses techniques for preventing oiling of birds as well as good practices for cleaning, caring for, and releasing recovered birds. This document is available at: http://www.fws.gov/contaminants/OtherDocuments/best_practices.pdf.

Two Occupational Safety and Health Administration (OSHA) regulations cover the majority of occupational health and safety issues encountered during wildlife rescue and rehabilitation:

The Hazardous Wastes Operations and Emergency Response (29 CFR 1910.120) regulates organizations or individuals directly involved in on-site (hot-zone) retrieval or clean-up efforts. In addition, each state may have its own worker safety requirements; coordination with the appropriate state agency should be conducted to ensure these requirements are also met. The Hazard Communication Standard (29 CFR 1910.1200), also known as "Right to Know Law" or "HazCom" requires that all chemicals in the work place be fully evaluated for possible physical or health hazards and that all information relating to these hazards be made available to all workers. HazCom applies to rehabilitation organizations because petroleum is considered a human health hazard.

Rehabilitation organizations are legally required to educate and protect all employees, including volunteers. Individuals working with oiled animals need information of all potential hazards associated with the handling of these animals. The following minimum requirements should be applied to wildlife rescue and rehabilitation personnel, including volunteers:

- **Wildlife rescue and rehabilitation management personnel** are the core team of certified rehabilitators who will direct operations. These people must have 24 hours of classroom training in hazardous waste operations and emergency response.
- **Rehabilitation facility volunteers** work under the direction of the facility management team and are not allowed on-scene, nor in the hot-zone, unless additional training is provided (see Retrieval volunteers). Volunteers working in this category must receive four hours of training in the Hazard Communication Program before they can begin work.
- **Retrieval volunteers** work under the direction of the search and rescue management team and are allowed on-scene, but not in the hot zone. Volunteers working in this category must receive between 4-8 hours of training in the Hazard Communication Program before they can begin work.
- **Any hot-zone retrieval of animals** would need to be performed by someone with 40 hours of classroom safety training for hazardous waste workers that meets OSHA guidelines, including eight hour annual refresher training.

The OSC, in consultation with OSHA's representative to the Regional Response Team, has responsibility for making assessments when training requirements are in question.

(The NCP 300.210 (c) II (H) states that the annex will identify and secure the means of providing, if needed, the minimum required OSHA and EPA training for volunteers, including those who assist with injured wildlife.)

A **Hazard Communication Program** should contain all of the following elements:

- the nature of the oil and how its composition may change with the effect of weathering,
- the nature of other hazardous chemicals that may be contacted during rehabilitation efforts,
- routes of entry of these chemicals
- signs and symptoms of chemical exposure
- protective measures, including work practices and personal protective equipment (PPE, with training on how to properly use)
- environmental monitoring equipment
- importance of personal hygiene
- how to read a Material Safety Data Sheet and know what it means
- first aid protocols and identification of medically trained personnel and first aid stations
- storage and disposal of hazardous waste, including medical waste and PPE
- training records of written curriculum, date and hours of instruction, instructor and student names

Besides chemical hazards, other hazards such as mechanical, physical and biological hazards are also present during rescue and rehabilitation activities. Workers must also be trained on these hazards as well. In addition to the above, training elements may include the following:

Facility concerns:

- behavior of oiled birds
- proper animal restraint
- personal protective equipment and clothing to protect from bloodborne pathogens and zoonoses
- proper heavy lifting techniques
- safe working practices, e.g. no slippery or messy floors
- electrical safety

Field concerns (in addition to the above):

- climatic conditions (e.g. cold, heat)
- terrain
- proper retrieval methods
- vehicle safety (4-WD vehicle, boat)
- water hazards
- response operations hazards

Other safety concerns may occur at either the spill site or the rehabilitation facility. These concerns should be addressed on a site-specific basis.

6.4 ENDANGERED SPECIES ACT CONSULTATION

The following is a summary of FOSC and USFWS responsibilities under the Endangered Species Act, implementing regulations, and the ESA MOA. For detailed information of ESA consultation requirements and procedures, see Annex V (ESA MOA).

PRE-SPILL PLANNING

Area/Sub-Area Committee Chair Responsibilities

- Request (in writing) endangered species expertise, a species list, and a description of their habitats from USFWS.
- Engage in informal and, as necessary, formal consultation on the Area Contingency Plan (ACP) and Sub-Area Plans.
- Upon receipt, distribute updated species information to all holders of the RICP and Sub-Area Plans. Distribute updated Threatened and Endangered Species sections of the Fish and Wildlife and Sensitive Environments Plan and all Sub-Area plans at least semiannually.

USFWS Responsibilities

- In response to request, provide species list and a description of their habitats, and identify a listed species expert to assist the Area/Sub-Area Committee.
- Engage in informal and, as necessary, formal consultation on the ACP and Sub-Area Plans.
- As changes occur, but no less than semiannually, provide updated species information to the Area/Sub-Area Committee Chairs, through the DOI RRT/Area Committee Representative.

DURING SPILL RESPONSE

FOSC Responsibilities

- If fish and wildlife resources may be affected by a discharge or release, notify Federal and State natural resource trustees and managers, and consult with them on removal actions to be taken.
- If listed species and/or critical habitat are or could be present, immediately contact USFWS to initiate emergency consultation pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA.
- Keep USFWS and the DOI RRT/Area Committee Representative apprized of ongoing response actions.
- Document any adverse effects (including incidental take) to listed species or their habitat.
- Maintain a record of all oral and written communications with the USFWS during the response.

USFWS Responsibilities

- Provide the FOSC with timely recommendations on actions to avoid or minimize impacts to listed species and/or their habitats throughout the duration of the response.
- Respond to requests for emergency consultation pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA.
- If "incidental take" is anticipated, so advise the FOSC.
- Upon request, participate in the ICS/UC.
- Maintain a record of all oral and written communications with the FOSC during the response.

POST RESPONSE

FOSC Responsibilities

- If listed species or critical habitat have been adversely affected by response activities, initiate formal consultation of the effect of these activities pursuant to the Endangered Species Act, implementing regulations, and the ESA MOA. See Annex V to the RICP (ESA MOA) for specific requirements and procedures.

USFWS Responsibilities

- Respond to requests for formal consultation in accordance with the Endangered Species Act, implementing regulations, and the ESA MOA.

6.5 LAW ENFORCEMENT

The U.S. Fish and Wildlife Service's Division of Law Enforcement (DLE) is responsible for investigating suspected and alleged violations of Federal wildlife laws including the Migratory Bird Treaty Act, 16 USC 703 *et seq.*, the Endangered Species Act, 16 USC 1538 *et seq.*, the Eagle Protection Act, 16 USC 668a *et seq.*, the National Wildlife Refuge Act, 16 USC 668dd *et seq.*, and several others.

Wildlife injuries, mortalities, and habitat impacts resulting from spills can constitute violations of DLE-enforced laws. Special Agents of the DLE or Refuge Officers of the Division of Refuges (when USFWS lands are involved) may be required to initiate investigations during the spill response phase in order to document violations and collect evidence in a timely manner. These law enforcement officers will coordinate their activities with the OSC or other on- scene law enforcement personnel. Additionally, the Special Agents will insure that responders possess the necessary federal permits (Section 6.3) and that wildlife-related response activities are accomplished in accordance with applicable law and permit provisions.

Special Agents and Refuge Officers often have detailed knowledge of the local terrain and can provide timely, site specific information to response personnel. In many cases, the DLE and other USFWS responders have shared and similar interests and will work cooperatively on collecting or sampling, recording, storage, transportation, and laboratory analysis of injured or dead wildlife. When necessary, additional personnel operating under the guidance and direction of the DLE may be brought on scene to assist with wildlife handling or collection.

6.6 OTHER ROLES AND RESPONSIBILITIES OF NATURAL RESOURCE TRUSTEES

In the event of a spill, it may be necessary for natural resource trustees and managers to initiate a Natural Resource Damage Assessment (NRDA) . NRDA is the process by which trustees collect, compile and evaluate data, information and statistics to determine the extent of injury to natural resources. This information is used to assess damages, the dollar amount necessary to restore injured natural resources and compensate for lost use as a result of the injury, and then to seek recovery of those damages from the responsible party.

At the same time removal actions undertaken to contain and remove oil and wildlife rescue and rehabilitation activities are occurring, the natural resource trustees may initiate NRDA activities. These activities are usually initiated to acquire data and materials that are likely to be lost if not collected during or immediately after a spill has occurred. Such field sampling and data collection is typically limited to:

- Samples necessary to preserve perishable materials likely to have been affected or contain evidence of the oil. These samples will generally be biological material that is either dead or has been visible injured by the oil.
- Samples of other ephemeral conditions or materials, such as surface water, sediments, soil, or the oil itself, which are necessary for identification and measurement of concentrations. These samples would otherwise be lost because of such factors as dilution, movement, decomposition, or leaching if not taken immediately.
- Counts of dead or visibly injured organisms, which if delayed may not be possible because of factors such as decomposition, scavengers, sinking, or water movement.

In certain circumstances, a natural resource trustee may undertake emergency restoration efforts consistent with its existing authority to prevent or reduce the immediate migration of oil onto or into a trust resource. Emergency restoration would be undertaken by the trustee only if the responsible party does not do it or the EPA is precluded under statutory authority from conducting response and removal actions rapidly enough to protect natural resources.

Because initiation of natural resource damage assessment activities may occur concurrently with removal actions as part of the response, all sampling and field work conducted by the natural resource trustees must be coordinated with the lead response agency so as to minimize any interference with response operations or duplication of sampling and data collection efforts. Prior OSC approval is required for any work conducted in support of removal activities and before any associated costs will be reimbursed by the Oil Spill Liability Trust Fund. Other activities performed as part of initiation of damage assessments are reimbursable by the Oil Spill Liability Trust Fund as long as these activities are approved in advance by the Fund Center.

7.0 HISTORIC/ARCHEOLOGICAL RESOURCE RESPONSE

Although the NCP does not include language specific to protection of historic properties, there are several laws that require consultation to prevent impact to these resources. Additionally, various federal agencies including the EPA, DOI, U.S. Coast Guard (USCG), NOAA, Department of Energy (DOE), Department of Defense (DOD) and Department of Agriculture (USDA) signed the *Programmatic Agreement on Protection of Historic Properties during Emergency Response under the National Oil and Hazardous Substances Contingency Plan*. This Agreement ensures that historic properties are taken into account in the planning for and conduct of emergency response. Many states also have laws defining and protecting historic properties. Consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, or other State and Federal land management agencies during pre-emergency response planning and/or in the course of an emergency response will enable the FOSC to avoid or minimize impacts on these important resources. (See Annex VI for a copy of the *Programmatic Agreement*).

7.1 TECHNICAL EXPERTISE AND ASSISTANCE

During a response, historic resource managers/specialists can provide technical assistance and expertise on potential effects of oil on sensitive archeological and/or historic environments that can be found in the impacted area. They are familiar with the area and are able to provide recommendations on the best locations for staging areas and access points. They will recommend specific protective measures and provide advice on response actions to be taken. They can assist in the development of a monitoring plan and subsequent collection of data.

7.2 HISTORIC SITE PROTECTION

When an oil spill occurs, historic resource managers can provide timely advice on the necessary measures to protect protected sites from exposure to oil and the priority and timing of such measures. Protective measures are often site specific.

Applicable laws and regulations governing historic property protection include, but are not limited to:

- **The Historic Sites Act (HSA) of 1935**, which established the National Park Service as the Federal governments' paramount historic preservation advocate.
- **The Archeological Resources Protection Act (ARPA)**, which prohibits the unauthorized excavation, removal, or defacement of "archeological resources" on federal and Indian lands. "Archeological resources" are comprehensively defined to include archeological sites, structural remains, artifacts, bones, debris, etc. The Act provides stiff penalties for violators, and spell out permit requirements (uniform regulations jointly issued by the DOI, DOA and DOD).
- **The American Indian Religious Freedom Act (AIRFA)** is a joint Congressional resolution declaring that the U.S. government will protect the inherent rights of Indian tribes to the free exercise of their traditional religions. Generally, this requires agencies to consult with tribes when any action is contemplated that might affect the practice of traditional religion.
- **Executive Order 13007** requires agencies to avoid, to the best of their abilities, physical damage to Indian sacred sites on federal and Indian land.

8.0 EVALUATING THE INTERFACE OF THE RICP WITH NON-FEDERAL PLANS

The final rule on Oil Pollution Prevention for Non-Transportation-Related Onshore Facilities, 40 CFR Part 112, requires facilities with a total oil storage capacity greater than or equal to one million gallons to submit response plans if located at a distance such that a discharge of oil could cause injury (as defined at 40 CFR 112.2) to fish, wildlife, sensitive environments and public water intakes.

Facility owners or operators must determine the distance at which an oil spill could cause injury to fish and wildlife and sensitive environments and have a plan for mitigating a discharge's adverse effect. The plan must be consistent with the requirements of the NCP and this RICP Annex.

EPA will review and approve Facility Response Plans for compatibility with this Annex; pipeline plans in Region 7 will be reviewed and approved by RSPA. Participation by facilities in the Area and Subarea Committees is encouraged. Joint exercises will be conducted to test facility plans and their interface with this Annex.

FEDERAL TRUSTEE CONTACTS

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Robert F. Stewart
U.S. Department of the Interior
Building 56, Room 1003
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Denver, CO 80225-0007
Telephone 303 445-2500, Fax 303 445-6320

Department of Agriculture

Department of Defense

STATE TRUSTEE CONTACTS

State of Iowa
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Iowa Department of Natural Resources
Wallace Building
502 E. 9th Street
Des Moines, IA 50319
515-281-8694, Fax 515-281-8895

State of Kansas
Robert Moser, MD, Secretary
Kansas Department of Health and Environment
Staff Contact: Leo G. Henning, Director, Bureau of Environmental Field Services,
Kansas Department of Health and Environment
1000 SW Jackson, Suite 410
Topeka, KS 66612-1290
Telephone 785-296-5572, Fax 785-296-4823
Emergency Spill Response (24 hr) 785-296-1679

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State of Missouri
Mr. Tim Rielly, NRD Coordinator
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102
Staff Contact: Frances Klahr, NRD Coordinator
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Mr. Mike Linder, Director
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Box 98922
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APPENDIX A.2

ENVIRONMENTALLY SENSITIVE AREAS

ENVIRONMENTALLY SENSITIVE AREAS

APPENDIX A.2 TO REGION 7 INTEGRATED CONTINGENCY PLAN

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1.0 INTRODUCTION

Appendix A.2 contains a listing of Environmentally Sensitive Areas (ESA) in Region 7. The list has been accumulated by requesting information from Federal, state and local agencies regarding their areas of responsibility as recommended by the Oil Pollution Prevention; Non-Transportation-Related Onshore Facilities; Final Rule, 40 CFR Part 112. (See Table A.2.1)

TABLE A.2.1

RECOMMENDED ENVIRONMENTALLY SENSITIVE AREAS AND CURRENT STATUS IN REGION 7 RICP

ENVIRONMENTALLY SENSITIVE AREAS	RESPONSIBLE FEDERAL AGENCY	STATUS IN REGION 7 RICP
Wetlands, as defined in 40 CFR 230.3	EPA	Available. See #1 Wetlands
Critical habitat for designated or proposed endangered/threatened species	FWS	Listed
Habitat used by designated or proposed endangered/threatened species or marine mammals defined as depleted	FWS	Underdevelopment
National parks	DOI/NPS	Listed
Federal wilderness areas	USDA	Listed
Clean lakes program critical areas	EPA	Underdevelopment
National monuments	DOI/NPS	Listed
National lakeshore recreational areas	DOI/NPS	Listed
National preserves	DOI/NPS	Listed
National wildlife refuges	FWS	Listed
National river reach designated as Recreational	EPA	Listed
Federal or state designated scenic or wild river	DOI/NPS	Listed
Hatcheries	DOI/FWS	Listed
Waterfowl production areas	DOI/FWS	Listed
Wildlife Management Areas	State Wildlife Agencies	Listed only for Nebraska

Notes:

"Listed" is currently listed in this Appendix A.2
"See #" is referenced and available through EPA Region 7

DOI - Department of Interior
EPA - Environmental Protection Agency
FWS - Fish and Wildlife Service
NA = Not applicable in Region 7
NPS - National Park Service
USDA - United State Department of Agriculture

To aid responders operating within ESA, EPA in conjunction with the Upper Mississippi River Basin Association has developed Habitat Fact Sheets to guide oil response activities. Each fact sheet contains tips for operations within each habitat and their sensitivity to oil spills. The fact sheets address unique

habitat considerations and scientific references. Final drafts of the habitat fact sheets are available at http://umrba.org/spillplans.htm. An example fact sheet for Deep Marsh Annual is included at the end of this section. A list of example fact sheets includes the following:

- Deep Marsh Annual
- Deep Marsh Perennial
- Open Water
- Populus Community
- Rooted-Floating Aquatics
- Sedge Meadow
- Shallow Marsh Annual
- Shallow Marsh Perennial
- Submersed Vegetation
- Wet Meadow

2.0 ENVIRONMENTALLY SENSITIVE AREAS

The following list identifies Environmentally Sensitive Areas in EPA Region 7 by state, county , agency, type and name. The database is a growing bank of information to be utilized with the understanding that is limited in its data. Updates will be made periodically to acknowledge new Environmentally Sensitive Areas or to add information that may have been missed.

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Hardin	Iowa Dept. of Natural Resources	State Park	Pine Lake	0.5 Mi. N.E. Eldora - IA 118
Dickinson	IDNR	State Park	Gull Point	3.5 Mi. W. Milford - IA 32
Davis	IDNR	State Park	Lake Wapello	6 Mi. W. Drakesville - IA 273
Buna Vista	IDNR	State Park	Wanata	0.5 Mi. S. Peterson - IA 10
Taylor	IDNR	State Park	Lake of Three Fires	3 Mi. N.E. Bedford - IA 49
Washington	IDNR	State Park	Lake Darling	3 Mi. W. Brighton IA 78 & 1
Boone	IDNR	State Park	Ledges	6 Mi. S. Boone - IA 164
Warren	IDNR	State Park	Lake Ahquabi	5.5 Mi. SW Indianola - IA 349
Jasper	IDNR	State Park	Rock Creek	6 Mi. N.E. Kellogg - Co. Rd.
Black Hawk	IDNR	State Park	George Wyth Memorial	Adjoining Cedar Falls - US 57
Lucas	IDNR	State Park	Shimek Forest Camping	1 Mi. E Farmington - IA 2
Kossuth	IDNR	State Park	Ambrose A. Call	1.5 Mi. W. Algona
Guthrie	IDNR	State Park	Springbrook	8 Mi. NE Guthrie Center - IA 25 & 384
Calhoun	IDNR	State Park	Twin Lakes	7.5 MI N. Rockwell City - I 4 & 124
Monona	IDNR	State Park	Preparation Canyon	5 Mi. S.W. Moorhead - IA 372

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Fremont	IDNR	State Park	Waubonsie	7 Mi. SW Sidney - IA 239 - 2
Muscatine	IDNR	State Park	Wildcat Den	10 Mi. E. Muscatine - IA 22
Pottawattamie	IDNR	State Park	Wilson Island Rec. Area	5 Mi. W. Loveland IA 362
Allamakee	IDNR	State Park	Yellow River Forest Camping	14 MI. SE Waudon - IA 76
Monona	IDNR	State Park	Lewis & Clark	3 MIl NW Onawa - IA 342
Clayton	IDNR	State Park	Pikes Peak	2.5 Mi. SW Spirt Lake - IA 9
Dickinson	IDNR	State Park	Marble Beach	2 Mi. NW Orleans - IA 276
Cerro Gordo	IDNR	State Park	McIntosh Woods	0.75 Mi. E. Ventura - US 18
Dubuque	IDNR	State Park	Mines of Spain	S.edge of Dubuque - US 52
Dickinson	IDNR	State Park	Mini-Wakan	N. shore Spirt Lake
Decutar	IDNR	State Park	Nine Eagles	6 Mi. SE Davis City - Co. RD.
Emmet	IDNR	State Park	Okamanpedan	3 Mi. N.E. Dolliver-Co. Rd.
Linn	IDNR	State Park	Palisades-Kepier	3.5 Mi. W. Mt Vernon - US 30
Dickinson	IDNR	State Park	Lower Gar Access	0.5 Mi S.E. Arnolds Park US - 71
Jackson	IDNR	State Park	Maquoketa Caves	7 Mi. N.W. Maquoketa - IA 428
Hancock	IDNR	State Park	Pilot Knob	4 Mi E. Forest City - IA 9
Winneshiek	IDNR	State Park	Fort Atkins	Adjoins Ft. Atkinson - IA 24
Linn	IDNR	State Park	Pleasant Creek	4 Mi. N. & .5 Mi. W. Palo
Shelby	IDNR	State Park	Prairie Rose	6 Mi. S. E. Harlan
Jones	IDNR	State Park	Wapsipinicon	Adjoins Anomosa - E 34
Lucas	IDNR	State Park	Red Haw	1 Mi. E Chariton - US 34
Montgomery	IDNR	State Park	Viking Lake	4 Mi. S.E. Stanton - Co. Rd.
Polk	IDNR	State Park	Walnut Woods	4 Mi. SW Des Moines - IA 5
Van Buren	IDNR	State Park	Lacey-Kesauqua	Adjoins Keosauqua - IA 1
Appanose	IDNR	State Park	Honey Creek	0.5 MI. W/ 3.5 S.E. Moravia Hwy. 142
Winnebago	IDNR	State Park	Rice Lake	2.5 Mi. SE Lake Mills - Co. Rd. IA
Dickinson	IDNR	State Park	Tempiar Park Rec. Area	3 Mi. N.W. Spirtlake-IA 276
Buchanan	IDNR	State Park	Cedar Rock	3 Mi. N.W. Quasqueton
Plymoth	IDNR	State Park	Stone	8 Mi. NW Sioux City - IA 12
Van Buren	IDNR	State Park	Stephens Forest Camping	W. Lucas, E. Chariton - US 65 - 34
Pottawattamie	IDNR	State Park	Lake Manawa	1 Mi. S. Council Bluffs - IA 92
Lee	IDNR	State Park	Stephens Forest Camping	W. Lucas, E. Chariton - US 65 - 34
Henry	IDNR	State Park	Geode	4 Mi. SW Danville - Co. Rd.
Mahaska	IDNR	State Park	Lake Keomah	5 MI E. Oskaloosa - IA 371
Johnson	IDNR	State Park	Lake MacBride	4 Mi. W. Solon - IA 382
Cass	IDNR	State Park	Lake Anita	5 Mi. S. Anita Interchange - I 80
Tama	IDNR	State Park	Union Grove	4 Mi. S.W. Gladbrooke - Co. Rd.
Dickinson	IDNR	State Park	Trappers Bay	Adjoins Lake Park - IA 219
Fayette	IDNR	State Park	Volga River Rec. Area	4 Mi. n Fayette - IA 150
Various counties	National Parks Service (NPS)	National Historic Trail	Lewis & Clark National Historic Trail	Generally following the Missouri River

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	NPS	National Historic Trail	Mormon Pioneer National Historic Trail	From Nauvoo, IL, westward across southern IA toward Omaha.
Cherokee	The Nature Conservancy (TNC)	Project Area	Steele Prairie	
Winneshiek	TNC	Project Area	Finch Memorial Forest	Upper Iowa River
Howard	TNC	Project Area	Crossman Prairie	
Johnson	TNC	Project Area	Williams Prairie	
Warren	TNC	Project Area	Berry Woods	
Allamakee	TNC	Project Area	Moutain Maple Hollow	NE Iowa
Story	TNC	Project area	Ames High Prairie	
Scott	TNC	Project Area	Lock & Dam #14 Eagle Area	
Woodbury	TNC	Project Area	Sioux City Prairie	
Clayton	TNC	Project Area	Retz Menorial Forest	
Black Hawk	TNC	Project area	Cedar Hill Sand Prairie	
Clayton	TNC	Project Area	Bluebell Hollow	
Dickinson	TNC	Project Area	Freda Haffner Reserve	
Linn	TNC	Project Area	Behrens Ponnd & Woodland	
Muscatine	TNC	Projects Area	Red Cedar Woodland	
Muscatine	TNC	Projects Area	Greiner Family Nature Preserve	N. of Muscatine
Henry	TNC	Projects areas	Savage Memorial Woods	
Clayton	TNC	Projects Area	Roggman Boreal Slopes	
Dubuque	TNC	Projects Area	Kaufmann Avenue Prairie	Dubuque
Linn	TNC	Project Area	Hanging Bog	
Cerro Gordo	TNC	Project Area	Hoffman Prairie	
Allamakee	U.S. Fish and Wildlife Service (FWS)	National Wildlife Refuge	Upper Mississippi River Natl. Wildlife Refuge (NWR)	
Allamakee	NPS	National Monument	Effigy Mounds Nat. Monument	3 MI. N. of Marquette
Allamakee	FWS	National Wildlife Refuge	Driftless Area NWR	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Allamakee	NPS	Identified in NPS Nationwide Rivers Inventory	Upper Iowa River	Kendallville to Highway 76 crossing
Allamakee	NPS	Identified in NPS Nationwide Rivers Inventory	Yellow River	Mississippi river to Hwy W 60 near Myron
Appanoose	U.S. Army Corps of Engineers (COE)	Large Reservoir	Rathbun Lake	
Black Hawk	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Bremer	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Bremer	TNC	Project Area	Brayton-Horsley Prairie	
Buchanan	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Buena Vista	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Butler	TNC	Project Area	Big Marsh	near Allison
Calhoun	FWS	Topeka shiner Critical Habitat	West Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	East Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Purgatory Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Cedar Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Prairie Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Lake Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Camp Creek West Fork	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Calhoun	FWS	Topeka shiner Critical Habitat	Hardin Creek	
Calhoun	FWS	Topeka shiner Critical Habitat	Camp Creek	
Carroll	FWS	Topeka shiner Critical Habitat	North Racoon River	
Cedar	NPS	National Historic Site	Herbert Hoover Historic Site	8 Mi. E of Iowa City
Cedar	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Cerro Gordo	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Cerro Gordo	IDNR	State Park	Clear Lake	2 Mi S. Clear Lake - IA 106
Chickasaw	TNC	Project Area	Schrieder Prairie & Fen	
Clark	FWS	National Wildlife Refuge	Mark Twain NWR	
Clay	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Clay	NPS	Nat NPS Rural Landmark	Dewey Pasture & Smith's Slough	4 Mi. NW of Ruthven
Clay	TNC	Project Area	Lindstron-Simons Fen	
Clayton	FWS	National Wildlife Refuge	Upper Mississippi River NWR	
Clayton	FWS	National Wildlife Refuge	Driftless Area NWR	
Clayton	IDNR	State Park	Bixby	2 Mi. N Edgewood
Clayton	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Clinton	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Clinton NPS	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Dallas	COE	Large Reservoir	Saylorville Lake	
Dallas	FWS	Topeka shiner Critical Habitat	Elm Branch	
Dallas	FWS	Topeka shiner Critical Habitat	Swan Lake Branch	

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TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dallas		Identified in NPS Nationwide Rivers Inventory	Middle Raccoon River	Panora to city of Redfield dam
Dallas	TNC	Project Area	Dilvers-Smith Woods	access to Raccoon River
Delaware	IDNR	State Park	Backbone	4 Mi SW Strawberry Point - IA 410
Dickenson	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Dickinson	IDNR	State Park	Emerson Bay	2.5 Mi. N. Milford - IA 32
Dickinson	NPS	Natural Landmark	Caylar Prairie	5 Mi. NW of West Okaboji
Dickinson	TNC	Project Area	Silver Lake Fen	
Dickinson	TNC	Project Area	Halbur Fen	
Dubuque	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Dubuque	FWS	National Wildlife Refuge	Driftless Area NWR	
Dubuque	NPS	Natural Landmark	White Pine Hollow Preserve	20 Mi/ NW of Dubuque
Emmet	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Emmet	IDNR	State Park	Fort Defiance	1 MI. W. Esterville - IA 9
Fayette	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Franklin	IDNR	State Park	Beeds Lake	3 MI. N.W. Hampton-Co. Rd.
Greene	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Greene	FWS	Topeka shiner Critical Habitat	North Racoon River	
Greene	FWS	Topeka shiner Critical Habitat	East Buttrick Creek	
Greene	FWS	Topeka shiner Critical Habitat	Short Creek	
Greene	FWS	Topeka shiner Critical Habitat	Hardin Creek	
Greene	FWS	Topeka shiner Critical Habitat	Buttrick Creek	
Greene	FWS	Topeka shiner Critical Habitat	Cedar Creek	
Greene	FWS	Topeka shiner Critical Habitat	West Buttrick Creek	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Guthrie	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Raccoon River	Panora to city of Redfield dam
Guthrie	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Hamilton	FWS	Topeka shiner Critical Habitat	Eagle Creek	
Hamilton	NPS	Identified in NPS Nationwide Rivers Inventory	Boone River	From Webster City to confluence with Des Moines River
Hamilton	NPS	Natural Landmark	Anderson Goose Lake	1 Mi. E. of Jewell
Hancock	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Harrison	FWS	National Wildlife Refuge	DeSoto NWR	
Harrison	NPS	Natural Landmark	Loess Hill	Turin & Little Sioux/Smith Lake
Howard	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Howard	NPS	Natural Landmark	Hayden Prairie	12 Mi. NW of Cresco
Iowa	FWS	National Wildlife Refuge	Mark Twain NWR	
Jackson	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Jackson	FWS	National Wildlife Refuge	Driftless Area NWR	
Jackson	IDNR	State Park	Bellevue	2.5 Mi. S. Belleuve - US 52
Jackson	NPS	Identified in NPS Nationwide Rivers Inventory	Maquoketa River	Mississippi River to US 151 Bridge
Jasper	FWS	National Wildlife Refuge	Neal Smith NWR	
Johnson	COE	Large Reservoir	Coralville Lake	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Jones	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Jones	NPS	Identified in NPS Nationwide Rivers Inventory	Maquoketa River	Mississippi River to US 151
Kossuth	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Kossuth	FWS	National Wildlife Refuge	Union Slough NWR	
Linn	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Louisa	FWS	National Wildlife Refuge	Mark Twain NWR	
Louisa	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar River	Iowa River to Highway 6
Lyon	FWS	Topeka shiner Critical Habitat	Kanaranzi Creek	From its confluence with the Rock River (T100N, R45W, Sec. 28), upstream to the Iowa/Minnesota State border (T100N, R45W, Sec. 11)
Lyon	FWS	Topeka shiner Critical Habitat	Rock River	From its confluence with Kanaranzi Creek (T100N, R45W, Sec. 28), upstream to the Iowa/Minnesota State border (T100N, R45W, Sec. 8)
Madison	IDNR	State Park	Badger Creek Rec. Area	6 Mi. SE Van Meter
Marion	COE	Large Reservoir	Lake Red Rock	
Marion	IDNR	State Park	Elk Rock (Red Rock)	7 MI. N Knoxville - IA 14
Monona	NPS	Natural Landmark	Loess Hills	Turin * Little Souix/Smith Lake
Muscatine	IDNR	State Park	Fairport	5 Mi. E. Muscatine - IA 22
Muscatine	IDNR	State Fish Hatchery	Fairport SFH	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Louisa	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar River	Iowa River to Highway 6
Osceola	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Osceola	FWS	Topeka shiner Critical Habitat	Little Rock River	From State Highway 9 (T100N, R43W, Sec. 34), upstream to the Iowa/Minnesota State border (T100N, R42W, Sec. 7)
Palo Alto	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Palo Alto	NPS	Natural Landmark	Dewey Pasture & Smith's Slough	4 Mi. NW of Ruthven
Pike	FWS	National Wildlife Refuge	Mark Twain NWR	
Plymouth	TNC	Project Area	Broken Kettle Grasslands	Loess Hills
Plymouth	TNC	Project Areas	Five Ridge Preserve	
Polk	COE	Large Reservoir	Saylorville Lake	
Polk	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Polk	IDNR	State Park	Big Creek	2 Mi. N. Polk City - IA 415
Pottawattamie	FWS	National Wildlife Refuge	DeSoto NWR	
Sac	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Sac	FWS	Topeka shiner Critical Habitat	Outlet Creek	From Black Hawk Lake from its confluence with Ditch 57 (T86N, R36W, Sec. 1), upstream to lake outlet (T87N, R35W, Sec. 35)
Sac	FWS	Topeka shiner Critical Habitat	Ditch 57	Tributary to Indian Creek, from their confluence (T87N, R35W, Sec. 23), upstream to the confluence with the outlet creek from Black Hawk Lake (T86N, R36W, Sec. 1)
Sac	FWS	Topeka shiner Critical Habitat	Indian Creek	From its confluence with the North Raccoon River (T87N, R35W, Sec. 24), upstream through T87N, R35W, Sec. 29
Sac	FWS	Topeka shiner Critical Habitat	North Racoon River	
Sac	IDNR	State Park	Black Hawk	Lake View - IA 175 & 71

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Scott	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Scott	FWS	National Wildlife Refuge	Upper Mississippi River NWFR	
Scott	NPS	Identified in NPS Nationwide Rivers Inventory	Wapsipinicon River	Mississippi River to Hwy. 334 at Frederika
Scotts Bluff	TNC	Project Area	Scotts Bluff Monument	
Tama	BIA	Federal Indian Reservation	Sac & Fox	
Tama	FWS	National Wildlife Refuge	Mark Twain NWR	
Thomas	USFS	Research Area	Signal Hill	
VanBuren	TNC	Project Area	Reno Timber	
Wayne	IDNR	State Park	Bobwhite	1 Mi. W. Allerton - IA 40
Webster	FWS	Topeka shiner Critical Habitat	Buttrick Creek	
Webster	FWS	Topeka shiner Critical Habitat	Ditch 57	
Webster	IDNR	State Park	Brushy Creek Rec. Area	4 Mi. E Lehigh - Co. Rd.
Webster	IDNR	State Park	Dolliver Memorial	3 Mi. NW Lehigh - IA 50
Webster	NPS	Identified in NPS Nationwide Rivers Inventory	Boone River	From Webster City to confluence with Des Moines River
Winnebago	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Winnesheik	NPS	Natural Landmark	Cold Water Cave	
Winneshiek	NPS	Identified in NPS Nationwide Rivers Inventory	Turkey River	Mississippi River to Vernon Springs
Winneshieck	NPS	Identified in NPS Nationwide Rivers Inventory	Upper Iowa River	Kendallville to Highway 76 crossing
Worth	FWS	National Wildlife Refuge	Iowa Wetland Management District	

TABLE A.2.2

ENVIRONMENTALLY SENSITIVE AREAS – IOWA

COUNTY	AGENCY	TYPE	NAME	NOTES
Wright	FWS	National Wildlife Refuge	Iowa Wetland Management District	
Wright	FWS	Topeka shiner Critical Habitat	Eagle Creek	
Wright	FWS	Topeka shiner Critical Habitat	Ditch 19	From its confluence with Ditch 3 (T91N, R26W, Sec. 31), upstream through T91N, R26W, Sec. 31
Wright	FWS	Topeka shiner Critical Habitat	Ditch 3	From its confluence with the Boone River (T91N, R26W, Sec. 32), upstream through T91N, R26W, Sec. 30

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Sedgwick	Kansas Dept. of Wildlife and Parks (KDWP)	State Park	Cheney	RR 1, Box 167A, Chenney 67025
Douglas	KDWP	State Park	Clinton	798 N. 1415 RD, Lawrence, 66049
Crawford	KDWP	State Park	Crawford	Farlington, 66734
Trego	KDWP	State Park	Cedar Bluff	P.O. 76A, Ellis, 67637
Osage	KDWP	State Park	Eisenhower	RR 2, Box 306, Osage City, 66523
Butler	KDWP	State Park	El Dorado	RR3, Box 29A, El Dorado, 67402
Montgomery	KDWP	State Park	Elk City	Box 845, Independence, 67301
Greenwood	KDWP	State Park	Fall River	RR 1, Box 44, Toronto, 66777
Mitchell	KDWP	State Park	Glen Elder	Box 162A, Glen Elder, 67446
Miami	KDWP	State Park	Hillsdale	26001 W. 255th St., Paola, 66071
Ellsworth	KDWP	State Park	Kanopolis	RR 1 Box 26d, Marquette, 67464
Jewell	KDWP	State Park	Lovewell	RR1, Box 66A, Webber, 66970
Meade	KDWP	State Park	Meade	Box K, Meade, 67864
Riley	KDWP	State Park	Milford	8881 State Park, Milford, 66514
Ellsworth	KDWP	State Park	Mushroom Rock	RR 1, Box 26D, Marquette, 67464
Jefferson	KDWP	State Park	Perry	RR 1, Box 464A Ozawkie, 66070
Osage	KDWP	State Park	Pomona	RR 1, Box 118, Vassar, 66543
Norton	KDWP	State Park	Prairie Dog	Box 431, Norton, 67654
Harvey	KDWP	State Park	Sand Hills	4207 E. 56th, Rt 5, Hutchinson, 67502
Scott	KDWP	State Park	Scott	RR1, Box 50, Scott City, 67871
Riley	KDWP	State Park	Tuttle Creek	5020-B, Tuttle Cr. Blvd., Manhattan 66502
Rooks	KDWP	State Park	Webster	RR 2, Box 153, Stockton, 67669
Russell	KDWP	State Park	Wilson	RR 1, Box 181, Sylvan Grove, 67481
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis & Clark National Historic Trail	Generally following the Missouri River
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	From Independence, MO to Topeka. The trail then headed generally northwestward, parallel to the Little Blue River, toward NE.

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, following the route of the Oregon Trail through KS toward the Platte River and the West.
Various counties	NPS	National Historic Trail	Santa Fe National Historic Trail	From Independence, MO, generally southwestward, across the state to Ft. Larned NHS. The trail then split, either following the Arkansas River or on a direct overland route toward the SW corner of the state.
Allen	Kansas Dept. of Health and Environment (KDHE)	Stream	Bloody Run	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Marmaton River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Little Osage River	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Onion Creek	Special Aquatic Life Use Waters
Allen	KDHE	Stream	Little Osage River, Middle Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Little Osage River, Middle Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Pottawatomie Creek, S Fork	Special Aquatic Life Use Waters
Anderson	KDHE	Stream	Little Indian Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	Whiskey Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	White Clay Creek	Special Aquatic Life Use Waters
Atchison	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Atchison	KDHE	Wetland	Muscotah Marsh	
Barber	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, North	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, South	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek, South E Branch	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Bear Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Elm Creek,South W Branch	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Medicine Lodge River	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Barber	KDHE	Stream	Mulberry Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Amber Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Barber	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Barber		Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	KS/OK line to Gerlane
Barber		Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	Gerlane to Belvidere
Barton	U.S. Fish and Wildlife Service (FWS)	Whooping Crane Critical Habitat	Cheyenne Bottoms	
Barton	KDHE	Stream	Deception Creek	Special Aquatic Life Use Waters
Barton	KDHE	Stream	Little Cheyenne Creek	Special Aquatic Life Use Waters Exceptional State Waters
Barton	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Barton	KDHE	Stream	Blood Creek	Special Aquatic Life Use Waters Exceptional State Waters
Barton	KDHE	Wetland	Cheyenne Bottoms	
Barton	The Nature Conservancy (TNC)	Project Area	Cheyenne Bottoms Wildlife Area	near Great Bend
Bourbon	KDHE	Stream	Marmaton River	Special Aquatic Life Use Waters
Bourbon	KDHE	Stream	Little Osage River	Special Aquatic Life Use Waters
Bourbon	NPS	National Historic Site	Fort Scott Nat. Historic Site	Adjacent to Fort Scott bus. district
Brown	Bureau of Indian Affairs (BIA)	Federal Indian Reservation	Iowa	
Brown	BIA	Federal Indian Reservation	Kickapoo	
Brown	BIA	Federal Indian Reservation	Sac & Fox	
Butler	U.S. Army Corps of Engineers (COE)	Large Reservoir	El Dorado Lake	
Butler	KDHE	Stream	Walnut River	Special Aquatic Life Use Waters Exceptional State Waters
Butler	KDHE	Stream	Cottonwood River, S Fork	Special Aquatic Life Use Waters Exceptional State Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Butler	KDHE	Stream	Grouse Creek	Special Aquatic Life Use Waters Exceptional State Waters
Butler	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Chase	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Chase	FWS	Topeka shiner Habitat	Fox Creek, and tributaries	
Chase	FWS	Topeka shiner Habitat	Diamond Creek and tributaries	
Chase	FWS	Topeka shiner Habitat	Middle Creek and tributaries	
Chase	KDHE	Stream	Jacob Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Collett Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cottonwood River	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cottonwood River, S Fork	Special Aquatic Life Use Waters Exceptional State Waters
Chase	KDHE	Stream	Bloody Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Little Cedar Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Chase	KDHE	Stream	Cedar Creek	Special Aquatic Life Use Waters Exceptional State Waters
Chase	NPS	National Preserve	Tallgrass Prairie National Preserve	
Chase		Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Cottonwood River to Chase county line
Chase		Identified in NPS Nationwide Rivers Inventory	South Fork Cottonwood River	Cottonwood River to Little Cedar Creek
Chautauqua	FWS	Burying Beetle Habitat		upland prairie
Chautauqua	KDHE	Stream	Caney River	Special Aquatic Life Use Waters Exceptional State Waters
Chautauqua	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Chautauqua		Identified in NPS Nationwide Rivers Inventory	Caney River	KS/OK line to source
Cherokee	KDHE	Stream	Brush Creek	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Cherokee	KDHE	Stream	Shoal Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee	KDHE	Stream	Spring River	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee	KDHE	Stream	Taylor Branch	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Cow Creek	Special Aquatic Life Use Waters
Cherokee	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters Exceptional State Waters
Cherokee		Identified in NPS Nationwide Rivers Inventory	Shoal Creek	Spring River to source
Cherokee		Identified in NPS Nationwide Rivers Inventory	Spring River	Hwy. 96 to Hwy. 44
Cheyenne	KDHE	Stream	Republican River, S Fork	Special Aquatic Life Use Waters
Cheyenne	KDHE	Stream	Arikaree River	Special Aquatic Life Use Waters
Cheyenne		Identified in NPS Nationwide Rivers Inventory	Arikaree River	KS/NE line to Alder Creek
Clark	KDHE	Lake	Clark Co. SFL	
Clark	KDHE	Lake	St. Jacobs Well (Big Basin W.	
Clark	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Clark	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Clark	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters
Clark	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Clark		Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. of Liberal to CO/KS Line
Clark	NPS	Natural Landmark	Big Basin Preserve	13 Mi. WNW of Ashland
Clay	COE	Large Reservoir	Milford Lake	
Clay	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Cloud	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Cloud	KDHE	Wetland	Jamestown W.A.	

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Coffey	COE	Large Reservoir	John Redmond Res.	
Coffey	FWS	National Wildlife Refuge	Flint Hills NWR	Neosho River Valley
Coffey	KDHE	Stream	Little Indian Creek	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Frog Creek	Special Aquatic Life Use Waters
Coffey	KDHE	Stream	Long Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters
Comanche	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek, Middle	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Cavalry Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Kiowa Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Nescatunga Creek	Special Aquatic Life Use Waters
Comanche	KDHE	Stream	Wiggins Creek	Special Aquatic Life Use Waters
Comanche		Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy. 23 E. of Liberal to CO/KS line
Cowley	KDHE	Stream	Beaver Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Grouse Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Little Beaver Creek	Special Aquatic Life Use Waters
Cowley	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Cowley	KDHE	Stream	Walnut River	Special Aquatic Life Use Waters Exceptional State Waters
Cowley	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Taylor Branch	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Cow Creek	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	First Cow Creek	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Cow Creek, East	Special Aquatic Life Use Waters
Crawford	KDHE	Stream	Brush Creek	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Crowley	NPS	Identified in NPS Nationwide Rivers Inventory	Grouse Creek	Arkansas River to Cowley county line
Dickinson	KDHE	Lake	Herington Reservoir	
Dickinson	KDHE	Stream	Lime Creek	Special Aquatic Life Use Waters
Dickinson	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters Exceptional State Waters
Dickinson	KDHE	Stream	Lyon Creek, W Branch	Special Aquatic Life Use Waters
Dickinson	KDHE	Stream	Carry Creek	Special Aquatic Life Use Waters
Dickinson	NPS	Identified in NPS Nationwide Rivers Inventory	Lyon Creek	Smoky Hill River to RR bridge S. of Woodbine
Dickinson	FWS	Topeka shiner Habitat	Lyon Creek and tributaries	
Doniphan	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Douglas	COE	Large Reservoir	Clinton Lake	
Douglas	KDHE	Lake	Clinton Lake	
Douglas	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Douglas	KDHE	Stream	Tauy Creek	Special Aquatic Life Use Waters
Douglas	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Douglas	NPS	Natural Landmark	Baldwin woods	11 Mi. S. of Lawrence
Douglas	NPS	Natural Landmark	Baker University Wetlands	3 Mi. S of Lawrence
Edwards	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Elk	FWS	Burying Beetle Habitat		Upland prairie
Elk	KDHE	Stream	Fall River	Special Aquatic Life Use Waters Exceptional State Waters
Elk	KDHE	Stream	Grouse Creek	Exceptional State Waters
Elk	KDHE	Stream	Caney River	Special Aquatic Life Use Waters Exceptional State Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Elk	NPS	Identified in NPS Nationwide Rivers Inventory	Fall River	Verdigris River to Fall River Lake
Ellis	KDHE	Stream	Saline River	Exceptional State Waters
Ellsworth	KDHE	Stream	Smoky Hill River	Exceptional State Waters
Finney	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Ford	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Ottawa Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Franklin	KDHE	Stream	Tauy Creek	Special Aquatic Life Use Waters
Geary	COE	Large Reservoir	Milford Lake	
Geary	FWS	Topeka shiner Habitat	Clarks Creek and tributaries	
Geary	FWS	Topeka shiner Habitat	Lyon Creek and tributaries	
Geary	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters Exceptional State Waters
Geary	KDHE	Stream	Lyon Creek, W Branch	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Geary	KDHE	Stream	Carry Creek	Special Aquatic Life Use Waters
Geary	NPS	Identified in NPS Nationwide Rivers Inventory	Lyon Creek	Smoky Hill River to RR bridge S. of Woodbine
Gove	NPS	Natural Landmark	Monument Rocks Natural Area	23 Mi. S of Oakley
Graham	NPS	National Historic Site	Brown v. Board of Ed. National Historic Site	
Grant	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters Exceptional State Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Grant	NPS	Identified in Nationwide Rivers Inventory	Cimarron River	Hwy. 23 E. of Liberal to Co/KS line
Greeley	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Greeley	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Greenwood	FWS	Topeka shiner Critical Habitat	Cottonwood River and tributaries	
Greenwood	KDHE	Stream	Fall River , E Branch	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Fall River, W Branch	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	KDHE	Stream	Otter Creek	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	KDHE	Stream	Otter Creek, S Branch	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Greenwood	KDHE	Stream	Fall River	Special Aquatic Life Use Waters Exceptional State Waters
Greenwood	NPS	Identified in NPS Nationwide Rivers Inventory	Otter Creek and N. Branch	Fall River Reservoir to Hwy 96/NW of Blodgett
Hamilton	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Harper	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters Exceptional State Waters
Harper	KDHE	Stream	Sand Cr	Special Aquatic Life Use Waters
Harper	NPS	Identified in NPS Nationwide Rivers Inventory	Chikaskia River	KS/OK line to Hwy 2, NE of Runnymede
Haskell	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Haskell	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Jackson	BIA	Federal Indian Reservation	Potawatomi	
Jefferson	COE	Large Reservoir	Perry Lake	
Jefferson	KDHE	Lake	Perry Lake	
Jefferson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Jefferson	KDHE	Stream	Buck Creek	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Jefferson	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Jewell	U.S. Department of Interior (DOI)/Bureau of Reclamation (BuRec)	Lake	Lovewell Reservoir	
Jewell	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Johnson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Johnson	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Johnson	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Kearney	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Allen Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters Exceptional State Waters
Kingman	KDHE	Stream	Chikaskia River, N Fork	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Duck Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Nester Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Painter Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Pat Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Kingman	KDHE	Stream	Smoots Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek, Middle	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Kiowa Creek, West	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Medicine Lodge River	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Mule Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Cavalry Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Soldier Creek	Special Aquatic Life Use Waters
Kiowa	KDHE	Stream	Thompson Creek	Special Aquatic Life Use Waters Exceptional State Waters
Kiowa	KDHE	Stream	Wiggins Creek	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Kiowa	NPS	Identified in NPS Nationwide Rivers Inventory	Medicine (Lodge) River	Gerlane to Belvidere
Labette	KDHE	Stream	Labette Creek	Special Aquatic Life Use Waters
Labette	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters Exceptional State Waters
Leavenworth	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Salt Creek	Special Aquatic Life Use Waters
Leavenworth	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Leavenworth	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River
Linn	KDHE	Stream	Richland Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Muddy Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Big Sugar Creek	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Sugar Creek, North	Special Aquatic Life Use Waters
Linn	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Linn	KDHE	Wetland	Marais des Cygnes Wildlife Area (WA)	
Linn	FWS	National Wildlife Refuge	Marais des Cygnes National Wildlife Refuge (NWR)	
Logan	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Depperschmidt Draw	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Twin Butte Creek	Special Aquatic Life Use Waters
Logan	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Cottonwood River	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Jacob Creek	Special Aquatic Life Use Waters
Lyon	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Marion	COE	Large Reservoir	Marion Lake	
Marion	FWS	Topeka shiner Habitat	Mud Creek	From the south section line of T19S, R3E, Sec. 13, upstream through T18S, R3E, Sec. 28

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Marion	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Lyon Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Mud Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Catlin Creek	Special Aquatic Life Use Waters
Marion	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Marshall	FWS	Topeka shiner Habitat	North Elm Creek	From its confluence with the Big Blue River (T1S, R7E, Sec. 11), upstream through T1S, R8E, Sec. 21
Marshall	FWS	Topeka shiner Habitat	Clear Fork Creek	From its confluence with Jim Creek (T5S, R9E, Sec. 17), upstream through T6S, R10E, Sec. 18
Marshall	KDHE	Stream	Black Vermillion R, Clear Fk	Special Aquatic Life Use Waters
Marshall	KDHE	Stream	Manley Creek	Special Aquatic Life Use Waters
Marshall	COE	Large Reservoir	Tuttle Creek	
Meade	KDHE	Lake	Lake Meade State Park	
Meade	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Crooked Creek	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Meade	KDHE	Stream	Stumpie Arroyo	Special Aquatic Life Use Waters
Meade	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Miami	KDHE	Lake	Hillsdale Lake	
Miami	KDHE	Stream	Marais des Cygnes River	Special Aquatic Life Use Waters
Miami	KDHE	Stream	Pottawatomie Creek	Special Aquatic Life Use Waters
Miami	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Mitchell	DOI/BuRec	Lake	Glen Elder Reservoir	
Montgomery	FWS	Burying Beetle Habitat		Upland prairie
Montgomery	KDHE	Stream	Onion Creek	Special Aquatic Life Use Waters
Montgomery	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Morris	FWS	Topeka shiner Habitat	Diamond Creek and tributaries	
Morris	COE	Lake	Council Grove Reservoir	
Morris	KDHE	Stream	Middle Creek	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Lime Creek	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Morris	KDHE	Stream	Six Mile Creek	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Morton	KDHE	Lake	Moss Lake East	
Morton	KDHE	Lake	Moss Lake Middle	
Morton	KDHE	Lake	Moss Lake West	
Morton	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Morton	KDHE	Stream	Cimarron River, N Fork	Special Aquatic Life Use Waters
Morton	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Nemaha	KDHE	Stream	Big Nemaha River, S Fork	Special Aquatic Life Use Waters
Nemaha	KDHE	Stream	Manley Creek	Special Aquatic Life Use Waters
Neosho	KDHE	Stream	Flat Rock Creek	Special Aquatic Life Use Waters
Neosho	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Neosho	KDHE	Wetland	Neosho WA	
Norton	DOI/BuRec	Lake	Keith Sebelius Reservoir	
Osage	KDHE	Stream	Long Creek	Special Aquatic Life Use Waters
Osage	KDHE	Stream	Frog Creek	Special Aquatic Life Use Waters
Osage	KDHE	Stream	Appanoose Creek	Special Aquatic Life Use Waters
Ottawa	NPS	Natural Landmark	Rock City	2.5 Mi. SW of Minneapolis
Pawnee	NPS	National Historic Site	Fort Larned Nat. Historic Site	6 MI. W. Larned - Hwy 156
Phillips	KDHE/DOI/BuRec	Lake	Kirwin Lake	
Phillips	FWS	National Wildlife Refuge	Kirwin NWR	N. Fork of Soloman River Valley
Pottawatomie	FWS	Topeka shiner Critical Habitat	Clear Fork Creek	Continuation of item #41 above
Pottawatomie	KDHE	Stream	Bucksnort Creek	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Black Vermillion River, Clear Fork	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Pottawatomie	KDHE	Stream	Bluff Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Mulberry Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Amber Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Chikaskia River, N Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Elm Creek, North	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Elm Creek, South E Branch	Special Aquatic Life Use Waters

TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Pratt	KDHE	Stream	Elm Creek , South W Branch	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Turkey Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Natrona Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Ninnescah River, W Branch of S Fork	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Painter Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Pratt	KDHE	Wetland	Texas Lake WA.	
Reno	DOI/BuRec/KDHE	Lake	Cheney Reservoir	
Reno	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas
Reno	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Ninnescah River, N Fork	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Red Rock Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Silver Creek	Special Aquatic Life Use Waters
Reno	KDHE	Stream	Smoots Creek	Special Aquatic Life Use Waters
Reno	FWS	Wetland	Quivira Little Salt Marsh	
Republic	KDHE	Stream	Republican River	Special Aquatic Life Use Waters
Republic	KDHE	Wetland	Jamestown WA.	
Rice	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas
Rice	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Rice	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Rice	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Riley	FWS	Topeka shiner Habitat	Walnut Creek	from the east section line of T7S, R6E, Sec. 19, upstream through T8S, R5E, Sec. 1
Riley	FWS	Topeka shiner Habitat	Deep Creek and tributaries	
Riley	FWS	Topeka shiner Habitat	Wildcat Creek and tributaries	
Riley	KDHE	Stream	Deep Creek	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Riley	KDHE	Stream	Wildcat Creek	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Riley	COE	Large Reservoir	Tuttle Creek	
Riley	TNC, Kansas State University (KSU)	Project Area, Biosphere Reserve	Konza Prairie	S. of Manhattan
Rooks	DOI/BuRec	Lake	Webster Reservoir	
Rush	KDHE	Stream	Blood Creek	Special Aquatic Life Use Waters
Russell	COE	Large Reservoir	Wilson Lake	
Russell	NPS	Identified in NPS Nationwide Rivers Inventory	Saline River	Wilson Lake to Fairport
Russell	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Russell	KDHE	Stream	Saline River	Special Aquatic Life Use Waters
Scott	KDHE	Lake	Lake Scott State Park	
Scott	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Chisolm Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Clearwater Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Nester Creek	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Ninnescah River	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Ninnescah River, S Fork	Special Aquatic Life Use Waters
Sedgwick	KDHE	Stream	Sand Creek	Special Aquatic Life Use Waters
Seward	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Seward	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Shawnee	FWS	Topeka shiner Habitat	Mission Creek	From Interstate Highway 70 (T11S, R14E, Sec. 33), upstream to the confluence of North Branch Mission Creek and South Branch Mission Creek (T13S, R12E, Sec. 1)
Shawnee	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Shawnee	KDHE	Stream	Mill Creek	Special Aquatic Life Use Waters
Shawnee	NPS	National Historic Site	Nicodemus National Historic Site	
Stafford	FWS	National Wildlife Refuge	Quivira NWR	South-central Kansas

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Stafford	FWS	Whooping crane Critical Habitat	Quivira NWR	
Stafford	KDHE	Stream	Peace Creek	Special Aquatic Life Use Waters
Stafford	KDHE	Stream	Ninnescah River, N Fork	Special Aquatic Life Use Waters
Stafford	KDHE	Stream	Rattlesnake Creek	Special Aquatic Life Use Waters
Stafford	FWS	Wetland	Quivira Little Salt Marsh	NWR
Stafford	FWS	Wetland	Quivira Big Salt Marsh	NWR
Stevens	KDHE	Stream	Cimarron River	Special Aquatic Life Use Waters
Stevens	NPS	Identified in NPS Nationwide Rivers Inventory	Cimarron River	Hwy 23 E. Of Liberal, KS to CO/KS line
Sumner	KDHE	Stream	Ninnescah River	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Arkansas River	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Spring Creek	Special Aquatic Life Use Waters
Sumner	KDHE	Stream	Chikaskia River	Special Aquatic Life Use Waters
Sumner	NPS	Identified in NPS Nationwide Rivers Inventory	Chikaskia River	KS/OK line to Hwy 2, NE of Runnynede
Trego	DOI/BuRec	Lake	Cedar Bluff Reservoir	
Wabaunsee	FWS	Topeka shiner Habitat	Mill Creek and tributaries	
Wabaunsee	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Deep Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Elm Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Illinois Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, W Branch	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Locust Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, E Branch	Special Aquatic Life Use Waters
Wabaunsee	KDHE	Stream	Mill Creek, S Branch	Special Aquatic Life Use Waters
Wallace	FWS	Topeka shiner Habitat	Willow Creek	From its confluence with the Smoky Hill River (T13S, R41W, Sec. 17), upstream through T13S, R42W, Sec. 3
Wallace	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Capper Draw	Special Aquatic Life Use Waters

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TABLE A.2.3

ENVIRONMENTALLY SENSITIVE AREAS – KANSAS

COUNTY	AGENCY	TYPE	NAME	NOTES
Wallace	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Coon Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Depperschmidt Draw	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Eagletail Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Pond Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Rose Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Smoky Hill River	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Twin Butte Creek	Special Aquatic Life Use Waters
Wallace	KDHE	Stream	Willow Creek	Special Aquatic Life Use Waters
Wichita	KDHE	Stream	Chalk Creek	Special Aquatic Life Use Waters
Wichita	KDHE	Stream	Ladder Creek	Special Aquatic Life Use Waters
Wilson	FWS	Burying Beetle habitat		Upland prairie
Wilson	KDHE	Stream	Fall River	Special Aquatic Life Use Waters
Wilson	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Wilson	NPS	Identified in NPS Nationwide Rivers Inventory	Fall River	Verdigris River to Fall river Lake
Woodson	KDHE	Lake	Woodson Co. State Fishing Lake (SFL)	
Woodson	KDHE	Lake	Circle Lake	
Woodson	KDHE	Lake	Leonard's Lake	
Woodson	KDHE	Stream	Bloody Run	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Neosho River	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Owl Creek, South	Special Aquatic Life Use Waters
Woodson	KDHE	Stream	Verdigris River	Special Aquatic Life Use Waters
Woodson	KDHE	Wetland	Woodson WA.	
Wyandotte	KDHE	Stream	Kansas River	Special Aquatic Life Use Waters
Wyandotte	KDHE	Stream	Little Turkey Creek	Special Aquatic Life Use Waters
Wyandotte	KDHE	Stream	Missouri River	Special Aquatic Life Use Waters
Wyandotte	NPS	Identified in NPS Nationwide Rivers Inventory	Kansas River	I-635 to Delaware River

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TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Hickory	U.S. Army Corps of Engineers (COE)	Large Reservoir	Pomme De Terre Lake	
Clay	COE	Large Reservoir	Smithville Lake	
	COE	Large Reservoir	Harry S. Truman Lake	
	COE	Large Reservoir	Mark Twain Lake	
	COE	Large Reservoir	Stockton Lake	
	COE	Large Reservoir	Table Rock Lake	
	COE	Large Reservoir	Wappapello Lake	
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis & Clark National Historic Trail	Generally follows the Missouri River
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	Started in Independence, MO, and headed westward.
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, following the route of the Oregon Trail through KS toward the Platte River and the West.
Various counties	NPS	National Historic Trail	Santa Fe National Historic Trail	
Various counties	NPS	National Historic Trail	Trail of Tears National Historic Trail	In an arc through southern MO, from just north of Cape Girardeau, northwestward to the present-day route of I-44, and then southwestward toward Tahlequah, AR.
	U.S. Forest Service (USFS)	National Forest	Mark Twain Nat. Forest	Numerous counties in south-central Missouri
	USFS	National Wilderness Area	Devil's Backbone	
	USFS	National Wilderness Area	Hercules Glades	
	USFS	National Wilderness Area	Irish	

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TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
	USFS	National Wilderness Area	Paddy Creek	
	USFS	National Wilderness Area	Piney Creek	
	USFS	National Wilderness Area	Rockpile Mountain	
	USFS	National Wilderness Area	Bell Mountain	
Barry	NPS	Identified in NPS Nationwide Rivers Inventory	Shoal Creek	Spring River to source
Barton	NPS	Natural Landmark	Golden Prairie	16 Mi. NE of Carthage
Barton	The Nature Conservancy (TNC)	St Conservancy Preserve	Shelton L Cook Memorial Meadow	
Barton	TNC	St Conservancy Preserve	Tri-Sho Prairie	
Barton	TNC	St Conservancy Preserve	Hunkah Prairie	
Barton	TNC	St Conservancy Preserve	Pawhuska Prairie	
Benton	TNC	St Conservancy Preserve	Rockhill Prairie	
Bollinger	U.S. Fish and Wildlife Service (FWS)	National Wildlife Refuge	Mingo National Wildlife Refuge (NWR)	Watershed drains into Refuge
Bollinger	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Boone	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Missouri River to Hwy WW
Boone	TNC	St Conservancy Preserve	Hinkson Valley	
Butler	NPS	Identified in NPS Nationwide Rivers Inventory	Little Black River	S36,T25N, R2E to MO-AR state line

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Callaway	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Missouri River to Hwy WW
Callaway	NPS	Natural Landmark	Tucker Prairie	7 Mi. NNw of Fulton
Camden	NPS	Natural Landmark	Carroll Cave	Private
Carter	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Carter	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways
Cedar	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Sac river to source
Cedar	TNC	St Conservancy Preserve	Mo-Ko Prairie	
Cedar	TNC	St Conservancy Preserve	Monegaw Prairie	
Chariton	FWS	National Wildlife Refuge	Swan Lake NWR	
Chariton	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy. 36
Christian	NPS	Identified in NPS Nationwide Rivers Inventory	Swan Creek	From S4, T26N, R18W to Bull Shoals Lake
Clark	FWS	National Wildlife Refuge	Great River NWR	Fox Island Division
Clark	FWS	National Wildlife Refuge	Mark Twain NWR	
Clay	NPS	Natural Landmark	Maple Woods Natural Area	
Clinton	TNC	St Conservancy Preserve	Trice-Dedman Memorial Woods	
Cooper	FWS	National Wildlife Refuge	Big Muddy NWR	Overton Bottoms North Unit

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TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Huzzah Creek	Meramec River to Dillard
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Courtois Creek	Huzzah Creek to Brazil
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Crawford	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Hill to Hwy B
Crawford	NPS	Natural Landmark	Onondag Cave	5 Mi. SW of Leasburg
Crawford	TNC	St Conservancy Preserve	Zahorsky Woods	
Dade	NPS	Identified in NPS Nationwide Rivers Inventory	Cedar Creek	Sac river to source
Dade	TNC	St Conservancy Preserve	Niawthe Prairie	
Dade	TNC	St Conservancy Preserve	N. B. Altvater Corry Flatrocks	
Dade	TNC	St Conservancy Preserve	Greenfield Glade	
Dallas	NPS	Identified in NPS Nationwide Rivers Inventory	Little Niangua River	S20, T35N, R19W to Lake of the Ozarks
Dallas	NPS	Identified in NPS Nationwide Rivers Inventory	Niangua River	Bennet Spring Branch to Camden/Dallas county line
Daviess	NPS	Identified in NPS Nationwide Rivers Inventory	Marrowbone Creek	Hwy 13 to I-35

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TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Dent	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways
Dent	NPS	Identified in NPS Nationwide Rivers Inventory	Little Piney Creek	S21, T34N, R8W to Gasconade River
Dent	TNC	St Conservancy Preserve	Hyer Woods	
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Beaver Creek	S24,T26N, R17W to Bull Shoals Lake
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Bryant Creek	N. Fork White River to Hwy. 14
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Indian Creek	North Fork of the White River to source
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Douglas	NPS	Identified in NPS Nationwide Rivers Inventory	Spring Creek	S24, T26N, R10W to S34, T25N, R11W, almost entirely within the Mark Twain NF
Douglas	TNC	St Conservancy Preserve	Alma Peterson Azalea Memorial	
Douglas	TNC	St Conservancy Preserve	Williams Memorial Woods	
Franklin	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy 8

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Franklin	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Gasconade	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy. 8
Gasconade	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Greene	NPS	National Battlefield	Wilson Creek Nat. Battlefield	10 MI. SW of Springfield
Hickory	NPS	Identified in NPS Nationwide Rivers Inventory	Little Niangua River	S20, T35N, R19W to Lake of the Ozarks
Holt	FWS	National Wildlife Refuge	Squaw Creek	
Holt	TNC	St Conservancy Preserve	J. C. McCormack Loess Mounds	
Howard	FWS	National Wildlife Refuge	Big Muddy NWR	Lisbon Bottoms Unit
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Indian Creek	North Fork of the White River to source
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring Creek	S24, T26N, R10W to S34, T25N, R11W, almost entirely within the Mark Twain NF
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River and Warm Fork	From confluence with Black River to headwaters near West Plains, MO
Howell	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River, South Fork	From confluence with Spring River to headwaters south of South Fork, Mo
Iron	FWS	National Wildlife Refuge	Pilot Knob NWR	Administered by Mingo NWR

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Jackson	FWS	National Wildlife Refuge	Big Muddy NWR	Jackass Bend Unit
Jackson	NPS	National Historic Site	Harry Truman Nat. Historic Site	Truman Rd & Main, Independence
Jasper	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River	Highway 96 to Highway 44
Jasper	TNC	St Conservancy Preserve	Wha-Sha-She Prairie	
Jefferson	FWS	National Wildlife Refuge	Middle Mississippi River NWR	Harlow Island District
Jefferson	TNC	St Conservancy Preserve	Victoria Glade	
Jefferson	TNC	St Conservancy Preserve	N. B. Altwater LaBarque Hills	
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	South Fabius River	Count Hwy. E to confluence of N. & S. Forks
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Niangua River	Bennet Spring Branch to Camden/Dallas county line
Laclede	NPS	Identified in NPS Nationwide Rivers Inventory	Osage Fork of the Gasconade River	South of High Prairie to S23, T35N, R14W
Laclede	TNC	St Conservancy Preserve	Bennett Spring Savanna	
Lafayette	FWS	National Wildlife Refuge	Big Muddy NWR	Baltimore Bottoms Unit
Lawrence	FWS	National Wildlife Refuge	Ozark Cavefish NWR	Administered by Mingo NWR

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Lawrence	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River	Highway 96 to Hwy 44
Lawrence	TNC	St Conservancy Preserve	Mount Vernon Prairie	
Lewis	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Lewis	TNC	St Conservancy Preserve	Accola Woods	
Lincoln	NPS	Identified in NPS Nationwide Rivers Inventory	West Fork Cuivre River	Cuivre River to County Hwy AC
Linn	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy 36
Livingston	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	Grant River to Hwy 36
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	Little St. Francois River	Northwest of Fredericktown to St. Francois River
Madison	NPS	Identified in NPS Nationwide Rivers Inventory	St Francis River	Lake Wappapello to Syenite
Maries	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Marion	NPS	Natural Landmark	Mark Twain & Cameron Caves	2 Mi. SE of Hannibal
McDonald	NPS	Identified in NPS Nationwide Rivers Inventory	Big Sugar Creek	S35,T22N, R30W to Pineville. Joins Little Sugar Creek to form the Elk River.
McDonald	NPS	Identified in NPS Nationwide Rivers Inventory	Elk River	From Pineville to the MO-OK state line
Mississippi	NPS	Natural Landmark	Big Oak Tree	Big Oak Tree State Park
Montgomery	NPS	Identified in NPS Nationwide Rivers Inventory	West Fork Cuivre River	Cuivre River to County Hwy AC
Newton	FWS	National Wildlife Refuge	Mingo NWR - Neosho Unit	Spring containing Ozark cavefish habitat
Newton	FWS	National Fish Hatchery	Neosho National Fish Hatchery (NFH)	
Newton	NPS	National Park	George Washington Carver Nat. Monument	7. Mi s of I-44
Newton	NPS	Identified in NPS Nationwide Rivers Inventory	Shoal Creek	
Newton	FWS	National Research Facility	Columbia Environmental & Contaminants Research Ctr.	
Nodaway	TNC	St Conservancy Preserve	Dobbins Woodlands	
Oregon	NPS	Identified in NPS Nationwide Rivers Inventory	Spring River and Warm Fork	From confluence with Black River to headwaters near West Plains, MO
Oregon	NPS	National Scenic River	Eleven Point	Downstream from Thomasville to State Highway 142
Oregon	NPS	Natural Landmark	Grand Gulf	8 Mi. W of Thayer
Oregon	NPS	Natural Landmark	Greer Spring	52 Mi. W of Poplar Bluff

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Osage	FWS	National Wildlife Refuge	Big Muddy NWR	St. Aubert=s Island Unit
Osage	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Ozark	NPS	Identified in NPS Nationwide Rivers Inventory	Bryant Creek	N. Fork White River to Hwy 14
Ozark	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Bourbeuse River	Noser Mill to Hwy B
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Little Piney Creek	S21, T34N, R8W to Gasconade River
Phelps	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Phelps	NPS	Natural Landmark	Maramec Spring	8 Mi. SE of St. James
Pike	FWS	National Wildlife Refuge	Great River NWR	Clarence Cannon Refuge
Pike	FWS	National Wildlife Refuge	Mark Twain NWR	

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Pulaski	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Pulaski	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source
Reynolds	NPS	Identified in NPS Nationwide Rivers Inventory	Black River	Hwy K to source
Reynolds	TNC	St Conservancy Preserve	Lily Pond	
Reynolds	TNC	St Conservancy Preserve	N.B. Altvater Grasshopper Holl	
Ripley	NPS	Identified in NPS Nationwide Rivers Inventory	Little Black River	S36, T25N, R2E to MO-AR state line
Ripley	NPS	Natural Landmark	Cupola Pond	Mark Twain Nat. Forest
Ripley	TNC	St Conservancy Preserve	N.B. Altvater Pondberry	
Saline	FWS	National Wildlife Refuge	Big Muddy NWR	Jameson Island Unit
Schuyler	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Scotland	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Fabius River & N. Fork	N. Fabius River to source
Shannon	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Shannon	NPS	Identified in NPS Nationwide Rivers Inventory	Current River	Entire segment within Ozark National Scenic Riverways

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Shannon	NPS	Identified in NPS Nationwide Rivers Inventory	Jacks Fork	Entire segment within Ozark National Scenic Riverways
Shannon	TNC	St Conservancy Preserve	N.B. Altvater Shut-in-Mntn Fen	
St. Charles	FWS	National Wildlife Refuge	Mark Twain NWR	
St. Clair	FWS	National Wildlife Refuge	Swan Lake	
St. Charles	FWS	National Wildlife Refuge	Big Muddy NWR	Boone=s Crossing Unit
St. Francois	NPS	Identified in NPS Nationwide Rivers Inventory	St. Francis River	Lake Wappapello to Syenite
St. Genevieve	NPS	Natural Landmark	Pickle Springs	7 Mi. E. of Farmington
St. Clair	NPS	Natural Landmark	Taberville Prairie	2.5 Mi. N of Taberville
St. Clair	TNC	St Conservancy Preserve	Wah'Kon-Tah Prairie	
St. Clair	TNC	St Conservancy Preserve	Lichen Glade	
St. Francis	TNC	St Conservancy Preserve	Silas Dees Azalea & Wildflower	
St. Louis	NPS	National Memorial	Jefferson Nat. Expansion Memorial	Mississippi Riverfront, St. Louis
St. Louis	NPS	National Historic Site	Ulysses S. Grant Historic Site	9060 White Haven Dr. St. Louis
Stoddard	FWS	National Wildlife Refuge	Mingo NWR	
Stone	NPS	Natural Landmark	Marvel Cave	50 Mi. S of Springfield
Sullivan	NPS	Identified in NPS Nationwide Rivers Inventory	Locust Creek	End channelization to sect. 28
Taney	NPS	Identified in NPS Nationwide Rivers Inventory	Beaver Creek	S24,T26N, R17W to Bull Shoals Lake

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Taney	NPS	Identified in NPS Nationwide Rivers Inventory	Swan Creek	S4, T26N, R18W to Bull Shoals Lake
Taney	NPS	Natural Landmark	Tumbling Creek Cave	
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	Big Piney River	Gasconade River to Hwy 63
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	Jacks Fork	Entire segment within Ozark National Scenic Riverways
Texas	NPS	Identified in NPS Nationwide Rivers Inventory	North Fork White River	Norfork Lake to source
Texas	NPS	National Scenic Riverway	Ozark National Scenic Riverway	134 Mi. of Jacks Fork & Current Rivers
Vernon	TNC	St Conservancy Preserve	Marmaton River Bottoms Wet Prairie	
Vernon	TNC	St Conservancy Preserve	Little Osage Prairie	
Vernon	TNC	St Conservancy Preserve	Gamagrass Meadows	
Warren	NPS	Natural Landmark	Wegener Woods	.25 Mi N of Holstein
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Mineral Fork	Big River to Hwy F
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Courtois Creek	Huzzah Creek to Brazil
Washington	NPS	Identified in NPS Nationwide Rivers Inventory	Meramec River	Meramec State Park to Cook Station
Wayne	FWS	National Wildlife Refuge	Mingo NWR	

TABLE A.2.4

ENVIRONMENTALLY SENSITIVE AREAS – MISSOURI

COUNTY	AGENCY	TYPE	NAME	NOTES
Wayne	NPS	Identified in NPS Nationwide Rivers Inventory	Castor River	
Wayne	NPS	Identified in NPS Nationwide Rivers Inventory	St. Francis River	Lake Wappapello to Syerite
Webster	NPS	Identified in NPS Nationwide Rivers Inventory	Osage Fork of the Gasconade River	South of High Prairie to S23, T35N, R14W
Wright	NPS	Identified in NPS Nationwide Rivers Inventory	Gasconade River	Missouri R. to source County Lake

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Various counties	National Parks Service (NPS)	National Historic Trail	California National Historic Trail	Developed over a period of years, and contains numerous cutoffs and alternate routes. General route began at Various jumping off points in MO, including Independence and St. Joseph, and headed westward following the routes of the Oregon and Santa Fe Trails through KS and the Platte River through NE.
Various counties	NPS	National Historic Trail	Lewis and Clark National Historic Trail	Generally follows the Missouri River
Various counties	NPS	National Historic Trail	Mormon Pioneer National Historic Trail	Generally follows the Platte River on north side of the channel, from near Omaha to Scotts Bluff in western Nebraska.
Various counties	NPS	National Historic Trail	Oregon National Historic Trail	Enters southeast Nebraska west of Odell, and generally follows the Blue River to Ayr. Then the trail cuts northwest toward Kearney and the Platte River, which it follows westward to Scotts Bluff. The trail generally follows the south side of the channel. West of Ogallala, a portion of the trail follows the S. Platte and the route of I-80 to Sydney, before cutting north again along the route of US-385 back toward the N. Platte.
Various counties	NPS	National Historic Trail	Pony Express National Historic Trail	Most of original trail has been obliterated through time. Some Pony Express Stations still exist. Trail started in Independence, MO, and went generally westward to San Francisco, CA, following the Platte River.
Adams	U.S. Fish and Wildlife Service (FWS)	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Adams	FWS	Waterfowl Production Area	Weseman Waterfowl Production Area (WPA)	
Adams	FWS	Waterfowl Production Area	Kenesaw WPA	
Adams	Nebraska Game and Parks Commission (NGPC)	State Recreation Area	Crystal Lake State Recreation Area (SRA)	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Adams	NGPC	State Recreation Area	DLD SRA	
Adams	NGPC	State Recreation Area	Prairie Lake SRA	
Adams	The Nature Conservancy (TNC)	Project Area	Various Platte River	
Antelope	NGPC	State Historical Park	Ashfall Fossil Beds State Historic Park (SHP)	
Antelope	NGPC	Wildlife Management Area	Hackberry Creek WMA	
Antelope	NGPC	Wildlife Management Area	Grove Lake WMA	
Antelope	NGPC	Wildlife Management Area	Red Wing WMA	
Arthur	TNC	Project Area	Arapaho Prairie	
Arthur	TNC	Project Area	Arapaho Prairie	Managed by University of NE
Banner	NGPC	Wildlife Management Area	Wildcat Hills WMA	
Banner	NGPC	Wildlife Management Area	Buffalo Creek WMA	
Blain	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn diversion Dam to source
Blaine	NGPC	Wildlife Management Area	Milburn Diversion Dam WMA	
Blaine	NPS	Identified in NPS Nationwide Rivers Inventory	Dismal River	Middle Loup River to source
Boone	NGPC	Wildlife Management Area	Beaver Bend WMA	
Boyd	FWS	Piping Plover Critical Habitat	Niobrara River and Missouri River	Niobrara R. from Norden Bridge to mouth at Missouri River. Missouri River from S.D border to river mile 252.2 (at Ponca).
Boyd	FWS	National Wildlife Refuge	Karl E. Mundt National Wildlife Refuge (NWR)	
Boyd	NGPC	Wildlife Management Area	Hull Lake WMA	
Boyd	NGPC	Wildlife Management Area	Parshall Bridge WMA	
Boyd	NPS	National Recreational River	Missouri River	Fort Randall Dam (SD) downstream to Knox county line
Boyd	NPS	National Scenic River	Niobrara River	76 miles downstream of Valentine
Boyd	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Boyd	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River (omit Spencer Dam & Reservoir)
Brown	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Brown	NGPC	State Recreation Area	Long Lake SRA	
Brown	NGPC	State Recreation Area	Keller Park SRA	
Brown	NGPC	State Recreation Area	Long Pine SRA	
Brown	NGPC	Wildlife Management Area	Pine Glen WMA	
Brown	NGPC	Wildlife Management Area	Bobcat WMA	
Brown	NGPC	Wildlife Management Area	Keller Park/School Land WMA	
Brown	NGPC	Wildlife Management Area	Plum Creek Valley	1.5 miles S. of Johnstown
Brown	NGPC	Wildlife Management Area	Long Pine WMA	
Brown	NGPC	Wildlife Management Area	South Twin Lake WMA	
Brown	NGPC	Wildlife Management Area	American Game Marsh WMA	
Brown	NGPC	Wildlife Management Area	Willow Lake (Brown Co) WMA	
Brown	NGPC	Wildlife Management Area	South Pine WMA	12 miles S. of Long Pine
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus	North Loup River to source
Brown	NPS	Identified in NPS Nationwide Rivers Inventory	Long Pine Creek	Niobrara River to source
Brown	TNC	Project Area	Niobrara Valley Preserve	Parts of T32-R23 and R24, T33-R23 and R24
Buffalo	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Buffalo	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Buffalo	FWS	Endangered Species Act (ESA) Mitigation Land	Wyoming property	2 miles E, 1 mile S of Kearney; owned by WY state for mitigation purposes

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Buffalo	FWS	Farmers Home Administration (FmHA) easement under the NWR	Wize	Section 12, T12N, R14W
Buffalo	FWS	FmHA easement under the NWR	Altmaier, Freddie	Section 31, T10N, R17W
Buffalo	NAS	Wildlife Sanctuary	Lillian Annette Rowe Wildlife Sanctuary	South of Gibbon
Buffalo	NGPC	State Recreation Area	War Axe SRA	
Buffalo	NGPC	State Recreation Area	Union Pacific SRA	
Buffalo	NGPC	State Recreation Area	Windmill SRA	
Buffalo	NGPC	Wildlife Management Area	Bufflehead WMA	3.25 mile W of Minden INT
Buffalo	NGPC	Wildlife Management Area	Bassway Strip WMA	
Buffalo	NGPC	Wildlife Management Area	Coot Shallows WMA	1.75 mile W of Odessa INT
Buffalo	NGPC	Wildlife Management Area	Blue Hole WMA	
Buffalo	NGPC	Wildlife Management Area	Kea Lake WMA	SW Quad, Kearney INT
Buffalo	NGPC	Wildlife Management Area	Kea West WMA	N I-80, 1 mile W of Kearney INT
Buffalo	NGPC	Wildlife Management Area	East Odessa WMA	
Buffalo	NGPC	Wildlife Management Area	Denman Island WMA	
Buffalo	Nebraska Public Power District (NPPD)	ESA Mitigation Land	Elm Creek Island	
Buffalo	TNC	Project Area	Various Platte River	Parts of T8-R15
Burt	NGPC	State Recreation Area	Pelican Point SRA	
Burt	NGPC	State Recreation Area	Summit Lake SRA	
Burt	NGPC	Wildlife Management Area	Middle Decatur Bend WMA	4 miles E of Decatur
Butler	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Butler	NGPC	Wildlife Management Area	Skull Creek #1 WMA	2.5 miles N, 0.75 E of Brainard
Butler	NGPC	Wildlife Management Area	Skull Creek #2 WMA	2 miles N, 0.5 W of Abie
Butler	NGPC	Wildlife Management Area	Redtail WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Cass	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Cass	NGPC	State Recreation Area	Louisville Lakes SRA	
Cass	NGPC	State Park	Platte River State Park (SP)	
Cass	NGPC	State Park	Eugene T. Mahoney SP	
Cass	NGPC	Wildlife Management Area	Randall W. Schilling WMA	
Cass	NGPC	Wildlife Management Area	Cedar Creek Island	River Access NE of Cedar
Cass	NGPC	Wildlife Management Area	Rakes Creek WMA	
Cass	NGPC	Wildlife Management Area	Rhoden WMA	NE of Plattsmouth
Cass	NGPC	Wildlife Management Area	William Gilmour (Tobacco Island)	3 miles S, 0.5 E of Plattsmouth
Cedar	FWS	Piping Plover Critical Habitat	Missouri River	From S.D. border to river mile 252.2 (at Ponca)
Cedar	NGPC	Wildlife Management Area	Wiseman WMA	
Cedar	NGPC	Wildlife Management Area	Tatanka WMA	
Cedar	NGPC	Wildlife Management Area	Chalkrock WMA	
Cedar	NPS	National Recreational River	Missouri River	Gavin=s Point Dam downstream to Dixon county line
Chase	NGPC	State Recreation Area	Champion Lake SRA	
Chase	NGPC	State Recreation Area	Enders Reservoir SRA	
Chase	NGPC	State Historical Park	Champion Mill SHP	
Chase	NGPC	Wildlife Management Area	Enders Reservoir WMA	
Chase	NGPC	Wildlife Management Area	Wanamaker WMA	
Cherry	FWS	National Wildlife Refuge	Fort Niobrara NWR	
Cherry	FWS	National Wildlife Refuge	Valentine NWR	
Cherry	FWS	National Wilderness Area	Fort Niobrara	
Cherry	NGPC	State Historical Park	Bowring Ranch SHP	
Cherry	NGPC	State Park	Smith Falls SP	
Cherry	NGPC	State Recreation Area	Cottonwood Lake SRA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Cherry	NGPC	State Recreation Area	Merritt Reservoir SRA	
Cherry	NGPC	Wildlife Management Area	Willow Lake WMA	
Cherry	NGPC	Wildlife Management Area	Ballards Marsh WMA	
Cherry	NGPC	Wildlife Management Area	Merritt Reservoir WMA	
Cherry	NGPC	Wildlife Management Area	Anderson Bridge WMA	
Cherry	NGPC	Wildlife Management Area	Rat and Beaver Lakes WMA	
Cherry	NGPC	Wildlife Management Area	Shell Lake WMA	
Cherry	NGPC	Wildlife Management Area	Cottonwood/Steverson WMA	27 miles N of Hyannis
Cherry	NGPC	Wildlife Management Area	Big Alkali Lake WMA	
Cherry	NGPC	Wildlife Management Area	Borman Bridge WMA	
Cherry	NGPC	Wildlife Management Area	Schlagel Creek WMA	11 miles S, 4 W of Valentine
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn Diversion Dam to source
Cherry	NPS	National Scenic River	Niobrara River	From Valentine downstream 76 miles
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek (Omit Cornell Dam and Reservoir)
Cherry	NPS	Identified in NPS Nationwide Rivers Inventory	Snake River	Niobrara River to source
Cherry	TNC	Project Area	Niobrara Valley Preserve	
Cherry	TNC	Project Area	Niobrara Valley Preserve/Horse Creek Fen	Parts of T27-R31, T33-R25 and R26, T34-R25 and R26
Cherry	U.S. Forest Service (USFS)	National Forest	Samuel McKelvie National Forest	
Clay	FWS	National Wildlife Refuge	McMurtrey Marsh NWR	
Clay	FWS	Waterfowl Production Area	Harvard WPA	
Clay	FWS	Waterfowl Production Area	Hultine WPA	
Clay	FWS	Waterfowl Production Area	Verona WPA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Clay	FWS	Waterfowl Production Area	Lange WPA	
Clay	FWS	Waterfowl Production Area	Theesen WPA	
Clay	FWS	Waterfowl Production Area	Glenvil WPA	
Clay	FWS	Waterfowl Production Area	Massie WPA	
Clay	FWS	Waterfowl Production Area	Harms WPA	
Clay	FWS	Waterfowl Production Area	Moger WPA	
Clay	FWS	Waterfowl Production Area	Meadowlark WPA	
Clay	FWS	Waterfowl Production Area	Green Acres WPA	
Clay	FWS	Waterfowl Production Area	Eckhardt WPA	
Clay	FWS	Waterfowl Production Area	Schuck WPA	
Clay	FWS	Waterfowl Production Area	Smith WPA	
Clay	FWS	Waterfowl Production Area	Hansen WPA	
Clay	NGPC	Wildlife Management Area	Greenwing WMA	
Clay	NGPC	Wildlife Management Area	Bulrush WMA	
Clay	NGPC	Wildlife Management Area	Bluewing WMA	
Clay	NGPC	Wildlife Management Area	White-front WMA	
Clay	NGPC	Wildlife Management Area	Greenhead WMA	
Clay	NGPC	Wildlife Management Area	Kissinger Basin WMA	
Colfax	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Colfax	NGPC	Wildlife Management Area	Whitetail WMA	
Cuming	NGPC	Wildlife Management Area	Black Island WMA	
Custer	FWS	FmHA easement under the NWR	Scott, John J.	Section 10, T17N, R18W
Custer	FWS	FmHA easement under the NWR	Thorton	Section 9, T15N, R20W
Custer	NGPC	State Recreation Area	Arnold Lake SRA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Custer	NGPC	State Recreation Area	Victoria Springs SRA	
Custer	NGPC	Wildlife Management Area	Pressey WMA	
Custer	NGPC	Wildlife Management Area	Arcadia Diversion Dam WMA	
Custer	NGPC	Wildlife Management Area	Myrtle E. Hall WMA	
Dakota	NGPC	Wildlife Management Area	Basswood Ridge WMA	
Dakota	NGPC	Wildlife Management Area	Omadi Bend WMA	2 miles E, 1 N of Homer
Dawes	NGPC	State Park	Chadron SP	
Dawes	NGPC	State Recreation Area	Box Butte Reservoir SRA	
Dawes	NGPC	State Park	Fort Robinson SP	
Dawes	NGPC	Wildlife Management Area	Ponderosa WMA	
Dawes	NGPC	Wildlife Management Area	Big Horn WMA	
Dawes	NGPC	Wildlife Management Area	Whitney Inlet WMA	4 miles W. of Whitney
Dawes	NGPC	Wildlife Management Area	Bordeaux WMA	3 miles E of Chadron
Dawes	TNC	Project Area	Carter Ranch	Parts of T31-R50
Dawes	USFS	National Forest	Oglala National Grassland	
Dawes	USFS	National Forest	Nebraska National Forest - Pine Ridge District	
Dawson	Central Nebraska Public Power and Irrigation District (CNPPID)	ESA Mitigation Land	Jeffrey Island	
Dawson	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Dawson	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Dawson	NGPC	State Recreation Area	Johnson Lake SRA	
Dawson	NGPC	State Recreation Area	Gallagher Canyon SRA	
Dawson	NGPC	Wildlife Management Area	E. Willow Island WMA	
Dawson	NGPC	Wildlife Management Area	Willow Island WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dawson	NGPC	Wildlife Management Area	Cozad WMA	
Dawson	NGPC	Wildlife Management Area	W. Cozad WMA	
Dawson	NGPC	Wildlife Management Area	East Cozad WMA	S I-80, 1.5 miles E of Cozad
Dawson	NGPC	Wildlife Management Area	Dogwood WMA	
Dawson	NGPC	Wildlife Management Area	Darr WMA	NW Quad, Darr INT
Dawson	NGPC	Wildlife Management Area	East Darr WMA	0.5 miles E of Darr INT
Dawson	NGPC	Wildlife Management Area	Bitterns Call WMA	
Dawson	NGPC	Wildlife Management Area	Overton WMA	NW Quad Oveton INT
Dawson	NGPC	Wildlife Management Area	Blue Heron WMA	
Dawson	NGPC	Wildlife Management Area	Darr Strip WMA	
Dawson	NGPC	Wildlife Management Area	Plum Creek WMA	10 SW of Lexington
Dawson	NGPC	Wildlife Management Area	West Elm Creek WMA	N I-80, SW Elm Creek
Dawson	NGPC	Wildlife Management Area	East Gothenburg WMA	4 E Gothenburg INT
Dawson	NPPD	ESA Mitigation Land	Cottonwood Ranch	
Dawson	NPPD	ESA Mitigation Land	Overton Island	
Dawson	NPPD	ESA Mitigation Land	Lexington Island	
Deuel	NGPC	Wildlife Management Area	Goldenrod WMA	1 mile S, 2 E of Chappel
Deuel	NGPC	Wildlife Management Area	Bittersweet WMA	
Deuel	NGPC	Wildlife Management Area	Goldeneye WMA	
Dixon	FWS	Piping Plover Critical Habitat	Missouri River	From S.D. border to river mile 252.2 (at Ponca)
Dixon	NGPC	State Park	Ponca SP	
Dixon	NGPC	Wildlife Management Area	Buckskin Hills WMA	
Dixon	NGPC	Wildlife Management Area	Mulberry Bend WMA	4 mile N, 3 W of Newcastle
Dixon	NPS	National Recreational River	Missouri River	From Cedar county line downstream to Ponca State Park (NE)

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Dodge	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Dodge	FWS	FmHA easement under the NWR	Thomsen, Vern	Section 32, T19N, R7E
Dodge	FWS	FmHA easement under the NWR	Tuma	SE 1/4 Section 23, T19N, R5E
Dodge	FWS	Waterfowl Production Area	Haseman WPA	
Dodge	NGPC	State Recreation Area	Dead Timber SRA	
Dodge	NGPC	State Recreation Area	Fremont Lakes SRA	
Dodge	NGPC	Wildlife Management Area	Powder Horn WMA	
Douglas	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Douglas	NGPC	State Recreation Area	Two Rivers SRA	
Douglas	NGPC	Wildlife Management Area	Two Rivers WMA	
Dundy	FWS	FmHA easement under the NWR	Jones, Daniel	Sections 29, 20, T1N, R41/42W
Dundy	NGPC	State Recreation Area	Rock Creek Lake SRA	
Fillmore	FWS	Waterfowl Production Area	Real WPA	
Fillmore	FWS	Waterfowl Production Area	Griess WPA	
Fillmore	FWS	Waterfowl Production Area	Rauscher WPA	
Fillmore	FWS	Waterfowl Production Area	Rolland WPA	
Fillmore	FWS	Waterfowl Production Area	Morphy WPA	
Fillmore	FWS	Waterfowl Production Area	Brauning WPA	
Fillmore	FWS	Waterfowl Production Area	Wilkins WPA	
Fillmore	FWS	Waterfowl Production Area	Krause WPA	
Fillmore	FWS	Waterfowl Production Area	Mallard Haven WPA	
Fillmore	FWS	Waterfowl Production Area	Millers Pond WPA	
Fillmore	NGPC	Wildlife Management Area	Bluebill WMA	
Fillmore	NGPC	Wildlife Management Area	Sandpiper WMA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Fillmore	NGPC	Wildlife Management Area	Redhead WMA	
Fillmore	NGPC	Wildlife Management Area	Sora WMA	
Fillmore	NGPC	Wildlife Management Area	Marsh Hawk WMA	
Fillmore	TNC	Project Area	Marsh Hawk WMA	
Fillmore	TNC	Project Area	Real WMA	
Franklin	FWS	Waterfowl Production Area	Ritterbush WPA	
Franklin	FWS	Waterfowl Production Area	Macon Lakes WPA	
Franklin	FWS	Waterfowl Production Area	Quadhamer WPA	
Franklin	NGPC	Wildlife Management Area	Limestone Bluffs WMA	
Franklin	NGPC	Wildlife Management Area	Ash Grove WMA	
Frontier	NGPC	State Recreation Area	Red Willow Reservoir SRA	
Frontier	NGPC	State Recreation Area	Medicine Creek SRA	
Frontier	NGPC	Wildlife Management Area	Red Willow Reservoir WMA	
Frontier	NGPC	Wildlife Management Area	Medicine Creek WMA	
Furnas	FWS	FmHA easement under the NWR	Avon Arms	Sections 2, 11, 10, T4N, R23W
Furnas	NGPC	Wildlife Management Area	Oxford WMA	
Furnas	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Gage	FWS	FmHA easement under the NWR	Arlington, Norman	Section 10, T2N, R7E
Gage	FWS	FmHA easement under the NWR	Meints	Sections 25, 26, T2N, R6E
Gage	FWS	FmHA easement under the NWR	Virmar Farms	Sections 3, 4, 33, T2N, R5E
Gage	NGPC	State Recreation Area	Rockford SRA	
Gage	NGPC	Wildlife Management Area	Iron Horse Trail (IHT) WMA	
Gage	NGPC	Wildlife Management Area	Arrowhead WMA	
Gage	NGPC	Wildlife Management Area	Diamond Lake WMA	
Gage	NGPC	Wildlife Management Area	Donald Whitney Memorial WMA	3.5 miles W of Odell

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Gage	NPS	National Monument	Homestead National Monument of America	4.5 miles west of Beatrice
Garden	FWS	National Wildlife Refuge	Crescent Lake NWR	
Garden	NGPC	State Historical Park	Bluewater Battlefield SHP	
Garden	NGPC	State Historical Park	Ash Hollow SHP	
Garden	TNC	Project Area	Graves Ranch	Parts of T20-R45
Garfield	NGPC	State Recreation Area	Calamus Reservoir SRA	
Garfield	NGPC	Wildlife Management Area	Mirdan Canal WMA	
Garfield	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Gosper	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Gosper	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Gosper	FWS	Waterfowl Production Area	Elley WPA	
Gosper	FWS	Waterfowl Production Area	Peterson WPA	
Gosper	FWS	Waterfowl Production Area	Victor Lakes WPA	
Gosper	NGPC	State Recreation Area	East Phillips Canyon SRA	8 miles S of Lexington
Gosper	NGPC	State Recreation Area	Johnson Lake SRA	
Gosper	NGPC	State Recreation Area	Elwood Reservoir SRA	
Gosper	NGPC	Wildlife Management Area	Plum Creek WMA	
Grant	NGPC	Wildlife Management Area	Frye Lake WMA	
Grant	NGPC	Wildlife Management Area	De Fair Lake WMA	1.5 miles E, 3 S of Hyannis
Grant	NPS	Natural Landmark	Nebraska Sandhills	Immediately S. of Hyannis
Greeley	NGPC	Wildlife Management Area	Davis Creek WMA	
Hall	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Hall	FWS	FmHA easement under the NWR	Hannon	Sections 9, 10, T9N, R12W
Hall	FWS	Waterfowl Production Area	Hannon WPA	
Hall	NGPC	State Recreation Area	Cheyenne SRA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Hall	NGPC	State Recreation Area	Mormon Island SRA	
Hall	NGPC	Wildlife Management Area	Cornhusker Farm WMA	
Hall	NGPC	Wildlife Management Area	Cattail WMA	3 miles W Alda INT
Hall	NGPC	Wildlife Management Area	Wood River West WMA	4 miles S. of Wood River
Hall	NGPC	Wildlife Management Area	Martin's Reach WMA	
Hall	NGPC	Wildlife Management Area	Loch Linda WMA	
Hall	TNC	Project Area	Various Platte River	Parts of T9-R11, T10-R10
Hamilton	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Hamilton	FWS	FmHA easement under the NWR	Mowitz, Eldred	Section 10, T12N, R5W
Hamilton	FWS	FmHA easement under the NWR	Larson, Steven	Section 18, T10N, R6W
Hamilton	FWS	Waterfowl Production Area	Troester Basin WPA	
Hamilton	FWS	Waterfowl Production Area	Springer WPA	
Hamilton	FWS	Waterfowl Production Area	Nelson WPA	
Hamilton	NGPC	Wildlife Management Area	Deep Well WMA	
Hamilton	NGPC	Wildlife Management Area	Pintail WMA	
Hamilton	NGPC	Wildlife Management Area	Gadwall WMA	
Harlan	COE	Large Reservoir	Harlan County Lake	
Harlan	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Harlan	NGPC	Wildlife Management Area	Southeast Sacramento WMA	
Harlan	NGPC	Wildlife Management Area	South Sacramento WMA	
Hayes	NGPC	Wildlife Management Area	Frenchman WMA	1.5 miles N of Palisade
Hayes	NGPC	Wildlife Management Area	Hayes Center WMA	
Hitchcock	NGPC	State Recreation Area	Swanson Reservoir SRA	
Hitchcock	NGPC	Wildlife Management Area	Swanson Reservoir WMA	
Holt	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Holt	NGPC	State Recreation Area	Atkinson Lake SRA	
Holt	NGPC	Wildlife Management Area	Dry Creek WMA	
Holt	NGPC	Wildlife Management Area	Redbird WMA	
Holt	NGPC	Wildlife Management Area	Spencer Dam WMA	22 miles N of O'Neill
Holt	NGPC	Wildlife Management Area	Goose Lake WMA	2 miles N of Royal
Holt	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Holt	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River
Hooker	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milbourn Diversion Dam to source
Howard	FWS	Piping Plover Critical Habitat	Loup River	Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Howard	FWS	FmHA easement under the NWR	Gillilavd	Section 1, T14N, R12W
Howard	NGPC	State Recreation Area	North Loup SRA	
Howard	NGPC	Wildlife Management Area	Harold W. Andersen WMA	
Howard	NGPC	Wildlife Management Area	Loup Bottoms/Junction WMA	
Howard	NGPC	Wildlife Management Area	Leonard A. Koziol WMA	1.5 miles E, 3 N of St. Paul
Howard	NGPC	Wildlife Management Area	Marsh Wren WMA	1.5 miles S, 2 E of Elba
Jefferson	NGPC	State Recreation Area	Rock Creek Station SRA	
Jefferson	NGPC	State Recreation Area	Alexandria Lakes SRA	
Jefferson	NGPC	State Historical Park	Rock Creek Station SHP	
Jefferson	NGPC	Wildlife Management Area	Rock Glen WMA	
Jefferson	NGPC	Wildlife Management Area	Rose Creek WMA	
Jefferson	NGPC	Wildlife Management Area	Alexandria Lakes WMA	
Jefferson	NGPC	Wildlife Management Area	Flathead WMA	1 mile S. of Fairbury

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Johnson	NGPC	Wildlife Management Area	Hickory Ridge WMA	
Johnson	NGPC	Wildlife Management Area	Osage WMA	
Johnson	NGPC	Wildlife Management Area	Twin Oaks WMA	
Kearney	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Kearney	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman
Kearney	FWS	ESA Mitigation Land	Wyoming property	2 miles E, 1 mile S of Kearney; owned by WY state for mitigation purposes
Kearney	FWS	FmHA easement under the NWR	Nickels Brothers	NW 1/4 Section 7, T7N, R15W
Kearney	FWS	FmHA easement under the NWR	Johansen, Bruce	Section 11, T6N, R14W
Kearney	FWS	Waterfowl Production Area	Killdeer WPA	
Kearney	FWS	Waterfowl Production Area	Clark WPA	
Kearney	FWS	Waterfowl Production Area	Youngson WPA	
Kearney	FWS	Waterfowl Production Area	Frerichs WPA	
Kearney	FWS	Waterfowl Production Area	Lindau WPA	
Kearney	FWS	Waterfowl Production Area	Jensen WPA	
Kearney	FWS	Waterfowl Production Area	Gleason WPA	
Kearney	FWS	Waterfowl Production Area	Bluestem WPA	
Kearney	FWS	Waterfowl Production Area	Prairie Dog WPA	
Kearney	NGPC	State Recreation Area	Fort Kearney SRA	
Kearney	NGPC	State Historical Park	Fort Kearney SHP	
Kearney	NGPC	Wildlife Management Area	Northeast Sacramento WMA	
Keith	NGPC	State Recreation Area	Lake McConaughy SRA	
Keith	NGPC	State Recreation Area	Lake Ogallala SRA	
Keith	NGPC	Wildlife Management Area	Big Springs WMA	0.5 mile E of Big Springs
Keith	NGPC	Wildlife Management Area	Clear Creek WMA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Keith	NGPC	Wildlife Management Area	Ogallala Strip WMA	
Keya Paha	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Keya Paha	FWS	FmHA easement under the NWR	Johnson, Cecil	Section 5, T34N, R30W
Keya Paha	FWS	FmHA easement under the NWR	Mead, Darrell	Sections 20, 21, 28, 29, T32N, R19W
Keya Paha	FWS	FmHA easement under the NWR	Johnson, Cecil	Section 32, T35N, R30W
Keya Paha	NGPC	Wildlife Management Area	Thomas Creek WMA	
Keya Paha	NGPC	Wildlife Management Area	Holt Creek WMA	6 miles W, 5 N of Burton
Keya Paha	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek (Omit Cornell Dam & Reservoir)
Keya Paha	NPS	National Scenic River	Niobrara River	From Valentine 76 miles downstream
Keya Paha	TNC	Project Area	Niobrara Valley Preserve	Parts of T33-R23 and R-24
Kimball	NGPC	State Recreation Area	Oliver Reservoir SRA	
Knox	BIA	Indian Reservation	Santee Indian Reservation	
Knox	FWS	Piping Plover Critical Habitat	Niobrara River and Missouri River	Niobrara R. from Norden Bridge to mouth at Missouri River; Missouri R. from S.D. border to river mile 252.2 (at Ponca)
Knox	FWS	FmHA easement under the NWR	Wagner, Raymond 11C	Section 8, T29N, R6W
Knox	FWS	FmHA easement under the NWR	Wagner, Raymond 10C	SE 1/4 Section 6, T29N, R6W
Knox	FWS	FmHA easement under the NWR	Larson Farms	Sections 19, 20, T31N, R5W
Knox	NGPC	State Recreation Area	Lewis and Clark SRA	
Knox	NGPC	State Park	Niobrara SP	
Knox	NGPC	Wildlife Management Area	Greenvale WMA	
Knox	NGPC	Wildlife Management Area	Niobrara WMA	
Knox	NGPC	Wildlife Management Area	Bazile Creek WMA	
Knox	NGPC	Wildlife Management Area	Bohemia Prairie WMA	
Knox	NGPC	Wildlife Management Area	Ferry Landing WMA	3 miles E of Niobrara

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Knox	NGPC	Wildlife Management Area	Verdel Landing WMA	2 miles E, 2 N of Verdel
Knox	NPS	National Recreational River	Missouri River	Running Water SD to Fort Randall Dam
Knox	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Missouri River to Keya Paha River
Lancaster	NGPC	State Recreation Area	Conestoga Lake SRA	
Lancaster	NGPC	State Recreation Area	Stagecoach Lake SRA	
Lancaster	NGPC	State Recreation Area	Bluestem Lake SRA	
Lancaster	NGPC	State Recreation Area	Olive Creek Lake SRA	
Lancaster	NGPC	State Recreation Area	Pawnee Lake SRA	
Lancaster	NGPC	State Recreation Area	Branched Oak Lake SRA	
Lancaster	NGPC	State Recreation Area	Wagon Train Lake SRA	
Lancaster	NGPC	Wildlife Management Area	Wildwood WMA	
Lancaster	NGPC	Wildlife Management Area	Arbor Lake WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Lancaster	NGPC	Wildlife Management Area	Branched Oak Lake WMA	
Lancaster	NGPC	Wildlife Management Area	Yankee Hill WMA	
Lancaster	NGPC	Wildlife Management Area	Jack Sinn Memorial WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Lancaster	NGPC	Wildlife Management Area	Killdeer WMA	
Lancaster	NGPC	Wildlife Management Area	Hedgefield WMA	
Lancaster	NGPC	Wildlife Management Area	Teal Lake WMA	
Lancaster	TNC	Project Area	Little Salt Fork Marsh	Parts of T11 and 12-R6; Saline Wetlands of eastern Nebraska
Lincoln	NGPC	State Historical Park	Buffalo Bill Ranch SHP	
Lincoln	NGPC	State Recreation Area	Lake Maloney Reservoir SRA	
Lincoln	NGPC	State Recreation Area	Sutherland Reservoir SRA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Lincoln	NGPC	State Recreation Area	Buffalo Bill Ranch SRA	
Lincoln	NGPC	Wildlife Management Area	West Gothenburg WMA	N & S I-80, 3 miles W of Brady
Lincoln	NGPC	Wildlife Management Area	Sutherland Reservoir WMA	
Lincoln	NGPC	Wildlife Management Area	East Sutherland WMA	
Lincoln	NGPC	Wildlife Management Area	Brady WMA	SE Quad, Brady INT
Lincoln	NGPC	Wildlife Management Area	West Brady WMA	S I-80, 3 miles W of Brady
Lincoln	NGPC	Wildlife Management Area	North River WMA	
Lincoln	NGPC	Wildlife Management Area	Muskrat Run WMA	
Lincoln	NGPC	Wildlife Management Area	Hershey WMA	
Lincoln	NGPC	Wildlife Management Area	East Hershey WMA	
Lincoln	NGPC	Wildlife Management Area	West Hershey WMA	N I-80, 0.5 mile W Hershey INT
Lincoln	NGPC	Wildlife Management Area	Birdwood Lake WMA	
Lincoln	NGPC	Wildlife Management Area	Platte WMA	
Lincoln	NGPC	Wildlife Management Area	Box Elder Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Wellfleet WMA	
Lincoln	NGPC	Wildlife Management Area	Pawnee Slough WMA	
Lincoln	NGPC	Wildlife Management Area	Cottonwood Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Chester Island WMA	
Lincoln	NGPC	Wildlife Management Area	Jeffrey Canyon WMA	
Lincoln	NGPC	Wildlife Management Area	Hansen Memorial Reserve WMA	
Lincoln	NGPC	Wildlife Management Area	Cedar Valley WMA	
Lincoln	NGPC	Wildlife Management Area	Fremont Slough WMA	N I-80, 4.5 miles E of North Platte
Lincoln	NGPC	Wildlife Management Area	West Maxwell WMA	N I-80, 1 mile W Maxwell INT
Lincoln	NPS	Natural Landmark	Kissected Loess Plains	17 miles SSW of Brady
Lincoln	TNC	Project Area	Muskrat Run WMA	302 acres, N Platte River
Lincoln	TNC	Project Area	Kelly Ranch	Parts of T14-R33 and R34

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Loup	NGPC	State Recreation Area	Calamus Reservoir SRA	
Loup	NGPC	Wildlife Management Area	Calamus Reservoir WMA	
Loup	NGPC	Wildlife Management Area	Almeria Meadow WMA	
Loup	NGPC	Wildlife Management Area	Kent Diversion Dam WMA	
Loup	NGPC	Wildlife Management Area	Myrtle E. Hall WMA	
Loup	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Madison	FWS	FmHA easement under the NWR	Muhs	Section 24, T23N, R2W
Madison	FWS	Topeka Shiner Critical Habitat	Taylor Creek	the 6 mi. upstream from confluence w/ Union Creek
Madison	NGPC	Wildlife Management Area	Oak Valley WMA	
Madison	NGPC	Wildlife Management Area	Elkhorn WMA	N edge of Norfolk
Madison	NGPC	Wildlife Management Area	Yellowbanks WMA	
Merrick	FWS	Piping Plover Critical Habitat	Platte River and Loup River	Platte River from Lexington to mouth at Missouri River; Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Merrick	NGPC	Wildlife Management Area	Bruce Cowgill WMA	1.5 mile E of Silver Creek
Merrick	NGPC	Wildlife Management Area	Lone Tree WMA	inaccessible (island?)
Merrick	NGPC	Wildlife Management Area	Silver Creek WMA	
Morrill	NGPC	State Recreation Area	Bridgeport SRA	
Morrill	NGPC	Wildlife Management Area	Chet and Jane Fliesbach WMA	
Morrill	NGPC	Wildlife Management Area	Trupp WMA	
Morrill	NPS	National Historic Site	Chimney Rock National Historic Site	19 miles east of Gering on Hwy 92
Nance	FWS	Piping Plover Critical Habitat	Loup River	Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Nance	NGPC	Wildlife Management Area	Loup Lands (Loup River PPD) WMA	
Nance	NGPC	Wildlife Management Area	Sunny Hollow WMA	

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Nance	NGPC	Wildlife Management Area	Council Creek WMA	6.5 miles W of Genoa
Nance	NGPC	Wildlife Management Area	Prairie Wolf WMA	
Nemaha	NGPC	State Park	Indian Cave SP	
Nemaha	NGPC	State Recreation Area	Brownville SRA	
Nemaha	NGPC	Wildlife Management Area	Peru Bottoms WMA	1 mile E, 1 N of Peru
Nemaha	NGPC	Wildlife Management Area	Aspinwall Bend WMA	
Nuckolls	NGPC	Wildlife Management Area	Smartweed Marsh West WMA	
Nuckolls	NGPC	Wildlife Management Area	Smartweed Marsh WMA	
Otoe	NGPC	State Recreation Area	Riverview Marina SRA	
Otoe	NGPC	State Historical Park	Arbor Lodge SHP	
Otoe	NGPC	Wildlife Management Area	Triple Creek WMA	
Otoe	NGPC	Wildlife Management Area	Wilson Creek WMA	2 mile N, 2 W, 0.5 N of Dunbar
Otoe	NGPC	Wildlife Management Area	Hamburg Bend WMA	1 mile S, 4.5 E, 1 S, 0.5 E of Nebraska City
Pawnee	NGPC	Wildlife Management Area	Burchard WMA	
Pawnee	NGPC	Wildlife Management Area	Bowwood WMA	
Pawnee	NGPC	Wildlife Management Area	Iron Horse Trail WMA	
Pawnee	NGPC	Wildlife Management Area	Mayberry WMA	
Pawnee	NGPC	Wildlife Management Area	Table Rock WMA	
Pawnee	NGPC	Wildlife Management Area	Taylor's Branch WMA	
Pawnee	NGPC	Wildlife Management Area	Pawnee Prairie WMA	
Pawnee	NGPC	Wildlife Management Area	Prairie Knoll WMA	
Pawnee	NGPC	Wildlife Management Area	Lores Branch WMA	
Pawnee	TNC	Project Area	Pawnee Prairie WMA	
Phelps	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Phelps	FWS	Whooping Crane Critical Habitat	Platte River	Platte River from Lexington to Denman

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ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Phelps	FWS	Waterfowl Production Area	Johnson WPA	
Phelps	FWS	Waterfowl Production Area	Funk WPA	
Phelps	FWS	Waterfowl Production Area	Atlanta WPA	
Phelps	FWS	Waterfowl Production Area	Jones WPA	
Phelps	FWS	Waterfowl Production Area	Cottonwood WPA	
Phelps	FWS	Waterfowl Production Area	Linder WPA	
Phelps	NGPC	State Recreation Area	Sandy Channel SRA	
Phelps	NGPC	Wildlife Management Area	High Basin WMA	
Phelps	NGPC	Wildlife Management Area	West Sacramento WMA	
Phelps	NGPC	Wildlife Management Area	Sacramento - Wilcox WMA	
Phelps	NPPD	ESA Mitigation Land	Cottonwood Ranch	
Phelps	TNC	Project Area	Anderson	Part of T8-R19
Pierce	NGPC	State Recreation Area	Willow Creek SRA	
Platte	FWS	Piping Plover Critical Habitat	Platte River and Loup River	Platte River from Lexington to mouth at Missouri River; Loup River (proper - not the North, South, or Middle Loup - i.e., mainstem of Loup River)
Platte	NGPC	Wildlife Management Area	Lookingglass Creek WMA	
Platte	NGPC	Wildlife Management Area	George Syas WMA	
Platte	NGPC	Wildlife Management Area	Flat Water Landing WMA	1 mile S. of Columbus
Platte	NGPC	Wildlife Management Area	Wilkinson WMA	5 miles W, 1 N of Columbus
Polk	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Polk	FWS	FmHA easement under the NWR	Viergutz, James R.	Sections 11, 12, 13, T14N, R4W
Polk	FWS	FmHA easement under the NWR	Warner Farms	Section 33, T13N, R3W
Polk	FWS	FmHA easement under the NWR	Anderson, Bruce L.	SE 1/4 Section 34, T14N, R2W
Polk	NGPC	Wildlife Management Area	Flatsedge WMA	2.5 miles W, 2 N of Shelby

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Red Willow	NGPC	State Recreation Area	Red Willow Reservoir SRA	
Red Willow	NGPC	Wildlife Management Area	Bartley Diversion Dam WMA	
Red Willow	NGPC	Wildlife Management Area	Burton's Bend WMA	Along the Republican River
Red Willow	NGPC	Wildlife Management Area	Red Willow Reservoir WMA	
Red Willow	NGPC	Wildlife Management Area	Red Willow Diversion Dam WMA	
Richardson	NGPC	State Recreation Area	Verdon Lake SRA	
Richardson	NGPC	State Park	Indian Cave SP	
Richardson	NGPC	Wildlife Management Area	Four-Mile Creek WMA	
Richardson	NGPC	Wildlife Management Area	Margrave WMA	
Richardson	NGPC	Wildlife Management Area	Iron Horse Trail WMA	
Richardson	NGPC	Wildlife Management Area	South Fork WMA	2.5 miles S, 3.5 W of Dawson
Richardson	NGPC	Wildlife Management Area	Kinters Ford WMA	
Richardson	TNC	Project Area	Rulo Bluffs	
Richardson	TNC	Project Area	Rulo Bluffs	Parts of T1-R18
Rock	FWS	Piping Plover Critical Habitat	Niobrara River	Niobrara R. from Norden Bridge to mouth at Missouri River
Rock	FWS	National Wildlife Refuge	John W. & Louise Seier NWR	
Rock	NAS	Wildlife Sanctuary	Niobrara River	
Rock	NGPC	Wildlife Management Area	Fred Thomas WMA	11.5 miles N of Bassett on Hwy 7
Rock	NGPC	Wildlife Management Area	Twin Lakes (Rock) WMA	20 miles S. of Bassett
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Lone Pine Creek	Niobrara River to source
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Keya Paha River to Antelope Creek
Rock	NPS	Identified in NPS Nationwide Rivers Inventory	Calamus River	North Loup River to source
Saline	FWS	Waterfowl Production Area	Schwisow WPA	
Saline	NGPC	Wildlife Management Area	Swan Creek WMA	
Saline	NGPC	Wildlife Management Area	Divoky Acres WMA	9 miles W, 2.5 N of Wilber

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Saline	NGPC	Wildlife Management Area	Shady Trail WMA	1 mile W, 4 N, 0.5 W, 0.5 N of Crete
Sarpy	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Sarpy	NGPC	State Recreation Area	Schramm Park SRA	
Sarpy	NGPC	Wildlife Management Area	Louisville WMA	0.5 mile NW of Louisville
Sarpy	NPS	Natural Landmark	Fontenelle Forest	1 Mile S. of Omaha
Saunders	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River
Saunders	FWS	FmHA easement under the NWR	Keller, Lynn	Section 1, T16N, R7E
Saunders	FWS	FmHA easement under the NWR	Thomas Farms	Sections 12,13, T13N, R9E
Saunders	FWS	FmHA easement under the NWR	Keller, Lynn	Section 6, T16N, R8E
Saunders	NGPC	State Recreation Area	Pioneer SRA	
Saunders	NGPC	State Recreation Area	Memphis Lake SRA	
Saunders	NGPC	Wildlife Management Area	Jack Sinn Memorial WMA	Saline wetlands of eastern Nebraska; unique habitat for Salt Creek Tiger Beetle (federally listed) & saltwort (state listed)
Saunders	NGPC	Wildlife Management Area	Memphis Lake WMA	
Saunders	NGPC	Wildlife Management Area	Bramble WMA	
Saunders	NGPC	Wildlife Management Area	Catfish Run WMA	1.2 mile E of Ashland
Saunders	NGPC	Wildlife Management Area	Larkspur WMA	3 miles W of Valparaiso
Scotts Bluff	FWS	National Wildlife Refuge	North Platte NWR	
Scotts Bluff	NGPC	State Recreation Area	Lake Minitare SRA	
Scotts Bluff	NGPC	State Recreation Area	Wildcat Hills SRA	
Scotts Bluff	NGPC	Wildlife Management Area	Nine Mile Creek WMA	
Scotts Bluff	NGPC	Wildlife Management Area	Kiowa WMA	
Scotts Bluff	NGPC	Wildlife Management Area	Cedar Canyon WMA	2.5 miles S and 4.5 W of Gering
Scotts Bluff	NPS	National Monument	Scotts Bluff National Monument	5 miles SW of Scotts Bluff
Scotts Bluff	TNC	Project Area	Kiowa WMA	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Seward	FWS	Waterfowl Production Area	Tamora Basin WPA	
Seward	FWS	Waterfowl Production Area	Freeman Lakes WPA	
Seward	NGPC	State Recreation Area	Blue River SRA	
Seward	NGPC	Wildlife Management Area	Straight Water WMA	
Seward	NGPC	Wildlife Management Area	Oak Glen WMA	
Seward	NGPC	Wildlife Management Area	Bur Oak WMA	
Seward	NGPC	Wildlife Management Area	Twin Lakes WMA	
Seward	NGPC	Wildlife Management Area	Blue Bluff WMA	3 miles S, 1 E, 1 N of Milford
Seward	NGPC	Wildlife Management Area	North Lake Basin WMA	
Sheridan	NGPC	State Recreation Area	Walgren Lake SRA	
Sheridan	NGPC	Wildlife Management Area	Smith Lake WMA	
Sheridan	NGPC	Wildlife Management Area	Metcalf WMA	
Sheridan	NPS	Identified in NPS Nationwide Rivers Inventory	Snake River	Niobrara River to source
Sherman	NGPC	State Recreation Area	Bowman Lake SRA	
Sherman	NGPC	State Recreation Area	Sherman Reservoir SRA	
Sherman	NGPC	Wildlife Management Area	Sherman Reservoir WMA	
Sioux	NGPC	State Park	Fort Robinson SP	
Sioux	NGPC	State Recreation Area	James Ranch SRA	
Sioux	NGPC	Wildlife Management Area	Peterson WMA	
Sioux	NGPC	Wildlife Management Area	Gilbert-Baker WMA	
Sioux	NPS	Identified in NPS Nationwide Rivers Inventory	Niobrara River	Entire segment within Agate Fossil Beds National Monument
Sioux	NPS	National Monument	Agate Fossil Beds National Monument	20 miles north of Harrison
Sioux	TNC	Project Area	Cherry Ranch	Parts of T29 and 30-R56
Sioux	USFS	National Forest/Grassland	Oglala National Grassland	

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Sioux	USFS	National Wilderness Area	Soldier Creek Wilderness	Nebraska NF
Stanton	NGPC	Wildlife Management Area	Red Fox WMA	
Stanton	NGPC	Wildlife Management Area	Wood Duck WMA	
Thayer	FWS	FmHA easement under the NWR	Gerdes, Don	Section 9, T2N, R2W
Thayer	NGPC	Wildlife Management Area	Prairie Marsh WMA	
Thayer	NGPC	Wildlife Management Area	Father Hupp WMA	
Thayer	NGPC	Wildlife Management Area	Meridian WMA	
Thayer	NGPC	Wildlife Management Area	Prairie Marsh West WMA	
Thayer	NGPC	Wildlife Management Area	Little Blue WMA	
Thayer	NGPC	Wildlife Management Area	Dry Sandy WMA	2 miles E, 0.75 N of Bruning
Thayer	NGPC	Wildlife Management Area	Little Blue East WMA	1.5 miles E of Hebron
Thayer	TNC	Project Area	Prairie Marsh WMA	
Thomas	NPS	Identified in NPS Nationwide Rivers Inventory	Dismal River	Middle Loup Rive to source
Thomas	NPS	Identified in NPS Nationwide Rivers Inventory	Middle Loup River	Milburn Diversion Dam to source
Thomas	USFS	National Forest	Nebraska National Forest - Bessey District	
Thurston	BIA	Indian Reservation	Omaha Indian Reservation	
Thurston	BIA	Indian Reservation	Winnebago Indian Reservation	
Valley	FWS	FmHA easement under the NWR	Plate, Willis	Section 34, T17N, R13W
Valley	FWS	FmHA easement under the NWR	Wayne, Gregory	Section 33, T20N, R13W
Valley	FWS	FmHA easement under the NWR	Wayne, Gregory	Sections 3 and 4, T19N, R13W
Valley	NGPC	State Historical Park	Fort Hartsuff SHP	
Valley	NGPC	Wildlife Management Area	Davis Creek WMA	
Valley	NGPC	Wildlife Management Area	Scotia Canal WMA	
Washington	FWS	Piping Plover Critical Habitat	Platte River	Platte River from Lexington to mouth at Missouri River

TABLE A.2.5

ENVIRONMENTALLY SENSITIVE AREAS – NEBRASKA

COUNTY	AGENCY	TYPE	NAME	NOTES
Washington	FWS	National Wildlife Refuge	Boyer Chute NWR	
Washington	FWS	National Wildlife Refuge	DeSoto NWR	
Washington	NGPC	State Historical Park	Fort Atkinson SHP	
Washington	TNC	Project Area	Cuming City Cemetery	
Wayne	NGPC	Wildlife Management Area	Sioux Strip WMA	
Webster	NGPC	Wildlife Management Area	Indian Creek WMA	
Webster	NGPC	Wildlife Management Area	Narrows WMA	
Webster	NGPC	Wildlife Management Area	Elm Creek WMA	
Webster	TNC	Project Area	Willa Cather Memorial Prairie	
Webster	TNC	Project Area	Willa Cather Memorial Prairie	Part of T1-R11
Wheeler	NGPC	State Recreation Area	Pibel Lake SRA	
York	FWS	FmHA easement under the NWR	Gocke, Raymond	Section 33, T12N, R1W
York	FWS	FmHA easement under the NWR	Jack R. Anstine	Section 28, T11N, R2W
York	FWS	FmHA easement under the NWR	Gocke, Raymond	Section 28, T12N, R1W
York	FWS	FmHA easement under the NWR	Thiessen, Harvey	Section 9, T9N, R2W
York	FWS	Waterfowl Production Area	Sinninger WPA	
York	FWS	Waterfowl Production Area	County Line WPA	
York	FWS	Waterfowl Production Area	Heron WPA	
York	FWS	Waterfowl Production Area	Waco WPA	
York	NGPC	Wildlife Management Area	Renquist Basin WMA	
York	NGPC	Wildlife Management Area	Kirkpatrick Basin - S WMA	
York	NGPC	Wildlife Management Area	Kirkpatrick Basin - N WMA	
York	NGPC	Wildlife Management Area	Spikerush WMA	
York	NGPC	Wildlife Management Area	Hidden Marsh WMA	

APPENDIX A.2.a

EXAMPLE HABITAT FACT SHEET

UPPER MISSISSIPPI RIVER BASIN ASSOCIATION DEEP MARSH ANNUAL FACT SHEET

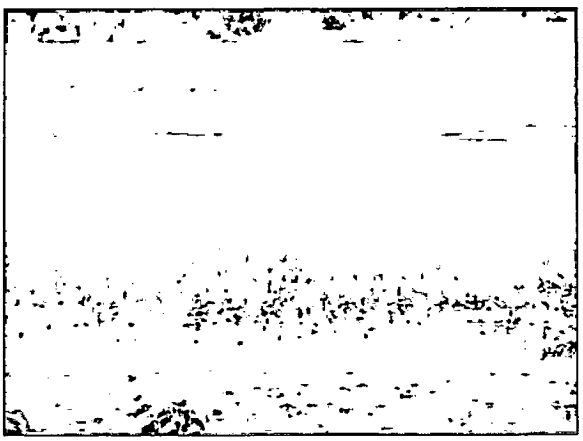
INLAND STRANDED OIL HABITAT FACT SHEET FOR RESPONSE:

DEEP MARSH ANNUAL

Indicator Species

wild rice (*Zizania*)

I. Habitat Description



The deep marsh annuals habitat includes portions of lakes, ponds, marshes, or backwaters that are >10% vegetated with wild rice (*Zizania*). While this habitat is dominated by wild rice, it may have inclusions of submersed, non-rooted-floating aquatics, rooted-floating aquatics, or emergent vegetation. Deep marsh annuals are typically found in areas which are flooded semipermanently and have water depths between 0.25 and 2 meters with a silt or mucky bottom. During normal water conditions, there is little flow, though there can be wind-generated currents and stronger flows at inlets and outlets. During flood conditions, these habitats can be connected to rivers or streams, have strong currents, and the potential to carry large amounts of debris.

II. Sensitivity to Oil Spills

The deep marsh annuals habitat is highly sensitive to oil spills. This biologically diverse habitat provides a home to many plants and animal species, including amphibians, reptiles, fish, invertebrates as well as a wide variety of migratory waterfowl and plants. Many animal species use wetlands for reproductive and early life phases, during which they are most susceptible to the effects of oil. Significant loss of this habitat would greatly affect the populations of these animals and consequently, the local ecology. During normal water levels, oil would be less likely to penetrate water-saturated soils; during floods, oil could be deposited in areas that dry out after the flood, and penetrate the loose, organic-rich surface soils.

References/Additional Information:

General Classification Handbook for Floodplain Vegetation in Large River Systems (http://pubs.usgs.gov/tm/2005/tm2A1/)

Inland Oil Spills: Options for Minimizing Environmental Impacts for Freshwater Spill Response (http://www.michigan.gov/documents/deq/deq-wb-wws-FreshwaterResponse_NOAA102706_265069_7.pdf)

NatureServe (natureserve.org)

Natural Wetland Inventory (http://www.fws.gov/wetlands/)

State Natural Heritage Programs (see state website)

The U.S. National Vegetation Classification (http://usnvc.org/)

III. Sensitivity to Response Methods

The following text describes potential adverse impacts to this habitat resulting from various oil spill response methods and provides recommendations to reduce impact when these methods are implemented. This is not intended to preclude the use of any particular methods, but rather to aid responders in balancing the need to remove oil with the possible adverse effects of removal. More detail about the response methods themselves can be found in the Inland Response Tactics Manual.

Least Adverse Habitat Impacts

Exclusion or Deflection Booming

- Boom can be used to exclude or deflect the spill away from sensitive resources.
- Effectiveness is increased by positioning boom at appropriate angles for the current speed.

Sorbents/Sorbent Boom

- Water movement is needed to bring oil to the sorbent. Use on edge of vegetated area only or where water moves.
- Care is necessary during placement and recovery to minimize disturbance of vegetation. Work in boats to avoid driving oil into the sediment.
- Pom-pom type sorbents are best for heavy viscous oils that coat the strands; sorbent boom is best for light, low-viscosity oils that can penetrate into the sorbents.
- Absorbent boom must be changed frequently to prevent it from becoming a source of sheen.

Flooding

- Where there is the ability to control water levels such as locks and dams, this technique could be used to remove trapped oil; otherwise it is very difficult to herd oil trapped in vegetation towards recovery devices in open water. Contact the U.S. Army Corps of Engineers water control regarding lock and dam operation.
- Though this technique may work well, some oil may still be stranded and will need to be removed through other means.

Low-Pressure, Ambient Water Flushing

- Maintain low output pressures (less than 50 psi) to avoid disrupting the substrate and vegetation.
- Effectiveness increases with lighter oils because less residual oil is left in the environment.
- This tactic can be used with flooding to prevent re-deposition of oil.
- Use for spot removal of oil because of the limited area of effectiveness.

In-Situ Burning

- Presence of a water layer on marsh surface can protect roots.
- "Heavy ends" of petroleum product remain unburned and need to be recovered. The burn residue may sink after it cools, so quick removal is needed.
- Need to consider the amount of natural fuel present and the ability to constraint the fire to the oiled areas.
- Authorization of in-situ burning is subject to RRT approval, consultation and concurrence from the state and the Department of the Interior.

Debris/ Vegetation Removal

- Most appropriate for oils that form a persistent, thick, sticky coating on the vegetation, such as medium and heavy oils.
- Removal will release trapped oil and speed natural flushing rates.
- Debris may be associated with nests or living areas (e.g., beaver and muskrat lodges), therefore impacts on resident animal habitat need to be considered.
- If oil is trapped in floating vegetation, removal may be the only way to recover the oil in the absence of water currents.
- May be appropriate to prevent secondary oiling of wildlife.
- Damage by cleanup crews may be reduced by avoiding excessive cutting/removal, controlling access routes, or conducting operations from boats.

Some Adverse Habitat Impact

Natural Attenuation/Phytoremediation

- This technique may have some adverse effects due to the fact that wild rice is an attractive food source and leaving oil could harm birds and other wildlife that come to feed. If that is not an issue, this technique has few effects.
- Lesser impact for small to moderate spills and lighter oils; avoids damage often associated with cleanup activities.
- Some cleanup may be warranted where large numbers of animals are likely to become oiled during wetland use.
- Seeding or planting may be used to assist oil degradation.

Most Adverse Habitat Impact

Light Equipment Oil Removal

- Use equipment such as swamp buggies or light equipment on pontoons.
- Damage to vegetation and substrate may be reduced by controlling access routes, using pontoons or mats, or using a helicopter to bring in equipment.

Sediment Removal

- Vacuum/dredge sediments and dewater using geotube/settling tank. Treat the water and dispose of sediment.
- Excavate the sediment. Dewater the area before excavation.
- The hydrology may change and it may be difficult to restore the plant community that existed prior to the spill incident.
- Permits will be required for sediment removal and for water discharge.

APPENDIX A.3

ECONOMICALLY SENSITIVE AREAS

APPENDIX A.3.a

REGION 7

SURFACE WATER INTAKES

This information is restricted.

Please e-mail kroone.janice@epamail.epa.gov requesting information on how to receive this information.

APPENDIX A.3.b

WATER INTAKES

MISSISSIPPI AND MISSOURI RIVER

This information is restricted.

Please e-mail kroone.janice@epamail.epa.gov requesting information on how to receive this information.

APPENDIX A.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES

APPENDIX A.4 TO REGION 7 INTEGRATED CONTINGENCY PLAN

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TABLE A.4.4 FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA 26

Note: The prairie bush-clover and western prairie fringed orchid potentially occur in all Iowa counties. In addition, the Indiana bat is assumed to occur in all counties south of Interstate 80. The list below indicates only those counties in which these species have actually been collected.

TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Adair	Indiana bat (Myotis sodalis)	Mammal	E
Adair	Mead's milkweed (Asclepias meadii)	Plant	T
Adair	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Adair	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Adams	Indiana bat (Myotis sodalis)	Mammal	E
Adams	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Adams	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Allamakee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Allamakee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Allamakee	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Allamakee	Northern monkshood (Aconitum novaboracense)	Plant	T
Appanoose	Indiana bat (Myotis sodalis)	Mammal	E
Appanoose	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Appanoose	Western prairie fringed orchid (Platanthaera praeclara)	Plant	T
Audubon	Indiana bat (Myotis sodalis)	Mammal	E
Audubon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Audubon	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Benton	Indiana bat (Myotis sodalis)	Mammal	E
Benton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Benton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Black Hawk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Black Hawk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boone	Indiana bat (Myotis sodalis)	Mammal	E
Boone	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Boone	Topeka shiner (Notropis topeka)	Fish	E
Boone	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Bremer	Eastern massasauga (Sistrurus catenatus)	Snake	C
Bremer	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Bremer	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buchanan	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buchanan	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Buena Vista	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Buena Vista	Topeka shiner (Notropis Topeka)	Fish	E
Buena Vista	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Butler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Calhoun	Topeka shiner (Notropis topeka)	Fish	E
Calhoun	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Calhoun	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

DISCLAIMER: This list identifies federally-listed endangered (E), threatened (T), proposed threatened/endangered (P) and candidate (C) species as provided by the U.S. Fish and Wildlife Service as of October 2012. While this list provides a REASONABLY ACCURATE GUIDE, it should not be considered the final word in determining species location.

TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Carroll	Indiana bat (Myotis sodalis)	Mammal	E
Carroll	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Carroll	Topeka shiner (Notropis topeka)	Fish	E
Carroll	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cass	Indiana bat (Myotis sodalis)	Mammal	E
Cass	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cass	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cedar	Indiana bat (Myotis sodalis)	Mammal	E
Cedar	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cedar	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cerro Gordo	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Cerro Gordo	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cerro Gordo	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cherokee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Cherokee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Chickasaw	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Chickasaw	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clarke	Indiana bat (Myotis sodalis)	Mammal	E
Clarke	Mead's milkweed (Asclepias meadii)	Plant	T
Clarke	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clarke	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clay	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clay	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clayton	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Clayton	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Clayton	Northern monkshood (Aconitum novaboracense)	Plant	T
Clayton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clayton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clinton	Indiana bat (Myotis sodalis)	Mammal	E
Clinton	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Clinton	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Clinton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Clinton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Crawford	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Crawford	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dallas	Indiana bat (Myotis sodalis)	Mammal	E
Dallas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dallas	Topeka shiner (Notropis topeka)	Fish	E
Dallas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Davis	Indiana bat (Myotis sodalis)	Mammal	E
Davis	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Davis	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Decatur	Indiana bat (Myotis sodalis)	Mammal	E
Decatur	Mead's milkweed (Asclepias meadii)	Plant	T
Decatur	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T

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TABLE A.4.1

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – IOWA

COUNTY	NAME	GROUP	STATUS
Decatur	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Decatur	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Delaware	Northern monkshood (Aconitum novaboracense)	Plant	T
Delaware	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Delaware	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Des Moines	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Des Moines	Indiana bat (Myotis sodalis)	Mammal	E
Des Moines	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Des Moines	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Des Moines	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dickenson	Dakota skipper (Hesperia dacotae)	Butterfly	C
Dickenson	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Dickenson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dickenson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dubuque	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Dubuque	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Dubuque	Northern monkshood (Aconitum novaboracense)	Plant	T
Dubuque	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Dubuque	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Emmet	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Emmet	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Emmet	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fayette	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Fayette	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Fayette	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Floyd	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Floyd	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Franklin	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Franklin	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fremont	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Fremont	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Fremont	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Greene	Indiana bat (Myotis sodalis)	Mammal	E
Greene	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Greene	Topeka shiner (Notropis topeka)	Fish	E
Greene	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grundy	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Grundy	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Guthrie	Indiana bat (Myotis sodalis)	Mammal	E
Guthrie	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Guthrie	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hamilton	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hamilton	Topeka shiner (Notropis topeka)	Fish	E
Hamilton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hancock	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C

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COUNTY	NAME	GROUP	STATUS
Hancock	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hancock	Topeka shiner (Notropis topeka)	Fish	E
Hancock	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hardin	Northern monkshood (Aconitum novaboracense)	Plant	T
Hardin	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Hardin	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Harrison	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Harrison	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Harrison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Henry	Indiana bat (Myotis sodalis)	Mammal	E
Henry	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Henry	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Howard	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Howard	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Humboldt	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Humboldt	Topeka shiner (Notropis topeka)	Fish	E
Humboldt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Ida	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Ida	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Iowa	Indiana bat (Myotis sodalis)	Mammal	E
Iowa	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Iowa	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jackson	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Jackson	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Jackson	Iowa pleistocene snail (Discus macclintocki)	Snail	E
Jackson	Northern monkshood (Aconitum novaboracense)	Plant	T
Jackson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jackson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jasper	Indiana bat (Myotis sodalis)	Mammal	E
Jasper	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jasper	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Indiana bat (Myotis sodalis)	Mammal	E
Jefferson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Johnson	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Johnson	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Johnson	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Johnson	Indiana bat (Myotis sodalis)	Mammal	E
Johnson	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jones	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Jones	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Jones	Indiana bat (Myotis sodalis)	Mammal	E
Jones	Prairie bush clover (Lespedeza leptostachya)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Jones	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Keokuk	Indiana bat (Myotis sodalis)	Mammal	E
Keokuk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Keokuk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Kossuth	Poweshiek skipperling (Oarisma poweshiek)	Butterfly	C
Kossuth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Kossuth	Topeka shiner (Notropis topeka)	Fish	E
Kossuth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lee	Indiana bat (Myotis sodalis)	Mammal	E
Lee	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lee	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Lee	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Lee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Linn	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Linn	Indiana bat (Myotis sodalis)	Mammal	E
Linn	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Linn	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Louisa	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Louisa	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Louisa	Indiana bat (Myotis sodalis)	Mammal	E
Louisa	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Louisa	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lucas	Indiana bat (Myotis sodalis)	Mammal	E
Lucas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lucas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lyon	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Lyon	Topeka shiner (Notropis topeka)	Fish	E
Lyon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Madison	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Madison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mahaska	Indiana bat (Myotis sodalis)	Mammal	E
Mahaska	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Mahaska	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Marion	Indiana bat (Myotis sodalis)	Mammal	E
Marion	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Marion	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Marshall	Indiana bat (Myotis sodalis)	Mammal	E
Marshall	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Marshall	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mills	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Mills	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Mills	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Mills	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Mitchell	Prairie bush clover (Lespedeza leptostachya)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Mitchell	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Monona	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Monona	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Monona	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Monroe	Indiana bat (Myotis sodalis)	Mammal	E
Monroe	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Monroe	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Montgomery	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Montgomery	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Muscatine	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Muscatine	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Muscatine	Indiana bat (Myotis sodalis)	Mammal	E
Muscatine	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Muscatine	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Muscatine	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Muscatine	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
O'Brien	Prairie bush clover (Lespedeza leptostachya)	Plant	T
O'Brien	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Osceola	Poweshiek skipperling (Oarisma Poweshiek)	Butterfly	C
Osceola	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Osceola	Topeka shiner (Notropis topeka)	Fish	E
Osceola	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Page	Indiana bat (Myotis sodalis)	Mammal	E
Page	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Page	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Palto Alto	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Palto Alto	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Plymouth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Plymouth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pocahontas	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Pocahontas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Polk	Indiana bat (Myotis sodalis)	Mammal	E
Polk	Least tern (Sterna antillarum)	Bird	E
Polk	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Polk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pottawattamie	Eastern massasauga rattlesnake (Sistrurus catenatus catenatus)	Snake	C
Pottawattamie	Least tern (Sterna antillarum)	Bird	E
Pottawattamie	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Pottawattamie	Piping plover (Charadrius melodus)	Bird	E
Pottawattamie	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Pottawattamie	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Poweshiek	Indiana bat (Myotis sodalis)	Mammal	E
Poweshiek	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Poweshiek	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Ringgold	Indiana bat (Myotis sodalis)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Ringgold	Mead's milkweed (Asclepias meadii)	Plant	T
Ringgold	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Ringgold	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sac	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Sac	Topeka shiner (Notropis topeka)	Fish	E
Sac	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Scott	Higgins' eye pearly mussel (Lampsilis higginsi)	Mussel	E
Scott	Indiana bat (Myotis sodalis)	Mammal	E
Scott	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Scott	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Scott	Sheepnose mussel (Plethobasus cyphyus)	Mussel	E
Scott	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Shelby	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Shelby	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sioux	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Sioux	Topeka shiner (Notropis Topeka)	Fish	E
Sioux	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Story	Indiana bat (Myotis sodalis)	Mammal	E
Story	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Story	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Tama	Indiana bat (Myotis sodalis)	Mammal	E
Tama	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Tama	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Taylor	Indiana bat (Myotis sodalis)	Mammal	E
Taylor	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Taylor	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Union	Indiana bat (Myotis sodalis)	Mammal	E
Union	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Union	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Van Buren	Indiana bat (Myotis sodalis)	Mammal	E
Van Buren	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Van Buren	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wapello	Indiana bat (Myotis sodalis)	Mammal	E
Wapello	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wapello	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Warren	Indiana bat (Myotis sodalis)	Mammal	E
Warren	Mead's milkweed (Asclepias meadii)	Plant	T
Warren	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Warren	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Washington	Indiana bat (Myotis sodalis)	Mammal	E
Washington	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Washington	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wayne	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wayne	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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COUNTY	NAME	GROUP	STATUS
Webster	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Webster	Topeka shiner (Notropis topeka)	Fish	E
Webster	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Winnebago	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Winnebago	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Winneshiek	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Winneshiek	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Woodbury	Least tern (Sterna antillarum)	Bird	E
Woodbury	Piping plover (Charadrius melodus)	Bird	E
Woodbury	Pallid Sturgeon (Scaphirynchus albus)	Fish	E
Woodbury	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Woodbury	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Worth	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Worth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wright	Topeka shiner (Notropis topeka)	Fish	E
Wright	Prairie bush clover (Lespedeza leptostachya)	Plant	T
Wright	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.2

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Allen	Mead's milkweed (Asclepias meadii)	Plant	T
Allen	Neosho madtom (Noturus placidus)	Fish	T
Allen	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Allen	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Allen	Sprague's pipit (Anthus spragueii)	Bird	C
Anderson	Mead's milkweed (Asclepias meadii)	Plant	T
Atchison	Pallid sturgeon (Scaphirhynchus)	Fish	T
Acthison	Sprague's pipit (Anthus spragueii)	Bird	C
Barber	Arkansas darter (Etheostoma cragini)	Fish	C
Barber	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Barber	Whooping crane (Grus americana)	Bird	E
Barber	Sprague's pipit (Anthus spragueii)	Bird	C
Barton	Arkansas darter (Etheostoma cragini)	Fish	C
Barton	Interior least Tern (Sterna antillarum athalassos)	Bird	E
Barton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Barton	Piping plover (Charadrius melodus)	Bird	T
Barton	Whooping crane (Grus americana)	Bird	E
Barton	Sprague's pipit (Anthus spragueii)	Bird	C
Bourbon	Mead's milkweed (Asclepias meadii)	Plant	T
Bourbon	Sprague's pipit (Anthus spragueii)	Bird	C
Brown	Topeka shiner (Notropis topeka)	Fish	E
Brown	Sprague's pipit (Anthus spragueii)	Bird	C
Chase	Neosho madtom (Noturus placidus)	Fish	T
Chase	Sprague's pipit (Anthus spragueii)	Bird	C
Chase	Topeka shiner (Notropis topeka)	Fish	E
Chatauqua	American burying beetle (Nicrophorus americanus)	Insect	E
Chataqua	Sprague's pipit (Anthus spragueii)	Bird	C
Cherokee	Arkansas darter (Etheostoma cragini)	Fish	C
Cherokee	Neosho madtom (Noturus placidus)	Fish	T
Cherokee	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Cherokee	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Cherokee	Sprague's pipit (Anthus spragueii)	Bird	C
Chyenne	Sprague's pipit (Anthus spragueii)	Bird	C
Clark	Arkansas darter (Etheostoma cragini)	Fish	C
Clark	Arkansas River shiner (Notropis girardi)	Fish	T
Clark	Interior least tern (Sterna antillarum)	Bird	E
Clark	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Clark	Piping plover (Charadrius melodus)	Bird	T
Clark	Sprague's pipit (Anthus spragueii)	Bird	C
Clay	Sprague's pipit (Anthus spragueii)	Bird	C
Cloud	Sprague's pipit (Anthus spragueii)	Bird	C
Cloud	Whooping crane (Grus americana)	Bird	E
Coffey	Neosho madtom (Noturus placidus)	Fish	T
Coffey	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Coffey	Rabbitsfoot (Quadrula cylindrica)	Mussel	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Coffey	Sprague's pipit (Anthus spragueii)	Bird	C
Comanche	Arkansas darter (Etheostoma cragini)	Fish	C
Comanche	Arkansas River shiner (Notropis girardi)	Fish	T
Comanche	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Comanche	Sprague's pipit (Anthus spragueii)	Bird	C
Comanche	Whooping crane (Grus americana)	Bird	E
Cowley	Arkansas darter (Etheostoma cragini)	Fish	C
Cowley	Interior least tern (Sterna antillarum)	Bird	E
Cowley	Sprague's pipit (Anthus spragueii)	Bird	C
Crawford	Gray bat (Myotis grisescens)	Mammal	E
Crawford	Mead's milkweed (Asclepias meadii)	Plant	T
Crawford	Sprague's pipit (Anthus spragueii)	Bird	C
Decatur	Whooping crane (Grus americana)	Bird	E
Decatur	Sprague's pipit (Anthus spragueii)	Bird	C
Dickinsin	Sprague's pipit (Anthus spragueii)	Bird	C
Dickinson	Topeka shiner (Notropis topeka)	Fish	E
Doniphan	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Doniphan	Sprague's pipit (Anthus spragueii)	Bird	C
Douglas	Mead's milkweed (Asclepias meadii)	Plant	T
Douglas	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Douglas	Sprague's pipit (Anthus spragueii)	Bird	C
Douglas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Edwards	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Edwards	Sprague's pipit (Anthus spragueii)	Bird	C
Edwards	Whooping crane (Grus americana)	Bird	E
Elk	American burying beetle (Nicrophorus americanus)	Insect	E
Elk	Sprague's pipit (Anthus spragueii)	Bird	C
Ellis	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ellis	Sprague's pipit (Anthus spragueii)	Bird	C
Ellis	Whooping crane (Grus americana)	Bird	E
Ellsworth	Sprague's pipit (Anthus spragueii)	Bird	C
Ellsworth	Whooping crane (Grus americana)	Bird	E
Finney	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Finney	Sprague's pipit (Anthus spragueii)	Bird	C
Finney	Whooping crane (Grus americana)	Bird	E
Ford	Arkansas River shiner (Notropis girardi)	Fish	T
Ford	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ford	Sprague's pipit (Anthus spragueii)	Bird	C
Ford	Whooping crane (Grus americana)	Bird	E
Franklin	Mead's milkweed (Asclepias meadii)	Plant	T
Franklin	Sprague's pipit (Anthus spragueii)	Bird	C
Geary	Topeka shiner (Notropis topeka)	Fish	E
Geary	Sprague's pipit (Anthus spragueii)	Bird	C
Gove	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Gove	Sprague's pipit (Anthus spragueii)	Bird	C

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TABLE A.4.2

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Gove	Whooping crane (Grus americana)	Bird	E
Graham	Sprague's pipit (Anthus spragueii)	Bird	C
Graham	Whooping crane (Grus americana)	Bird	E
Grant	Arkansas River shiner (Notropis girardi)	Fish	T
Grant	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Grant	Sprague's pipit (Anthus spragueii)	Bird	C
Gray	Arkansas River shiner (Notropis girardi)	Fish	T
Gray	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Gray	Sprague's pipit (Anthus spragueii)	Bird	C
Gray	Whooping crane (Grus americana)	Bird	E
Greeley	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Greeley	Sprague's pipit (Anthus spragueii)	Bird	C
Greenwood	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Greenwood	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Greenwood	Topeka shiner (Notropis topeka)	Fish	E
Hamilton	Arkansas River shiner (Notropis girardi)	Fish	T
Hamilton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Hamilton	Sprague's pipit (Anthus spragueii)	Bird	C
Harper	Arkansas darter (Etheostoma cragini)	Fish	C
Harper	Sprague's pipit (Anthus spragueii)	Bird	C
Harper	Whooping crane (Grus americana)	Bird	E
Harvey	Sprague's pipit (Anthus spragueii)	Bird	C
Harvey	Whooping crane (Grus americana)	Bird	E
Haskell	Arkansas River shiner (Notropis girardi)	Fish	T
Haskell	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Haskell	Sprague's pipit (Anthus spragueii)	Bird	C
Haskell	Whooping crane (Grus americana)	Bird	E
Hodgeman	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Hodgeman	Sprague's pipit (Anthus spragueii)	Bird	C
Hodgeman	Whooping crane (Grus americana)	Bird	E
Jackson	Sprague's pipit (Anthus spragueii)	Bird	C
Jefferson	Mead's milkweed (Asclepias meadii)	Plant	T
Jefferson	Sprague's pipit (Anthus spragueii)	Bird	C
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jewell	Sprague's pipit (Anthus spragueii)	Bird	C
Jewell	Whooping crane (Grus americana)	Bird	E
Johnson	Mead's milkweed (Asclepias meadii)	Plant	T
Johnson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Kearny	Arkansas River shiner (Notropis girardi)	Fish	T
Kearny	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Kearney	Sprague's pipit (Anthus spragueii)	Bird	C
Kingman	Arkansas darter (Etheostoma cragini)	Fish	C
Kingman	Sprague's pipit (Anthus spragueii)	Bird	C
Kingman	Whooping crane (Grus americana)	Bird	E
Kiowa	Arkansas darter (Etheostoma cragini)	Fish	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Kiowa	Arkansas River shiner (Notropis girardi)	Fish	T
Kiowa	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Kiowa	Sprague's pipit (Anthus spragueii)	Bird	C
Kiowa	Whooping crane (Grus americana)	Bird	E
Labette	American burying beetle (Nicrophorus americanus)	Insect	E
Labette	Neosho madtom (Noturus placidus)	Fish	T
Labette	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Labette	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Labette	Sprague's pipit (Anthus spragueii)	Bird	C
Lane	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Lane	Sprague's pipit (Anthus spragueii)	Bird	C
Lane	Whooping crane (Grus americana)	Bird	E
Leavenworth	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Leavenworth	Sprague's pipit (Anthus spragueii)	Bird	C
Leavenworth	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	Sprague's pipit (Anthus spragueii)	Bird	C
Lincoln	Whooping crane (Grus americana)	Bird	E
Linn	Mead's milkweed (Asclepias meadii)	Plant	T
Linn	Spectaclecase mussel (Cumberlandia monodonta)	Mussel	E
Linn	Sprague's pipit (Anthus spragueii)	Bird	C
Logan	Black-footed ferret (Mustela nigripes)	Mammel	E
Logan	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Logan	Sprague's pipit (Anthus spragueii)	Bird	C
Lyon	Neosho madtom (Noturus placidus)	Fish	T
Lyon	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Lyon	Topeka shiner (Notropis topeka)	Fish	E
Lyon	Sprague's pipit (Anthus spragueii)	Bird	C
Logan	Neosho madtom (Noturus placidus)	Fish	T
Marion	Sprague's pipit (Anthus spragueii)	Bird	C
Marion	Topeka shiner (Notropis topeka)	Fish	E
Marshall	Sprague's pipit (Anthus spragueii)	Bird	C
Marshall	Topeka shiner (Notropis topeka)	Fish	E
McPherson	Sprague's pipit (Anthus spragueii)	Bird	C
McPherson	Whooping crane (Grus americana)	Bird	E
Meade	Arkansas darter (Etheostoma cragini)	Fish	C
Meade	Arkansas River shiner (Notropis girardi)	Fish	T
Meade	Interior least tern (Sterna antillarum)	Bird	E
Meade	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Meade	Sprague's pipit (Anthus spragueii)	Bird	C
Meade	Whooping crane (Grus americana)	Bird	E
Miami	Mead's milkweed (Asclepias meadii)	Plant	T
Miami	Sprague's pipit (Anthus spragueii)	Bird	C
Mitchell	Sprague's pipit (Anthus spragueii)	Bird	C
Mitchell	Whooping crane (Grus americana)	Bird	E
Montgomery	American burying beetle (Nicrophorus americanus)	Insect	E

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TABLE A.4.2

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Montgomery	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Montgomery	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Montgomery	Sprague's pipit (Anthus spragueii)	Bird	C
Morris	Neosho madtom (Noturus placidus)	Fish	T
Morris	Sprague's pipit (Anthus spragueii)	Bird	C
Morris	Topeka shiner (Notropis topeka)	Fish	E
Morton	Arkansas River shiner (Notropis girardi)	Fish	T
Morton	Interior least tern (Sterna antillarum)	Bird	E
Morton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Morton	Sprague's pipit (Anthus spragueii)	Bird	C
Nemaha	Sprague's pipit (Anthus spragueii)	Bird	C
Neosho	Mead's milkweed (Asclepias meadii)	Plant	T
Neosho	Neosho madtom (Noturus placidus)	Fish	T
Neosho	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Neosho	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Neosho	Sprague's pipit (Anthus spragueii)	Bird	C
Ness	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Ness	Sprague's pipit (Anthus spragueii)	Bird	C
Ness	Whooping crane (Grus americana)	Bird	E
Norton	Sprague's pipit (Anthus spragueii)	Bird	C
Norton	Whooping crane (Grus americana)	Bird	E
Osage	Sprague's pipit (Anthus spragueii)	Bird	C
Osage	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Osborne	Sprague's pipit (Anthus spragueii)	Bird	C
Osborne	Whooping crane (Grus americana)	Bird	E
Ottawa	Sprague's pipit (Anthus spragueii)	Bird	C
Ottawa	Whooping crane (Grus americana)	Bird	E
Pawnee	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Pawnee	Sprague's pipit (Anthus spragueii)	Bird	C
Pawnee	Whooping crane (Grus americana)	Bird	E
Phillips	Interior least tern (Sterna antillarum)	Bird	E
Phillips	Sprague's pipit (Anthus spragueii)	Bird	C
Phillips	Whooping crane (Grus americana)	Bird	E
Pottawatomie	Interior least tern (Sterna antillarum)	Bird	E
Pottawatomie	Piping plover (Charadrius melodus)	Bird	T
Pottawatomie	Sprague's pipit (Anthus spragueii)	Bird	C
Pottawatomie	Topeka shiner (Notropis topeka)	Fish	E
Pratt	Arkansas darter (Etheostoma cragini)	Fish	C
Pratt	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Pratt	Sprague's pipit (Anthus spragueii)	Bird	C
Pratt	Whooping crane (Grus americana)	Bird	E
Rawlins	Sprague's pipit (Anthus spragueii)	Bird	C
Rawlins	Whooping crane (Grus americana)	Bird	E
Reno	Arkansas darter (Etheostoma cragini)	Fish	C
Reno	Interior least tern (Sterna antillarum)	Bird	E

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TABLE A.4.2

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Reno	Sprague's pipit (Anthus spragueii)	Bird	C
Reno	Whooping crane (Grus americana)	Bird	E
Republic	Sprague's pipit (Anthus spragueii)	Bird	C
Republic	Whooping crane (Grus americana)	Bird	E
Rice	Arkansas darter (Etheostoma cragini)	Fish	C
Rice	Interior least tern (Sterna antillarum)	Bird	E
Rice	Sprague's pipit (Anthus spragueii)	Bird	C
Rice	Whooping crane (Grus americana)	Bird	E
Riley	Interior least tern (Sterna antillarum)	Bird	E
Riley	Piping plover (Charadrius melodus)	Bird	T
Riley	Sprague's pipit (Anthus spragueii)	Bird	C
Riley	Topeka shiner (Notropis topeka)	Fish	E
Rooks	Sprague's pipit (Anthus spragueii)	Bird	C
Rooks	Whooping crane (Grus americana)	Bird	E
Rush	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Rush	Sprague's pipit (Anthus spragueii)	Bird	C
Rush	Whooping crane (Grus americana)	Bird	E
Russell	Sprague's pipit (Anthus spragueii)	Bird	C
Russell	Whooping crane (Grus americana)	Bird	E
Saline	Sprague's pipit (Anthus spragueii)	Bird	C
Saline	Whooping crane (Grus americana)	Bird	E
Scott	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Scott	Sprague's pipit (Anthus spragueii)	Bird	C
Scott	Whooping crane (Grus americana)	Bird	E
Sedgwick	Interior least tern (Sterna antillarum)	Bird	E
Sedgwick	Sprague's pipit (Anthus spragueii)	Bird	C
Sedgwick	Whooping crane (Grus americana)	Bird	E
Seward	Arkansas darter (Etheostoma cragini)	Fish	C
Seward	Arkansas River shiner (Notropis girardi)	Fish	T
Seward	Interior least tern (Sterna antillarum)	Bird	E
Seward	Sprague's pipit (Anthus spragueii)	Bird	C
Seward	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Seward	Whooping crane (Grus americana)	Bird	E
Shawnee	Interior least tern (Sterna antillarum)	Bird	E
Shawnee	Sprague's pipit (Anthus spragueii)	Bird	C
Shawnee	Topeka shiner (Notropis topeka)	Fish	E
Sheridan	Sprague's pipit (Anthus spragueii)	Bird	C
Sheridan	Whooping crane (Grus americana)	Bird	E
Sherman	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Sherman	Sprague's pipit (Anthus spragueii)	Bird	C
Smith	Sprague's pipit (Anthus spragueii)	Bird	C
Smith	Whooping crane (Grus americana)	Bird	E
Stafford	Arkansas darter (Etheostoma cragini)	Fish	C
Stafford	Interior least tern (Sterna antillarum)	Bird	E
Stafford	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – KANSAS

COUNTY	NAME	GROUP	STATUS
Stafford	Sprague's pipit (Anthus spragueii)	Bird	C
Stafford	Whooping crane (Grus americana)	Bird	E
Stanton	Arkansas River shiner (Notropis girardi)	Fish	T
Stanton	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Stanton	Sprague's pipit (Anthus spragueii)	Bird	C
Stevens	Interior least tern (Sterna antillarum)	Bird	E
Stevens	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Sumner	Arkansas darter (Etheostoma cragini)	Fish	C
Sumner	Interior least tern (Sterna antillarum)	Bird	E
Sumner	Sprague's pipit (Anthus spragueii)	Bird	C
Sumner	Whooping crane (Grus americana)	Bird	E
Trego	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Trego	Sprague's pipit (Anthus spragueii)	Bird	C
Trego	Whooping crane (Grus americana)	Bird	E
Wabaunsee	Interior least tern (Sterna antillarum)	Bird	E
Wabaunsee	Piping plover (Charadrius melodus)	Bird	T
Wabaunsee	Sprague's pipit (Anthus spragueii)	Bird	C
Wabaunsee	Topeka shiner (Notropis topeka)	Fish	E
Wallace	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Wallace	Sprague's pipit (Anthus spragueii)	Bird	C
Wallace	Topeka shiner (Notropis topeka)	Fish	E
Washington	Sprague's pipit (Anthus spragueii)	Bird	C
Wichita	Lesser prairie chicken (Tympanuchus pallidicinctus)	Bird	C
Wichita	Sprague's pipit (Anthus spragueii)	Bird	C
Wilson	American burying beetle (Nicrophorus americanus)	Insect	E
Wilson	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Wilson	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Wilson	Sprague's pipit (Anthus spragueii)	Bird	C
Woodson	Neosho madtom (Noturus placidus)	Fish	T
Woodson	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Woodson	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Woodson	Sprague's pipit (Anthus spragueii)	Bird	C
Wyandotte	Pallid sturgeon (Notropis girardi)	Fish	E
Wyandotte	Sprague's pipit (Anthus spragueii)	Bird	C

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Adair	Indiana bat (Myotis sodalis)	Mammal	E
Adair	Mead's milkweed (Asclepias meadii)	Plant	T
Andrew	Indiana bat (Myotis sodalis)	Mammal	E
Andrew	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Atchison	Indiana bat (Myotis sodalis)	Mammal	E
Atchison	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Atchison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Audrain	Indiana bat (Myotis sodalis)	Mammal	E
Barry	Arkansas darter (Etheostoma cragini)	Fish	C
Barry	Gray bat (Myotis grisescens)	Mammal	E
Barry	Indiana bat (Myotis sodalis)	Mammal	E
Barry	Neosho mucket (Lampsillis rafinesqueana)	Fish	C
Barry	Ozark big-eared bat (Corynorhinus townsendii ingens)	Mammal	E
Barry	Ozark cavefish (Amblyopsis rosae)	Fish	T
Barry	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Barton	Arkansas darter (Etheostoma cragini)	Fish	C
Barton	Mead's milkweed (Asclepias meadii)	Plant	T
Barton	Neosho mucket (Lampsillis rafinesqueana)	Fish	C
Benton	Gray bat (Myotis grisescens)	Mammal	E
Benton	Mead's milkweed (Asclepias meadii)	Plant	T
Benton	Niangua darter (Etheostoma nianguae)	Fish	T
Benton	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Bollinger	Curtis' pearlymussel (Epioblasma florentina curtisi)	Mussel	E
Bollinger	Small whorled pagonia (Isotria medeoloides)	Plant	T
Bollinger	Snuffbox (Epioblasma triquetra)	Plant	P
Boone	Gray bat (Myotis grisescens)	Mammal	E
Boone	Indiana bat (Myotis sodalis)	Mammal	E
Boone	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Boone	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Boone	Topeka shiner (Notropis topeka)	Fish	E
Boone	Virginia sneezeweed (Helenium virginicum)	Plant	T
Buchanan	Indiana bat (Myotis sodalis)	Mammal	E
Buchanan	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Butler	Curtis' pearlymussel (Epioblasma florentina curtisi)	Mussel	E
Butler	Pink mucket (Lampsilis abrupta)	Mussel	E
Butler	Pondberry (Lindera melissifolium)	Plant	E
Butler	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Caldwell	Indiana bat (Myotis sodalis)	Mammal	E
Caldwell	Topeka shiner (Notropis topeka)	Fish	E
Callaway	Gray bat (Myotis grisescens)	Mammal	E
Callaway	Indiana bat (Myotis sodalis)	Mammal	E
Callaway	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Callaway	Running buffalo clover (Trifolium stoloniferum)	Plant	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Callaway	Topeka shiner (Notropis topeka)	Fish	E
Camden	Gray bat (Myotis grisescens)	Mammal	E
Camden	Indiana bat (Myotis sodalis)	Mammal	E
Camden	Niangua darter (Etheostoma nianguae)	Fish	T
Cape Girardeau	Decurrent false aster (Boltonia decurrens)	Plant	T
Cape Girardeau	Interior least tern (Sterna antillarum athalassos)	Bird	E
Cape Girardeau	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Carroll	Indiana bat (Myotis sodalis)	Mammal	E
Carroll	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Carter	Gray bat (Myotis grisescens)	Mammal	E
Carter	Indiana bat (Myotis sodalis)	Mammal	E
Carter	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Carter	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Carter	Eastern prairie fringed orchid (Platanthera leucophaea)	Plant	T
Cass	Mead's milkweed (Asclepias meadii)	Plant	T
Cedar	Geocarpon (Geocarpon minimum)	Plant	T
Cedar	Gray bat (Myotis grisescens)	Mammal	E
Cedar	Mead's milkweed (Asclepias meadii)	Plant	T
Cedar	Niangua darter (Etheostoma nianguae)	Fish	T
Cedar	Pink mucket (Lampsilis abrupta)	Mussel	E
Cedar	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Cedar	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Chariton	Indiana bat (Myotis sodalis)	Mammal	E
Chariton	Interior least tern (Sterna antillarum athalassos)	Bird	E
Chariton	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Christian	Gray bat (Myotis grisescens)	Mammal	E
Christian	Indiana bat (Myotis sodalis)	Mammal	E
Christian	Missouri bladder-pod (Lesquerella filiformis)	Plant	E
Christian	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Christian	Virginia sneezeweed (Helenium virginicum)	Plant	T
Clark	Fat pocketbook (Potamilus capax)	Mussel	E
Clark	Indiana bat (Myotis sodalis)	Mammal	E
Clark	Topeka shiner (Notropis topeka)	Fish	E
Clay	Indiana bat (Myotis sodalis)	Mammal	E
Clay	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Clinton	Indiana bat (Myotis sodalis)	Mammal	E
Cole	Gray bat (Myotis grisescens)	Mammal	E
Cole	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cole	Pink mucket (Lampsilis abrupta)	Mussel	E
Cole	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Cole	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Cole	Topeka shiner (Notropis topeka)	Fish	E
Cooper	Indiana bat (Myotis sodalis)	Mammal	E
Cooper	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cooper	Running buffalo clover (Trifolium stoloniferum)	Plant	E

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Cooper	Topeka shiner (Notropis topeka)	Fish	E
Crawford	Gray bat (Myotis grisescens)	Mammal	E
Crawford	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Crawford	Indiana bat (Myotis sodalis)	Mammal	E
Crawford	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Crawford	Scaleshell (Leptodea leptodon)	Mussel	E
Crawford	Sheepnose (Plethobasus cyphyus)	Mussel	E
Crawford	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Dade	Arkansas darter (Etheostoma cragini)	Fish	C
Dade	Geocarpon (Geocarpon minimum)	Plant	T
Dade	Gray bat (Myotis grisescens)	Mammal	E
Dade	Mead's milkweed (Asclepias meadii)	Plant	T
Dade	Missouri bladder-pod (Physaria filiformis)	Plant	E
Dade	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Dade	Virginia sneezeweed (Helenium virginicum)	Plant	T
Dallas	Gray bat (Myotis grisescens)	Mammal	E
Dallas	Niangua darter (Etheostoma nianguae)	Fish	T
Daviess	Indiana bat (Myotis sodalis)	Mammal	E
Daviess	Topeka shiner (Notropis topeka)	Fish	E
DeKalb	Indiana bat (Myotis sodalis)	Mammal	E
DeKalb	Topeka shiner (Notropis topeka)	Fish	E
Dent	Gray bat (Myotis grisescens)	Mammal	E
Dent	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Dent	Indiana bat (Myotis sodalis)	Mammal	E
Dent	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Dent	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Dent	Virginia sneezeweed (Helenium virginicum)	Plant	T
Douglass	Gray bat (Myotis grisescens)	Mammal	E
Douglass	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	E
Dunklin	Decurrent false aster (Boltonia decurrens)	Plant	T
Dunklin	Fat pocketbook (Potamilus capax)	Mussel	E
Dunklin	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Franklin	Decurrent false aster (Boltonia decurrens)	Plant	T
Franklin	Gray bat (Myotis grisescens)	Mammal	E
Franklin	Indiana bat (Myotis sodalis)	Mammal	E
Franklin	Pallid sturgeon (Scapphirhynchus albus)	Fish	E
Franklin	Pink mucket (Lampsillis abrupta)	Mussel	E
Franklin	Scaleshell (Leptodea leptodon)	Mussel	E
Franklin	Sheepnose (Plethobasus cyphyus)	Mussel	E
Franklin	Snuffbox (Epioblasma triquetra)	Plant	P
Franklin	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Franklin	Winged mapleleaf (Quadrula fragosa)	Mussel	E
Gasconade	Gray bat (Myotis grisescens)	Mammal	E
Gasconade	Indiana bat (Myotis sodalis)	Mammal	E
Gasconade	Pallid sturgeon (Scaphirhynchus albus)	Fish	E

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Gasconade	Pink mucket (Lampsilis abrupta)	Mussel	E
Gasconade	Scaleshell (Leptodea leptodon)	Mussel	E
Gasconade	Snuffbox (Epioblasma triquetra)	Plant	P
Gasconade	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Gentry	Indiana bat (Myotis sodalis)	Mammal	E
Greene	Geocarpon (Geocarpon minimum)	Plant	T
Greene	Gray bat (Myotis grisescens)	Mammal	E
Greene	Missouri bladder-pod (Physaria filiformis)	Plant	T
Greene	Niangua darter (Etheostoma nianguae)	Fish	T
Greene	Ozark cavefish (Amblyopsis rosae)	Fish	T
Greene	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grundy	Eastern prairie fringed orchid (Platanthaera leucophaea)	Plant	T
Grundy	Indiana bat (Myotis sodalis)	Mammal	E
Grundy	Topeka shiner (Notropis topeka)	Fish	E
Harrison	Indiana bat (Myotis sodalis)	Mammal	E
Harrison	Mead's milkweed (Asclepias meadii)	Plant	T
Harrison	Topeka shiner (Notropis topeka)	Fish	E
Harrison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Henry	Gray bat (Myotis grisescens)	Mammal	E
Henry	Geocarpon (Geocarpon minimum)	Plant	T
Henry	Indiana bat (Myotis sodalis)	Mammal	E
Henry	Mead's milkweed (Asclepias meadii)	Plant	T
Hickory	Gray bat (Myotis grisescens)	Mammal	E
Hickory	Niangua darter (Etheostoma nianguae)	Fish	T
Holt	Indiana bat (Myotis sodalis)	Mammal	E
Holt	Pallid sturgeon (Scaphirrhynchus albus)	Fish	E
Holt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Gray bat (Myotis grisescens)	Mammal	E
Howard	Indiana bat (Myotis sodalis)	Mammal	E
Howard	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Howard	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Howell	Decurrent false aster (Boltonia decurrens)	Plant	T
Howell	Gray bat (Myotis grisescens)	Mammal	E
Howell	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Howell	Virginia sneezeweed (Helenium virginicum)	Plant	T
Iron	Gray bat (Myotis grisescens)	Mammal	E
Iron	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Iron	Indiana bat (Myotis sodalis)	Mammal	E
Iron	Mead's milkweed (Asclepias meadii)	Plant	T
Jackson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Jackson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jasper	Arkansas darter (Etheostoma cragini)	Fish	C
Jasper	Geocarpon (Geocarpon minimum)	Plant	T
Jasper	Gray bat (Myotis grisescens)	Mammal	E
Jasper	Neosho madtom (Noturus placidus)	Fish	T

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Jasper	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Jasper	Ozark cavefish (Amblyopsis rosae)	Fish	T
Jasper	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Jasper	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Jasper	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Gray bat (Myotis grisescens)	Mammal	E
Jefferson	Indiana bat (Myotis sodalis)	Mammal	E
Jefferson	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Jefferson	Pink mucket (Lampsilis abrupta)	Mussel	E
Jefferson	Scaleshell (Leptodea leptodon)	Mussel	E
Jefferson	Sheepnose (Plethobasus cyphyus)	Mussel	E
Jefferson	Snuffbox (Epioblasma triquetra)	Plant	P
Jefferson	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Johnson	Mead's milkweed (Asclepias meadii)	Plant	T
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Knox	Indiana bat (Myotis sodalis)	Mammal	E
Laclede	Gray bat (Myotis grisescens)	Mammal	E
Laclede	Indiana bat (Myotis sodalis)	Mammal	E
Laclede	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Laclede	Scaleshell (Leptodea leptodon)	Mussel	E
Laclede	Sheepnose (Plethobasus cyphyus)	Mussel	E
Laclede	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Lafayette	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Lawrence	Arkansas darter (Etheostoma cragini)	Fish	C
Lawrence	Geocarpon (Geocarpon minimum)	Plant	T
Lawrence	Gray bat (Myotis grisescens)	Mammal	E
Lawrence	Missouri bladder-pod (Physaria filiformis)	Plant	E
Lawrence	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Lawrence	Ozark cavefish (Amblyopsis rosae)	Fish	T
Lawrence	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lewis	Indiana bat (Myotis sodalis)	Mammal	E
Lewis	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Lewis	Sheepnose (Plethobasus cyphyus)	Mussel	E
Lincoln	Decurrent false aster (Boltonia decurrens)	Plant	T
Lincoln	Indiana bat (Myotis sodalis)	Mammal	E
Lincoln	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Linn	Indiana bat (Myotis sodalis)	Mammal	E
Livingston	Indiana bat (Myotis sodalis)	Mammal	E
Livingston	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Macon	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Gray bat (Myotis grisescens)	Mammal	E
Madison	Indiana bat (Myotis sodalis)	Mammal	E
Madison	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Madison	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Maries	Gray bat (Myotis grisescens)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Maries	Niangua darter (Etheostoma nianguae)	Fish	T
Maries	Pink mucket (Lampsilis abrupta)	Mussel	E
Maries	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Maries	Scaleshell (Leptodea leptodon)	Mussel	E
Maries	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Marion	Fat pocketbook (Potamilus capax)	Mussel	E
Marion	Higgins eye pearly mussel (Lampsilis higginsii)	Mussel	E
Marion	Indiana bat (Myotis sodalis)	Mammal	E
Marion	Sheepnose (Plethobasus cyphyus)	Mussel	E
Marion	Spectaclecase (Cumberlandia monodonta)	Mussel	E
McDonald	Cave crayfish (Cambarus aculabrum)	Fish	E
McDonald	Gray bat (Myotis grisescens)	Mammal	E
McDonald	Indiana bat (Myotis sodalis)	Mammal	E
McDonald	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Mercer	Indiana bat (Myotis sodalis)	Mammal	E
Mercer	Topeka shiner (Notropis topeka)	Fish	E
Miller	Gray bat (Myotis grisescens)	Mammal	E
Millerr	Indiana bat (Myotis sodalis)	Mammal	E
Miller	Niangua darter (Etheostoma nianguae)	Fish	T
Miller	Pink mucket (Lampsilis abrupta)	Mussel	E
Miller	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Mississippi	Decurrent false aster (Boltonia decurrens)	Plant	T
Mississippi	Fat pocketbook (Potamilus capax)	Mussel	E
Mississippi	Indiana bat (Myotis sodalis)	Mammal	E
Mississippi	Interior least tern (Sterna antillarum athalassos)	Bird	E
Mississippi	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Moniteau	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Moniteau	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Moniteau	Topeka shiner (Notropis topeka)	Fish	E
Monroe	Indiana bat (Myotis sodalis)	Mammal	E
Montgomery	Indiana bat (Myotis sodalis)	Mammal	E
Montgomery	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Montgomery	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Morgan	Gray bat (Myotis grisescens)	Mammal	E
Morgan	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Morgan	Topeka shiner (Notropis topeka)	Fish	E
New Madrid	Interior least tern (Sterna antillarum athalassos)	Bird	E
New Madrid	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Newton	Arkansas darter (Etheostoma cragini)	Fish	C
Newton	Gray bat (Myotis grisescens)	Mammal	E
Newton	Neosho mucket (Lampsilis rafinesqueana)	Mussel	C
Newton	Ozark cavefish (Amblyopsis rosae)	Fish	T
Newton	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Nodaway	Eastern Massasauga (Sistrurus catenatus catenatus)	Reptile	C
Nodaway	Indiana bat (Myotis sodalis)	Mammal	E

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COUNTY	NAME	GROUP	STATUS
Oregon	Gray bat (Myotis grisescens)	Mammal	E
Oregon	Indiana bat (Myotis sodalis)	Mammal	E
Oregon	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Osage	Gray bat (Myotis grisescens)	Mammal	E
Osage	Niangua darter (Etheostoma nianguae)	Fish	T
Osage	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Osage	Pink mucket (Lampsilis abrupta)	Mussel	E
Osage	Scaleshell (Leptodea leptodon)	Mussel	E
Osage	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Ozark	Gray bat (Myotis grisescens)	Mammal	E
Ozark	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Ozark	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Pemiscot	Interior least tern (Sterna antillarum athalassos)	Bird	E
Pemiscot	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Perry	Grotto sculpin (Cottus sp.)	Fish	C
Perry	Interior least tern (Sterna antillarum athalassos)	Bird	E
Perry	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Pettis	Mead's milkweed (Asclepias meadii)	Plant	T
Pettis	Topeka shiner (Notropis topeka)	Fish	E
Phelps	Gray bat (Myotis grisescens)	Mammal	E
Phelps	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Phelps	Indiana bat (Myotis sodalis)	Mammal	E
Phelps	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Phelps	Snuffbox (Epioblasma triquetra)	Plant	P
Phelps	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Pike	Decurrent false aster (Boltonia decurrens)	Plant	T
Pike	Fat pocketbook (Potamilus capax)	Mussel	E
Pike	Gray bat (Myotis grisescens)	Mammal	E
Pike	Indiana bat (Myotis sodalis)	Mammal	E
Pike	Sheepnose (Plethobasus cyphyus)	Mussel	E
Platte	Indiana bat (Myotis sodalis)	Mammal	E
Platte	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Polk	Geocarpon (Geocarpon minimum)	Plant	T
Polk	Mead's milkweed (Asclepias meadii)	Plant	T
Pulaski	Gray bat (Myotis grisescens)	Mammal	E
Pulaski	Indiana bat (Myotis sodalis)	Mammal	E
Pulaski	Scaleshell (Leptodea leptodon)	Mussel	E
Pulaski	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Putnam	Indiana bat (Myotis sodalis)	Mammal	E
Putnam	Topeka shiner (Notropis topeka)	Fish	E
Ralls	Eastern prairie fringed orchid (Platanthera leucophaea)	Plant	T
Ralls	Fat pocketbook (Potamilus capax)	Mussel	E
Ralls	Gray bat (Myotis grisescens)	Mammal	E
Ralls	Indiana bat (Myotis sodalis)	Mammal	E
Ralls	Sheepnose mussel (Plethobasus cyphysus)	Mussel	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Ralls	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Randolph	Indiana bat (Myotis sodalis)	Mammal	E
Randolph	Topeka shiner (Notropis topeka)	Fish	E
Ray	Indiana bat (Myotis sodalis)	Mammal	E
Ray	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Ray	Topeka shiner (Notropis topeka)	Fish	E
Reynolds	Gray bat (Myotis grisescens)	Mammal	E
Reynolds	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Reynolds	Indiana bat (Myotis sodalis)	Mammal	E
Reynolds	Mead's milkweed (Asclepias meadii)	Plant	T
Ripley	Curtis pearlymussel (Epioblasma florentina curtisii)	Mussel	E
Ripley	Gray bat (Myotis grisescens)	Mammal	E
Ripley	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Ripley	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Ripley	Pink mucket (Lampsilis abrupta)	Mussel	E
Ripley	Pondberry (Lindera melissifolium)	Plant	E
Ripley	Snuffbox (Epioblasma triquetra)	Plant	P
Saline	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
Schuyler	Indiana bat (Myotis sodalis)	Mammal	E
Schuyler	Topeka shiner (Notropis topeka)	Fish	E
Scotland	Indiana bat (Myotis sodalis)	Mammal	E
Scotland	Mead's milkweed (Asclepias meadii)	Plant	T
Scott	Interior Least tern (Sterna antillarum)	Bird	E
Scott	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Shannon	Gray bat (Myotis grisescens)	Mammal	E
Shannon	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Shannon	Indiana bat (Myotis sodalis)	Mammal	E
Shannon	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Amphibian	C
Shannon	Virginia sneezeweed (Helenium virginicum)	Plant	T
Shelby	Indiana bat (Myotis sodalis)	Mammal	E
St. Charles	Decurrent false aster (Boltonia decurrens)	Plant	T
St. Charles	Indiana bat (Myotis sodalis)	Mammal	E
St. Charles	Interior Least tern (Sterna antillarum)	Bird	E
St. Charles	Pallid sturgeon (Scaphirynchus albus)	Fish	E
St. Charles	Running buffalo clover (Trifolium stolonifereum)	Plant	E
St. Clair	Geocarpon (Geocarpon minimum)	Plant	T
St. Clair	Gray bat (Myotis grisescens)	Mammal	E
St. Clair	Mead's milkweed (Asclepias meadii)	Plant	T
St. Clair	Niangua darter (Etheostoma nianguae)	Fish	T
St. Clair	Pink mucket (Lampsilis abrupta)	Mussel	E
St. Clair	Spectaclecase (Cumberlandia monodonta)	Mussel	E
St. Francois	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
St. Francois	Indiana bat (Myotis sodalis)	Mammal	E
St. Genevieve	Indiana bat (Myotis sodalis)	Mammal	E
St. Genevieve	Pallid sturgeon (Scaphirhynchus albus)	Fish	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
St. Louis	Decurrent false aster (Boltonia decurrens)	Plant	T
St. Louis	Gray bat (Myotis grisescens)	Mammal	E
St. Louis	Indiana bat (Myotis sodalis)	Mammal	E
St. Louis	Mead's milkweed (Asclepias meadii)	Plant	T
St. Louis	Pallid sturgeon (Scaphirhynchus albus)	Fish	E
St. Louis	Pink mucket (Lampsilis abrupta)	Mussel	E
St. Louis	Running buffalo clover (Trifolium stoloniferum)	Plant	E
St. Louis	Scaleshell (Leptodea leptodon)	Mussel	E
St. Louis	Sheepnose (Plethobasus cyphysus)	Mussel	E
St. Louis	Snuffbox (Epioblasma triquetra)	Plant	P
St. Louis	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Stone	Gray bat (Myotis grisescens)	Mammal	E
Stone	Indiana bat (Myotis sodalis)	Mammal	E
Stone	Ozark big-eared bat (Corynorhinus townsendii ingens)	Mammal	E
Stone	Ozark cavefish (Amblyopsis rosae)	Fish	T
Sullivan	Indiana bat (Myotis sodalis)	Mammal	E
Sullivan	Mead's milkweed (Asclepias meadii)	Plant	T
Taney	Gray bat (Myotis grisescens)	Mammal	E
Taney	Indiana bat (Myotis sodalis)	Mammal	E
Taney	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Taney	Tumbling Creek cave snail (Antrobia culveri)	Mussel	E
Texas	Gray bat (Myotis grisescens)	Mammal	E
Texas	Indiana bat (Myotis sodalis)	Mammal	E
Texas	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Mammal	C
Texas	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Texas	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Texas	Virginia sneezeweed (Helenium virginicum)	Plant	T
Vernon	Mead's milkweed (Asclepias meadii)	Plant	T
Vernon	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Vernon	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Warren	Indiana bat (Myotis sodalis)	Mammal	E
Warren	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Washington	Gray bat (Myotis grisescens)	Mammal	E
Washington	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Washington	Spectaclecase (Cumberlandia monodonta)	Mussel	E
Washington	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Curtis pearlymussel (Epioblasma florentina curtisii)	Mussel	E
Wayne	Gray bat (Myotis grisescens)	Mammal	E
Wayne	Hine's emerald dragonfly (Somatochlora hineana)	Insect	E
Wayne	Indiana bat (Myotis sodalis)	Mammal	E
Wayne	Pink mucket (Lampsilis abrupta)	Mussel	E
Wayne	Rabbitsfoot (Quadrula cylindrica)	Mussel	C
Wayne	Running buffalo clover (Trifolium stoloniferum)	Plant	E
Wayne	Snuffbox (Epioblasma triquetra)	Plant	P
Webster	Niangua darter (Etheostoma nianguae)	Fish	T

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TABLE A.4.3

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – MISSOURI

COUNTY	NAME	GROUP	STATUS
Webster	Virginia sneezeweed (Helenium virginicum)	Plant	T
Worth	Indiana bat (Myotis sodalis)	Mammal	E
Wright	Gray bat (Myotis grisescens)	Mammal	E
Wright	Indiana bat (Myotis sodalis)	Mammal	E
Wright	Ozark hellbender (Cryptobranchus alleganiensis bishopi)	Mammal	E
Wright	Scaleshell (Leptodea leptodon)	Mussel	E
Wright	Virginia sneezeweed (Helenium virginicum)	Plant	T

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Adams	Black-footed ferret (Mustela nigripes)	Mammal	E
Adams	Whooping crane (Grus americana)	Bird	FE
Antelope	American burying beetle (Nicrophorus americanus)	Insect	FE
Antelope	Black-footed ferret (Mustela nigripes)	Mammal	E
Antelope	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Antelope	Whooping crane (Grus americana)	Bird	E
Arthur	Black-footed ferret (Mustela nigripes)	Mammal	E
Arthur	Blowout penstemon (Penstemon haydenii)	Plant	E
Arthur	Whooping crane (Grus americana)	Bird	E
Banner	Black-footed ferret (Mustela nigripes)	Mammal	E
Blaine	American burying beetle (Nicrophorus americanus)	Insect	E
Blaine	Black-footed ferret (Mustela nigripes)	Mammal	E
Blaine	Blowout penstemon (Penstemon haydenii)	Plant	E
Blaine	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Blaine	Whooping crane (Grus americana)	Bird	E
Boone	American burying beetle (Nicrophorus americanus)	Insect	E
Boone	Black-footed ferret (Mustela nigripes)	Mammal	E
Boone	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boone	Whooping crane (Grus americana)	Bird	E
Box Butte	Black-footed ferret (Mustela nigripes)	Mammal	E
Box Butte	Blowout penstemon (Penstemon haydenii)	Plant	E
Boyd	American burying beetle (Nicrophorus americanus)	Insect	E
Boyd	Black-footed ferret (Mustela nigripes)	Mammal	E
Boyd	Interior least tern (Sterna antillarum)	Bird	E
Boyd	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Boyd	Piping plover (Charadrius melodus)	Bird	T
Boyd	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Boyd	Whooping crane (Grus americana)	Bird	E
Brown	American burying beetle (Nicrophorus americanus)	Insect	E
Brown	Black-footed ferret (Mustela nigripes)	Mammal	E
Brown	Blowout penstemon (Penstemon haydenii)	Plant	E
Brown	Interior least tern (Sterna antillarum)	Bird	E
Brown	Piping plover (Charadrius melodus)	Bird	T
Brown	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Brown	Whooping crane (Grus americana)	Bird	E
Buffalo	Black-footed ferret (Mustela nigripes)	Mammal	E
Buffalo	Interior least tern (Sterna antillarum)	Bird	E
Buffalo	Piping plover (Charadrius melodus)	Bird	T
Buffalo	Western prairie fringed orchid (Platanthera praeclara)	Plant	ST
Buffalo	Whooping crane (Grus americana)	Bird	E
Burt	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Burt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Black-footed ferret (Mustela nigripes)	Mammal	E
Butler	Interior least tern (Sterna antillarum)	Bird	E
Butler	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Butler	Piping plover (Charadrius melodus)	Bird	T

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Butler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Butler	Whooping crane (Grus americana)	Bird	E
Cass	Interior least tern (Sterna antillarum)	Bird	E
Cass	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cass	Piping plover (Charadrius melodus)	Bird	T
Cass	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cedar	Interior least tern (Sterna antillarum)	Bird	E
Cedar	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Cedar	Piping plover (Charadrius melodus)	Bird	T
Cedar	Scaleshell (Leptodea leptodon)	Mussel	E
Cedar	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Chase	Black-footed ferret (Mustela nigripes)	Mammal	E
Chase	Whooping crane (Grus americana)	Bird	E
Cherry	American burying beetle (Nicrophorus americanus)	Insect	E
Cherry	Black-footed ferret (Mustela nigripes)	Mammal	E
Cherry	Blowout penstemon (Penstemon haydenii)	Plant	E
Cherry	Topeka shiner (Notropis topeka)	Fish	E
Cherry	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cherry	Whooping crane (Grus americana)	Bird	E
Cheyenne	Black-footed ferret (Mustela nigripes)	Mammal	E
Cheyenne	Whooping crane (Grus americana)	Bird	E
Clay	Black-footed ferret (Mustela nigripes)	Mammal	E
Clay	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Clay	Whooping crane (Grus americana)	Bird	E
Colfax	Black-footed ferret (Mustela nigripes)	Mammal	E
Colfax	Interior least tern (Sterna antillarum)	Bird	E
Colfax	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Colfax	Piping plover (Charadrius melodus)	Bird	T
Colfax	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cuming	Interior least tern (Sterna antillarum)	Bird	E
Cuming	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Cuming	Piping plover (Charadrius melodus)	Bird	T
Custer	American burying beetle (Nicrophorus americanus)	Insect	E
Custer	Blowout penstemon (Penstemon haydenii)	Plant	E
Custer	Black-footed ferret (Mustela nigripes)	Mammal	E
Custer	Interior least tern (Sterna antillarum athalassos)	Bird	E
Custer	Piping plover (Charadrius melodus)	Bird	E
Custer	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Custer	Whooping crane (Grus americana)	Bird	E
Dakota	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dakota	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dawes	Black-footed ferret (Mustela nigripes)	Mammal	E
Dawes	Whooping crane (Grus americana)	Bird	E
Dawson	American burying beetle (Nicrophorus americanus)	Insect	E
Dawson	Black-footed ferret (Mustela nigripes)	Mammal	E
Dawson	Interior least tern (Sterna antillarum athalassos)	Bird	E

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COUNTY	NAME	GROUP	STATUS
Dawson	Piping plover (Charadrius melodus)	Bird	E
Dawson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dawson	Whooping crane (Grus americana)	Bird	E
Deuel	Black-footed ferret (Mustela nigripes)	Mammal	E
Dixon	Interior least tern (Sterna antillarum)	Bird	E
Dixon	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dixon	Piping plover (Charadrius melodus)	Bird	T
Dodge	Interior least tern (Sterna antillarum)	Bird	E
Dodge	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Dodge	Piping plover (Charadrius melodus)	Bird	T
Dodge	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Douglas	Interior least tern (Sterna antillarum)	Bird	E
Douglas	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Douglas	Piping plover (Charadrius melodus)	Bird	T
Douglas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Dundy	Black-footed ferret (Mustela nigripes)	Mammal	E
Fillmore	Black-footed ferret (Mustela nigripes)	Mammal	E
Fillmore	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Fillmore	Whooping crane (Grus americana)	Bird	E
Franklin	Black-footed ferret (Mustela nigripes)	Mammal	E
Franklin	Whooping crane (Grus americana)	Bird	E
Frontier	American burying beetle (Nicrophorus americanus)	Insect	E
Frontier	Black-footed ferret (Mustela nigripes)	Mammal	E
Frontier	Whooping crane (Grus americana)	Bird	E
Furnas	Black-footed ferret (Mustela nigripes)	Mammal	E
Furnas	Whooping crane (Grus americana)	Bird	E
Gage	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Garden	Black-footed ferret (Mustela nigripes)	Mammal	E
Garden	Blowout penstemon (Penstemon haydenii)	Plant	E
Garden	Whooping crane (Grus americana)	Bird	E
Garfield	American burying beetle (Nicrophorus americanus)	Insect	E
Garfield	Black-footed ferret (Mustela nigripes)	Mammal	E
Garfield	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Garfield	Whooping crane (Grus americana)	Bird	E
Gosper	American burying beetle (Nicrophorus americanus)	Insect	E
Gosper	Black-footed ferret (Mustela nigripes)	Mammal	E
Gosper	Interior least tern (Sterna antillarum)	Bird	E
Gosper	Piping plover (Charadrius melodus)	Bird	T
Gosper	Whooping crane (Grus americana)	Bird	E
Grant	American burying beetle (Nicrophorus americanus)	Insect	E
Grant	Black-footed ferret (Mustela nigripes)	Mammal	E
Grant	Blowout penstemon (Penstemon haydenii)	Plant	E
Grant	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Grant	Whooping crane (Grus americana)	Bird	E
Greeley	American burying beetle (Nicrophorus americanus)	Insect	E
Greeley	Black-footed ferret (Mustela nigripes)	Mammal	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Greeley	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Greeley	Whooping crane (Grus americana)	Bird	E
Hall	Black-footed ferret (Mustela nigripes)	Mammal	E
Hall	Interior least tern (Sterna antillarum)	Bird	E
Hall	Piping plover (Charadrius melodus)	Bird	T
Hall	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hall	Whooping crane (Grus americana)	Bird	E
Hamilton	Black-footed ferret (Mustela nigripes)	Mammal	E
Hamilton	Interior least tern (Sterna antillarum)	Bird	E
Hamilton	Piping plover (Charadrius melodus)	Bird	T
Hamilton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hamilton	Whooping crane (Grus americana)	Bird	E
Harlan	Black-footed ferret (Mustela nigripes)	Mammal	E
Harlan	Whooping crane (Grus americana)	Bird	E
Hayes	American burying beetle (Nicrophorus americanus)	Insect	E
Hayes	Black-footed ferret (Mustela nigripes)	Mammal	E
Hayes	Whooping crane (Grus americana)	Bird	E
Hitchcock	Black-footed ferret (Mustela nigripes)	Mammal	E
Hitchcock	Whooping crane (Grus americana)	Bird	E
Holt	American burying beetle (Nicrophorus americanus)	Insect	E
Holt	Black-footed ferret (Mustela nigripes)	Mammal	E
Holt	Interior least tern (Sterna antillarum)	Bird	E
Holt	Piping plover (Charadrius melodus)	Bird	T
Holt	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Holt	Whooping crane (Grus americana)	Bird	E
Hooker	American burying beetle (Nicrophorus americanus)	Insect	E
Hooker	Black-footed ferret (Mustela nigripes)	Mammal	E
Hooker	Blowout penstemon (Penstemon haydenii)	Plant	E
Hooker	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Hooker	Whooping crane (Grus americana)	Bird	E
Howard	Black-footed ferret (Mustela nigripes)	Mammal	E
Howard	Interior least tern (Sterna antillarum)	Bird	E
Howard	Piping plover (Charadrius melodus)	Bird	T
Howard	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Howard	Whooping crane (Grus americana)	Bird	E
Jefferson	Black-footed ferret (Mustela nigripes)	Mammal	E
Jefferson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Jefferson	Whooping crane (Grus americana)	Bird	E
Johnson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Johnson	Whooping crane (Grus americana)	Bird	E
Kearney	Black-footed ferret (Mustela nigripes)	Mammal	E
Kearney	Interior least tern (Sterna antillarum)	Bird	E
Kearney	Piping plover (Charadrius melodus)	Bird	T
Kearney	Whooping crane (Grus americana)	Bird	E
Keith	Black-footed ferret (Mustela nigripes)	Mammal	E
Keith	Blowout penstemon (Penstemon haydenii)	Plant	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Keith	Interior least tern (Sterna antillarum)	Bird	E
Keith	Piping plover (Charadrius melodus)	Bird	T
Keith	Whooping crane (Grus americana)	Bird	E
Keya Paha	American burying beetle (Nicrophorus americanus)	Insect	E
Keya Paha	Black-footed ferret (Mustela nigripes)	Mammal	E
Keya Paha	Blowout penstemon (Penstemon haydenii)	Plant	E
Keya Paha	Interior least tern (Sterna antillarum)	Bird	E
Keya Paha	Piping plover (Charadrius melodus)	Bird	T
Keya Paha	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Keya Paha	Whooping crane (Grus americana)	Bird	E
Kimball	Black-footed ferret (Mustela nigripes)	Mammal	E
Kimball	Colorado butterfly plant (Gaura neomexicana coloradensis)	Plant	T
Knox	American burying beetle (Nicrophorus americanus)	Insect	E
Knox	Black-footed ferret (Mustela nigripes)	Mammal	E
Knox	Interior least tern (Sterna antillarum)	Bird	E
Knox	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Knox	Piping plover (Charadrius melodus)	Bird	T
Knox	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Knox	Whooping crane (Grus americana)	Bird	E
Lancaster	Salt Creek tiger beetle (Cicindela nevadica lincoiniana)	Insect	E
Lancaster	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	American burying beetle (Nicrophorus americanus)	Insect	E
Lincoln	Black-footed ferret (Mustela nigripes)	Mammal	E
Lincoln	Blowout penstemon (Penstemon haydenii)	Plant	E
Lincoln	Interior least tern (Sterna antillarum)	Bird	E
Lincoln	Piping plover (Charadrius melodus)	Bird	T
Lincoln	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Lincoln	Whooping crane (Grus americana)	Bird	E
Logan	Black-footed ferret (Mustela nigripes)	Mammal	E
Logan	Blowout penstemon (Penstemon haydenii)	Plant	E
Logan	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Logan	Whooping crane (Grus americana)	Bird	E
Loup	American burying beetle (Nicrophorus americanus)	Insect	E
Loup	Black-footed ferret (Mustela nigripes)	Mammal	E
Loup	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Loup	Whooping crane (Grus americana)	Bird	E
Madison	Black-footed ferret (Mustela nigripes)	Mammal	E
Madison	Interior least tern (Sterna antillarum)	Bird	E
Madison	Piping plover (Charadrius melodus)	Bird	T
Madison	Topeka shiner (Notropis topeka)	Fish	E
Madison	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Madison	Whooping crane (Grus americana)	Bird	E
McPherson	Black-footed ferret (Mustela nigripes)	Mammal	E
McPherson	Blowout penstemon (Penstemon haydenii)	Plant	E
McPherson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
McPherson	Whooping crane (Grus americana)	Bird	E

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FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Merrick	Black-footed ferret (Mustela nigripes)	Mammal	E
Merrick	Interior least tern (Sterna antillarum)	Bird	E
Merrick	Piping plover (Charadrius melodus)	Bird	T
Merrick	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Merrick	Whooping crane (Grus americana)	Bird	E
Morrill	Black-footed ferret (Mustela nigripes)	Mammal	E
Morrill	Blowout penstemon (Penstemon haydenii)	Plant	E
Morrill	Whooping crane (Grus americana)	Bird	E
Nance	Black-footed ferret (Mustela nigripes)	Mammal	E
Nance	Interior least tern (Sterna antillarum)	Bird	E
Nance	Piping plover (Charadrius melodus)	Bird	T
Nance	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Nance	Whooping crane (Grus americana)	Bird	E
Nemaha	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Nemaha	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Nuckolls	Black-footed ferret (Mustela nigripes)	Mammal	E
Nuckolls	Whooping crane (Grus americana)	Bird	E
Otoe	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Otoe	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Pawnee	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Perkins	Black-footed ferret (Mustela nigripes)	Mammal	E
Perkins	Whooping crane (Grus americana)	Bird	E
Phelps	Black-footed ferret (Mustela nigripes)	Mammal	E
Phelps	Interior least tern (Sterna antillarum)	Bird	E
Phelps	Piping plover (Charadrius melodus)	Bird	T
Phelps	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Phelps	Whooping crane (Grus americana)	Bird	E
Pierce	Black-footed ferret (Mustela nigripes)	Mammal	E
Pierce	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Platte	Black-footed ferret (Mustela nigripes)	Mammal	E
Platte	Interior least tern (Sterna antillarum)	Bird	E
Platte	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Platte	Piping plover (Charadrius melodus)	Bird	T
Platte	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Platte	Whooping crane (Grus americana)	Bird	E
Polk	Black-footed ferret (Mustela nigripes)	Mammal	E
Polk	Interior least tern (Sterna antillarum)	Bird	E
Polk	Piping plover (Charadrius melodus)	Bird	T
Polk	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Polk	Whooping crane (Grus americana)	Bird	E
Red Willow	Black-footed ferret (Mustela nigripes)	Mammal	E
Red Willow	Piping plover (Charadrius melodus)	Bird	T
Red Willow	Whooping crane (Grus americana)	Bird	E
Richardson	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Richardson	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Rock	American burying beetle (Nicrophorus americanus)	Insect	E

DISCLAIMER: This list identifies federally-listed endangered (E), threatened (T), proposed threatened/endangered (P) and candidate (C) species as provided by the U.S. Fish and Wildlife Service as of October 2012. While this list provides a REASONABLY ACCURATE GUIDE, it should not be considered the final word in determining species location.

TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Rock	Black-footed ferret (Mustela nigripes)	Mammal	E
Rock	Blowout penstemon (Penstemon haydenii)	Plant	E
Rock	Interior least tern (Sterna antillarum)	Bird	E
Rock	Piping plover (Charadrius melodus)	Bird	T
Rock	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Rock	Whooping crane (Grus americana)	Bird	E
Saline	Black-footed ferret (Mustela nigripes)	Mammal	E
Saline	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Saline	Whooping crane (Grus americana)	Bird	E
Sarpy	Interior least tern (Sterna antillarum)	Bird	E
Sarpy	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Sarpy	Piping plover (Charadrius melodus)	Bird	T
Sarpy	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Saunders	Interior least tern (Sterna antillarum)	Bird	E
Saunders	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Saunders	Piping plover (Charadrius melodus)	Bird	T
Saunders	Salt Creek tiger beetle (Cicindela nevadica lincoiniana)	Insect	C
Saunders	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Scotts Bluff	Black-footed ferret (Mustela nigripes)	Mammal	E
Scotts Bluff	Whooping crane (Grus americana)	Bird	E
Seward	Black-footed ferret (Mustela nigripes)	Mammal	E
Seward	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Seward	Whooping crane (Grus americana)	Bird	E
Sheridan	Black-footed ferret (Mustela nigripes)	Mammal	E
Sheridan	Blowout penstemon (Penstemon haydenii)	Plant	E
Sheridan	Whooping crane (Grus americana)	Bird	E
Sherman	Black-footed ferret (Mustela nigripes)	Mammal	E
Sherman	Interior least tern (Sterna antillarum)	Bird	E
Sherman	Piping plover (Charadrius melodus)	Bird	T
Sherman	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Sherman	Whooping crane (Grus americana)	Bird	E
Sioux	Black-footed ferret (Mustela nigripes)	Mammal	E
Sioux	Ute ladies'-tresses orchid (Spiranthes diluvialis)	Plant	T
Sioux	Whooping crane (Grus americana)	Bird	E
Stanton	Interior least tern (Sterna antillarum)	Bird	E
Stanton	Piping plover (Charadrius melodus)	Bird	T
Stanton	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Thayer	Black-footed ferret (Mustela nigripes)	Mammal	E
Thayer	Whooping crane (Grus americana)	Bird	E
Thomas	American burying beetle (Nicrophorus americanus)	Insect	E
Thomas	Black-footed ferret (Mustela nigripes)	Mammal	E
Thomas	Blowout penstemon (Penstemon haydenii)	Plant	E
Thomas	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Thomas	Whooping crane (Grus americana)	Bird	E
Thurston	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Thurston	Western prairie fringed orchid (Platanthera praeclara)	Plant	T

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TABLE A.4.4

FEDERALLY-LISTED ENDANGERED OR THREATENED SPECIES – NEBRASKA

COUNTY	NAME	GROUP	STATUS
Valley	American burying beetle (Nicrophorus americanus)	Insect	E
Valley	Black-footed ferret (Mustela nigripes)	Mammal	E
Valley	Interior least tern (Sterna antillarum)	Bird	E
Valley	Piping plover (Charadrius melodus)	Bird	T
Valley	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Valley	Whooping crane (Grus americana)	Bird	E
Washington	Pallid sturgeon (Scaphirynchus albus)	Fish	E
Washington	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wayne	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Webster	Black-footed ferret (Mustela nigripes)	Mammal	E
Webster	Whooping crane (Grus americana)	Bird	E
Wheeler	American burying beetle (Nicrophorus americanus)	Insect	E
Wheeler	Black-footed ferret (Mustela nigripes)	Mammal	E
Wheeler	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
Wheeler	Whooping crane (Grus americana)	Bird	E
York	Black-footed ferret (Mustela nigripes)	Mammal	E
York	Western prairie fringed orchid (Platanthera praeclara)	Plant	T
York	Whooping crane (Grus americana)	Bird	E

DISCLAIMER: This list identifies federally-listed endangered (E), threatened (T), proposed threatened/endangered (P) and candidate (C) species as provided by the U.S. Fish and Wildlife Service as of October 2012. While this list provides a REASONABLY ACCURATE GUIDE, it should not be considered the final word in determining species location.

APPENDIX A.5

METROPOLITAN STATISTICAL AREAS

METROPOLITAN STATISTICAL AREAS

APPENDIX A.5 TO REGION 7 INTEGRATED CONTINGENCY PLAN

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APPENDIX A.6

EPA WETLAND REGULATORY AUTHORITY

EPA Wetland Regulatory Authority

Regulatory Requirements

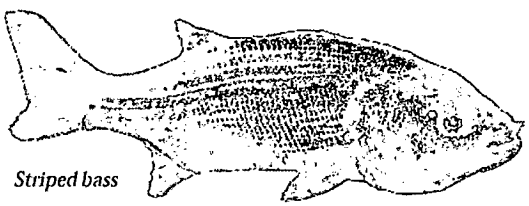
Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities).

Wetlands subject to Clean Water Act Section 404 are defined as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded. In other words, when you apply for a permit, you must show that you have, to the extent practicable:

- Taken steps to avoid wetland impacts;
- Minimized potential impacts on wetlands; and
- Provided compensation for any remaining unavoidable impacts.

Proposed activities are regulated through a permit review process. An *individual permit* is required for potentially significant impacts. Individual permits are reviewed by the U.S. Army Corps of Engineers, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines. However, for most discharges that will have only minimal adverse effects, a *general permit* may be suitable. General permits are issued on a nationwide, regional, or State basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with little or no delay, provided that the general or specific conditions for the general permit are met. For example, minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit. States also have a role in Section 404 decisions, through State program general permits, water quality certification, or program assumption.



Striped bass

Agency Roles and Responsibilities

The roles and responsibilities of the Federal resource agencies differ in scope.

U.S. Army Corps of Engineers:

- Administers day-to-day program, including individual and general permit decisions;
- Conducts or verifies jurisdictional determinations;
- Develops policy and guidance; and
- Enforces Section 404 provisions.

U.S. Environmental Protection Agency:

- Develops and interprets policy, guidance and environmental criteria used in evaluating permit applications;
- Determines scope of geographic jurisdiction and applicability of exemptions;
- Approves and oversees State and Tribal assumption;
- Reviews and comments on individual permit applications;
- Has authority to prohibit, deny, or restrict the use of any defined area as a disposal site (Section 404(c));
- Can elevate specific cases (Section 404(q));
- Enforces Section 404 provisions.

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U.S. Fish and Wildlife Service and National Marine Fisheries Service:

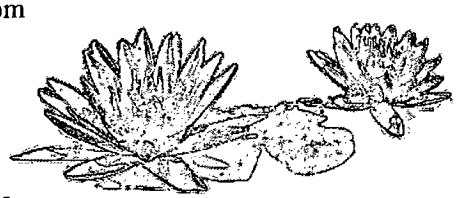
- Evaluates impacts on fish and wildlife of all new Federal projects and Federally permitted projects, including projects subject to the requirements of Section 404 (pursuant to the Fish and Wildlife Coordination Act); and
- Elevates specific cases or policy issues pursuant to Section 404(q).

Manual for Identifying Wetlands

The U.S. EPA and U.S. Army Corps of Engineers use the 1987 *Corps of Engineers Wetlands Delineation Manual* to identify wetlands for the CWA Section 404 permit program. The 1987 manual organizes the environmental characteristics of a potential wetland into three categories: soils, vegetation, and hydrology. The manual contains criteria for each category. Using this approach, an area that meets all three criteria is considered a wetland.

Wetlands on Agricultural Lands

Farmers who own or manage wetlands are directly affected by two important Federal programs—Section 404 of the CWA and the Swampbuster provision of the Food Security Act. The Swampbuster provision withholds certain Federal farm program benefits from farmers who convert or modify wetlands. The U.S. EPA, U.S. Army Corps of Engineers, U.S. Department of Agriculture, and U.S. Fish and Wildlife Service have established procedures to ensure consistency between the programs. Many normal farming practices are exempt from Section 404.



Water lilies

EPA843-F-04-001
Office of Water

Wetland Resources

On the Internet

EPA's Wetlands Website ..... www.epa.gov/owow/wetlands/regs/

Section 404 of the Clean Water Act ..... www.epa.gov/owow/wetlands/laws/

Wetland Delineation Manual ..... www.wes.army.mil/el/wetlands/wlpubs.html

U.S. Army Corps of Engineers Regulatory Program..... www.usace.army.mil/inet/functions/cw/cecwo/reg/

U.S. Army Corps of Engineers' Waterways Experiment Station Environmental Laboratory ..... www.wes.army.mil/el/wetlands/wetlands.html

Environmental Law Institute ..... www.eli.org

In Print

America's Wetlands: Our Vital Link Between Land and Water. For a copy, order from EPA's publications web site at http://yosemite.epa.gov/water/owrccatalog.nsf or call the EPA Wetlands Helpline at 1-800-832-7828.

Wetlands Deskbook, 2nd Edition, Margaret N. Strand. Available from the Environmental Law Institute. Call 1-800-433-5120; fax your request to (202) 939-3868; or e-mail to orders@eli.org.

Our National Wetland Heritage: A Protection Guide, 2nd Edition, Jon A. Kusler, Ph.D., Executive Director, Association of State Wetland Managers. Available from the Environmental Law Institute. Call 1-800-433-5120; fax your request to (202) 939-3868; or e-mail to orders@eli.org.

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APPENDIX A.7

THREATENED AND ENDANGERED SPECIES AND SENSITIVE AREAS GEOSPATIAL INFORMATION GUIDE

THREATENED AND ENDANGERED SPECIES AND SENSITIVE AREAS GEOSPATIAL INFORMATION GUIDE

APPENDIX A.7 TO REGION 7 INTEGRATED CONTINGENCY PLAN

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1.0 PURPOSE

The purpose of this document is to provide both the Federal On-Scene Coordinate (OSC) in the U.S. Environmental Protection Agency (EPA) Region 7 and owners/operators of facilities conducting facility response planning the necessary information to locate and analyze geo information pertaining to the Federal Oil Pollution Prevention regulation (Title 40 *Code of Federal Regulations* [40 CFR] Part 112) and supporting guidance documentation. The information outlined below are primarily for use with geographic information systems (GIS) or mapping systems and are designed to help locate critical features in relation to a facility. The information may include, but is not limited to, critical habitat, threatened and endangered species (for example, terrestrial or aquatic species), public use areas, cultural and historic areas, managed and protected areas, resources extraction areas, and water supplies.

2.0 SPECIAL CONSIDERATIONS

The information outlined below are not a product of the EPA and therefore the EPA does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any injury or loss resulting from the reliance upon the information. The information contained within is intended to provide guidance only, please refer to the Oil Pollution Prevention regulation found at 40 CFR Part 112 for additional information (can be found at http://www.gpo.gov).

Also, please note many of the resources listed below require GIS software to fully view or manipulate the information contained within.

3.0 GIS AND MAPPING DATA SOURCES

There are numerous resources publicly available on-line to view and download GIS and mapping information for the various features of concern when reviewing Facility Response Planning (FRP) guidance. Below is a list of resources organized by federal, state, and local, along with links to websites where data can be viewed and/or downloaded for use in GIS. This information, coupled with additional information gleaned from various guidance documents, will provide assistance in determining if a facility falls under FRP regulation.

National GIS/Mapping Data Sources:

- U.S. Fish & Wildlife Service - http://www.fws.gov/gis/data/national/index.html
- U.S. Fish & Wildlife Server Migratory Bird Data Center - https://migbirdapps.fws.gov/
- USGS GAP Analysis Program - http://www.gap.uidaho.edu/species_viewer.html
- USGS Maps/GIS - http://water.usgs.gov/maps.html
- GeoCOMMUNITY GIS Data Depot - http://data.geocomm.com/
- GIS INVENTORY - http://gisinventory.net/

State GIS/Mapping Data Sources:

- Iowa
  - Natural Resources Geographic Information Systems Library - http://www.igsb.uiowa.edu/nrgislibx/
- Kansas
  - State of Kansas GIS Data Access and Support Center - http://www.kansasgis.org/
- Missouri
  - Missouri Spatial data Information Service - http://msdis.missouri.edu/
- Nebraska
  - NDNR Data Bank Spatial/GIS Databases - http://dnr.ne.gov/databank/spat.html
  - NDNR Nebraska Geospatial Data Center - http://dnr.ne.gov/databank/geospatial.html
  - University of Nebraska – Lincoln School of Natural Resources - http://snr.unl.edu/data/geographygis/NebrGISdata.asp

The tables below contain detailed information regarding threatened and endangered species and protected areas as identified by various federal, state, and local agencies. The tables are organized first by state, and then by data category and type, followed by date, uniform resource locator (URL) and comments associated with the data. The tables can be used as a guide to streamline the research of a given area based on the state and data type in question. There a numerous types of data represented though, a majority of the information contained requires GIS software for viewing.

4.0 U.S. EPA REGION 7 SENSITIVITY ATLAS

The U.S. EPA Region 7 Sensitivity Atlas (R7 Atlas) is designed to confront the problem of inadequate and unconsolidated information regarding infrastructure and sensitive areas during a response to significant man-made and natural disasters along major river corridors within EPA Region 7. The R7 Atlas consolidates various forms of information into a comprehensive and easy-to-use web-based mapping application in which ESRI ArcGIS Viewer for Flex technology is used to deliver mapping data coupled with GIS-like functionality. The R7 Atlas is comprised of mapping components and layers including: response strategies, drinking water and utility intakes, river access points (boat ramps), sensitive species information, critical habitat information, protected areas, wetlands, mile marker locations, Nation Pipeline Mapping System (NPMS) information, river navigation charts, Public Land Survey System (PLSS) data, and bulk oil and chemical storage facilities. Each component is organized and grouped in an intuitive layer structure and is attributed with pertinent response information. Various layers are clickable in the Flex viewer map, allowing for display of information such as emergency responder contact information and boom deployment strategies in customized data pop-ups. This information provides decision makers a common operational picture to help predict, prevent, or minimize the risk to human health and the environment. The R7 Atlas is designed and built using ESRI ArcGIS Viewer for Flex technology and is easily updated and enhanced, allowing for low cost and efficient maintenance.

The R7 Atlas employs multiple levels of security and leverages a user's e-mail for further securing the application and providing a way to quickly access without the use of traditional username/password credentials. To access the application, simply navigate to https://gis.tetratech.com/viewers/7/ and complete and submit the corresponding form. Your application will be processed, following which you will receive an e-mail (at the address provided) containing a secure link to the Map Portal housing the R7 Atlas. Click the thumbnail image for the R7 Sensitivity Atlas to open the R7 Atlas mapping application. In the event a user logs out of the application or clears their browser cache, they can simply navigate to the URL referenced above and verify their e-mail to receive a secure link to access the application.

For more information, please contact EPA Region 7 On-Scene Coordinator (OSC) Paul Doherty.

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Phone: 913-551-7924
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5.0 GLOSSARY OF TERMS

- Raster: A term typically used in GIS which represents an image. A raster or raster graphic is a data structure representing a generally rectangular grid of pixels stored in an image file format (i.e. .jpg, .png, .tif). The raster images represented in the tables below are best viewed using GIS software.
- URL (Uniform Resource Locator): Constitutes the reference to a website, to navigate to this link copy and paste the URL into any web browser.
- Vector: A term typically used in GIS representing point, line, and polygon features. A vector graphic consists of geometrical primitives (based on mathematical expressions) consisting of X and Y coordinates, which combine to form an image (not related to a raster). The vector images represented in the tables below are best viewed using GIS software.

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TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Animals & Plants (General)	Refuge Trail	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://www.fws.gov/GIS/data/national/index.htm	National Wildlife Refuge System (NWRS) Trails, Vector
Animals & Plants (General)	Critical Habitat	USFWS	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector
Animals & Plants (General)	Endangered, threatened, and special concern animals & plants	Iowa Department of Natural Resources (IDNR) Interactive Mapping	Unknown	https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx	Digital Maps
Animals & Plants (General)	General Species Information	U.S. Geological Survey (USGS) Gap Analysis Program (GAP) Mapping	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector
Animals & Plants (General)	Endangered, threatened, and special concern animals & plants	IDNR, The Iowa Legislature	Unknown	http://search.legis.state.ia.us/NXT/gateway.dll/ar/iac/5710___natural%20resource%20commission%20__5b571__5d/0770___chapter%2077%20endangered%20and%20threatened%20plant%20and__2e/_r_5710_0770_0020.xml?f=templates$fn=default.htm	List of animals and plants
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database (DB)
Birds	Waterfowl	USFWS	Unknown	https://migbirdapps.fws.gov/	DB
Birds	Bird Conservation Areas	IDNR Geological Information System (GIS)	2009	http://www.igsb.uiowa.edu/nrgislibx/	Vector

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TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	DB with Coordinate, Repository with bird count data
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Repository to monitor the status and trends of North American birds
Birds	Ring Neck Duck (RNDU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Ruddy Duck (RUDU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Wood Duck (WODU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Canada Goose (CAGO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Double-Crested Cormorant (DCCO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Eared Grebe (EAGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Western Grebe (WEGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Hooded Merganser (HOME)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Killdeer (KILL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Piping Plover (PIPL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Spotted Sandpiper (SPSA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Ring-Billed Gull (RBGU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Black Tern (BLTE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Belted Kingfisher (BEKI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Green Heron (GNBH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great blue Heron (GTBH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Common Snipe (COSN)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Cattle Egret (CAEG)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great Egret (GREG)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Olympic coast, National Marine Sanctuary	National Oceanic and Atmospheric Administration (NOAA)	2002	http://olympiccoast.noaa.gov/living/marine_wildlife/seabirds/birdlist.html	Birds' list
Birds	Broad-Winged Hawk (BWHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Cooper's Hawk (COHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Common Nighthawk (CONI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Red-Shouldered Hawk (RSHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Red-tailed Hawk (RTHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Barred Owl (BAOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Burrowing Owl (BUOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Barn Owl (COBO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Eastern Screech-Owl (EASO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Great Horned Owl (GHOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

TABLE A.7.1

IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Long-eared Owl (LEOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	American Kestrel (MAKE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	PDF Document; BCR 11, 22, and 23, pages 27, 38 ,and 39 respectively.
Birds, Endangered Species	Least Bittern (LEBI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	American Bittern (AMBI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Upland Sandpiper (UPSA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bald Eagle (BAEA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Swainson's Hawk (SWHA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black Tern (BLTE)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black-billed Cuckoo (BBCU)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Short-eared Owl (SEOW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Red-Headed Woodpecker (RHWO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Grasshopper Sparrow (GRSP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Dickcissel (DICK)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Pied-Billed Grebe (PBGR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

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IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds, Endangered Species	Willow Flycatcher (WIFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Marsh Wren (MAWR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Brown Thrasher (BRTH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Blue-winged Warbler (BWWA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Cerulean Warbler (CERW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Henslow's Sparrow (HESP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bobolink (BOBO)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Black-Crowned Night-Heron (BCNH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Whip-poor-will (WPWI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Northern Flicker (NOFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Acadian Flycatcher (ACFL)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Loggerhead Shrike (LOSH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bell's Vireo (BEVI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Bewick's Wren (BEWR)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Wood Thrush (WOTH)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Kentucky Warbler (KEWA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster

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DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds, Endangered Species	Prothonotary Warbler (PROW)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Birds, Endangered Species	Field Sparrow (FISP)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Cultural Resources	Archaeological sites	IDNR GIS	2002	http://ags.gis.iastate.edu/IsitesPublicAccess/	Vector
Cultural Resources	Historical Sites	National Park Service		http://tps.cr.nps.gov/nhl/default.cfm	DB
Cultural Resources	Native American Lands	IDNR GIS	2003	http://www.igsb.uiowa.edu/nrgislibx/	Vector
Fish	Salmon	Iowa Rivers Information System (IRIS)	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Steelhead	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Trout Streams	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/	Vector - Line
Fish	Sturgeon	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Herring	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Temperate River Bass	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Smelt	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Lamprey	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Shad	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Fish Database	IRIS	Unknown	http://www.iowagis.org/iris/data/	Database - Maps
Fish	Streams Database	USGS, National Water Information System	Unknown	http://waterdata.usgs.gov/ia/nwis/current/?type=flow	Alphanumeric
Fish	Fish Database	IDNR	Unknown	http://www.iowadnr.gov/Fishing/IowaFishSpecies.aspx	Info-Map
Fish	Cold water streams	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/	Vector – Polygon

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IOWA SENSITIVE INFORMATION

DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Hazmat	Federal Response Program (FRP) Facilities	U.S. Environmental Protection Agency (EPA)	2011	FRP Database, Region 7 (v16r5)	Local DB, Vector
Land Management	Municipal Landfill	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Infrastructure Data Section, Vector
Management Areas	Protected state and local areas	USGS and National Biological Information Infrastructure (NBII)	2010	http://www.nbii.gov/portal/server.pt?open=512&objID=1850&mode=2&in_hi_userid=2&cached=true	Go to "Protected Areas Viewer" tab and choose "Download Data", Vector
Management Areas	Iowa Natural Areas Inventory (INAI Species)	IDNR GIS	2009	http://www.igsb.uiowa.edu/nrgislibx/	Biologic and Ecologic Natural Areas Inventory Data Section, Vector
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Online Map
Management Areas	Protected Streams	IDNR GIS	2005	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Management Areas	Protected Water Areas	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Management Areas	Cons rec lands public	IDNR GIS	2011	http://www.igsb.uiowa.edu/nrgislibx/	Administrative and Political Boundaries Section, Vector
Management Areas	Designated Wetlands Setback	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	Federal Reservoirs	IDNR GIS	2005	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	National Wetlands Inventory (NWI)	USFWS	Unknown	http://www.fws.gov/wetlands/Data/Mapper.html	Wetlands online mapper and data download, geodatabase (GDB)
Management Areas	NWI polygons	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Surface Water Data Section, Vector
Management Areas	Water Body	IDNR GIS	2007	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector

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DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Natural Hazards	Flood Hazard Area	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	Stay Dry v2.0.kmz
Recreation	Boat Ramps Parking	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Recreation Data Section, Vector
Recreation	Beach monitoring sites	IDNR GIS	2007	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Recreation	Water Access - Fishing and Boating (Canoe) Access Points	IDNR GIS	2009	http://www.igsb.uiowa.edu/nrgislibx/	Recreation Data Section, Vector
Recreation	State Parks	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Vector
Recreation	Public Prairie	IDNR GIS	2004	http://www.igsb.uiowa.edu/nrgislibx/IaArcIms.asp?Ims_layer=223	Vector
Recreation	Canoe Routes	IDNR GIS	2008	http://www.igsb.uiowa.edu/nrgislibx/IaArcIms.asp?Ims_layer=141	Vector
Recreation	General Recreation Information	IDNR Interactive Mapping	Unknown	http://programs.iowadnr.gov/ims/website/recreation/viewer.htm	Digital Map
Reptiles/ Amphibians	Northern Water Snake (NESI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Reptiles/ Amphibians	Reptiles/ Amphibians Iowa Database	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Reptiles/ Amphibians	Reptiles/ Amphibians Iowa Database	HerpNet.net	Unknown	http://www.herpnet.net/Iowa-Herpetology/index.php?option=com_frontpage&Itemid=1	Database – Maps
Resource Extraction	Municipal Water Intake	IDNR GIS	1996	http://www.igsb.uiowa.edu/nrgislibx/	Vector
Resource Extraction	All public wells	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector

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DATA CATEGORY	DATA TYPE	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector
Resource Extraction	SWAP Areas Surface Water	IDNR GIS	2006	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Resource Extraction	Water Use Surface Water Intakes	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Hydrologic Ground and Surface Water Data Section, Vector
Resource Extraction	Public Water Supply Sources	USGS, National Hydrology Dataset (NHD)	2010	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Shellfish	Freshwater Mussels	Iowa DNR Interactive Mapping	Unknown	https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx	Digital Map
Terrestrial Mammals	Otter (LUCA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Terrestrial Mammals	Beaver (CACA)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Terrestrial Mammals	Mink (MUVI)	IDNR GIS	2002	http://www.igsb.uiowa.edu/nrgislibx/	Raster
Transportation	Railroad	IDNR GIS	2010	http://www.igsb.uiowa.edu/nrgislibx/	Infrastructure Data Section, Vector
Water Supply	Dam	USGS, National Hydrology Dataset (NHD)	2010	ftp://nhdftp.usgs.gov/DataSets/National//	Vector

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector	
Animals & Plants - General	Endangered and Threatened Species	Kansas Department of Wildlife, Parks, and Tourism (KDWPT)	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Animals & Plants - General	Natural Communities	Kansas Data Access & Support Center (DASC)	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Animals & Plants - General	Rare Species	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	Vector	National Wildlife Refuge System (NWRS) Trails
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	American Black Duck	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	American Kestrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps	

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coord.	
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector	
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	List	BCR 18, 19, and 22, pages 34, 35, and 38 respectively.
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Burrowing Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Clark's Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ferruginous Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird
Birds	Mississippi Kite	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Shoveler	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Prairie Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Red-shouldered Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Sabine's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Waterfowl Birds	USGS GAP	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	Western Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Western Screech-owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Phalarope	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Snipe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Birds, E/T Species	Designated Critical Habitat	Kansas DASC	1997	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds, E/T Species	Black-capped Vireo	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Black-capped Vireo	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Eskimo Curlew	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds, E/T Species	Least Tern	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Birds, E/T Species	Piping Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Piping Plover	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Birds, E/T Species	Snowy Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Birds, E/T Species	Snowy Plover	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Birds, E/T Species	Whooping Crane	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Part of State Migratory Bird
Birds, E/T Species	Whooping Crane	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector	Endangered
Boundaries	Cities (Incorporated Places)	USGS - The National Map	2008	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Boundaries	County Boundaries	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/main	Vector	

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Cultural Resources	Archaeological sites	Kansas Historical Society	Unknown	http://www.kshs.org/p/archeological-site-and-survey-location-gis-coverage/15739	Guide	Guide to Access Private GIS Information
Cultural Resources	Historical Sites	National Park Service	Unknown	http://tps.cr.nps.gov/nhl/default.cfm	Database	
Cultural Resources	Native American Lands	Kansas DASC	2000	http://www.kansasgis.org/catalog/index.cfm	Vector	Administrative Boundaries Category
Emergency Services	Fire Stations	Kansas DASC	2009	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Emergency Services	EMS Stations	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Emergency Services	Law Enforcement	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Critical Infrastructure and Structures Category
Energy	Oil & Gas Wells	University of Kansas (KU), Kansas Geological Survey (KGS)	2011	http://www.kgs.ku.edu/PRS/petroDB.html	Vector	
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#		Interactive Maps; For Reference Purpose Only
Fish	2011 Fishing Atlas	KDWPT	2011	http://kdwpt.state.ks.us/news/KDWPT-Info/Locations/Hunting-Fishing-Maps-by-County/2011-Fishing-Atlas	Maps	2011 Fishing Atlas
Fish, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Fish, E/T Species	Arkansas River Shiner	USFWS	2005	http://criticalhabitat.fws.gov/crithab/	Vector	Endangered

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Arkansas Darter	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Arkansas Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Arkansas River Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Arkansas River Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Designated Critical Habitat	Kansas DASC	1997	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Fish, E/T Species	Arkansas River Speckled Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Blackside Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Chestnut Lamprey	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Flathead Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Hornyhead Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Neosho Madtom	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Plains Minnow	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Redspot Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Shoal Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Sicklefin Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Silver Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Silverband Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Sturgeon Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Western Silvery Minnow	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Arkansas River Speckled Chub	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Blackside Darter	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Chestnut Lamprey	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Flathead Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Hornyhead Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Neosho Madtom	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Pallid Sturgeon	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Plains Minnow	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Redspot Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Shoal Chub	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Sicklefin Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Silver Chub	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Fish, E/T Species	Silverband Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Sturgeon Chub	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Topeka Shiner	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Fish, E/T Species	Western Silvery Minnow	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector	Local Database
Land Management	Landfills	Kansas DASC	1994	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Land Management	Landuse (Kansas Land Cover Patterns, Level IV)	Kansas DASC	2005	http://www.kansasgis.org/catalog/index.cfm	Raster	Land Surface Geology Soils Category
Management Areas	Ecoregions	Kansas DASC	2003	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Interactive Map-Vector	
Management Areas	Groundwater Management Districts	Kansas DASC	2006	http://www.kansasgis.org/catalog/index.cfm	Vector	Administrative Boundaries Category
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector	
Management Areas	National Parks	National Park Service (IRMA Portal)	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector	
Management Areas	National Wetlands Inventory (NWI)	USFWS	2011	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB	Wetlands online mapper and data download
Management Areas	Protected Areas	Kansas DASC	2008	http://www.kansasgis.org/catalog/index.cfm	Vector	Environmental Resources Category
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector	
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Management Areas	Riparian Inventory	Kansas DASC	2001	http://www.kansasgis.org/catalog/index.cfm	Vector	Land Surface Geology Soils Category
Management Areas	Terrestrial Ecoregions	World Wildlife Federation (WWF)	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector	

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector	
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector	
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector	
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	-	KMZ File; Stay Dry v2.0.kmz
Plants	Endangered and threatened Species	USFWS	2011	http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=KS&s8fid=112761032792&s8fid=112762573902	List - Interactive Maps	
Recreation	Canoe Access	KDWPT	Unknown	http://kdwpt.state.ks.us/news/Boating/KS-State-Boating-Access	Interactive Map	
Recreation	Playa Lakes	Kansas DASC	2004	http://www.kansasgis.org/catalog/index.cfm	Vector	Archive Category
Recreation	State Parks	USGS GAP	Unknown	http://www.gap.uidaho.edu/padusmap.html	Interactive Map - Vector	
Recreation	Walk-In Hunting Access	Kansas DASC	2011	http://www.kansasgis.org/catalog/index.cfm	Vector	Cultural and Recreational Category
Reptiles/ Amphibians, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Reptiles/ Amphibians, E/T Species	Broadhead Skink	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Cave Salamander	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Reptiles/ Amphibians, E/T Species	Common Map Turtle	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Eastern Narrowmouth Toad	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Eastern Newt	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Green Frog	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Green Toad	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Grotto Salamander	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Reptiles/ Amphibians, E/T Species	Longtail Salamander	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Many-ribbed Salamander	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Reptiles/ Amphibians, E/T Species	Spring Peeper	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Reptiles/ Amphibians, E/T Species	Strecker's Chorus Frog	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Resource Extraction	Drinking Water	USGS - Drinking Water Watch	Unknown	http://165.201.142.59:8080/DWW/Maps/Map_Template.jsp	Database	

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector	
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector	
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Resource Extraction	Public Water Supply Systems (PWS)	Kansas DASC	2004	http://www.kansasgis.org/catalog/index.cfm	Vector	Utilities and Energy Resources Category
Resource Extraction	Registered Groundwater Wells	KU, KGS	2011	http://www.kgs.ku.edu/Magellan/WaterWell/index.html	List with Coordinates	
Shellfish, E/T Species	Butterfly Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Delta Hydrobe	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Elktoe Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Ellipse Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Flat Floater Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Flutedshell Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Shellfish, E/T Species	Mucket Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Neosho Mucket Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Ouchita Kidneyshell Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Rabbitsfoot Mussel	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Rock Pocketbook Mussel	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Sharp Hornsnail	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Shellfish, E/T Species	Slender Walker Snail	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Western Fanshell Mussell	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Shellfish, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	
Terrestrial Mammals	North American River Otter	USGS GAP	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Terrestrial Mammals, E/T Species	Endangered and Threatened Species	KDWPT	2009	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Statewide-List	List	

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KANSAS SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Terrestrial Mammals, E/T Species	Black-footed Ferret	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Terrestrial Mammals, E/T Species	Eastern Spotted Skunk	KDWPT	2005	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Threatened
Terrestrial Mammals, E/T Species	Gray Myotis	KDWPT	2000	http://kdwpt.state.ks.us/news/Services/Threatened-and-Endangered-Species/Threatened-and-Endangered-Species/Range-Maps	Map	Endangered
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector	
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	Vector	International Area
Transportation	Railroads	Kansas DASC	2002	http://www.kansasgis.org/catalog/index.cfm	Vector	Transportation Category
Water Supply	Aquifers	National Atlas	2006	http://nationalatlas.gov/mld/aquifrp.html	Vector	
Water Supply	Dams	National Atlas	2006	http://nationalatlas.gov/atlasftp.html#dams00x	Vector	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector	
Animals & Plants - General	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	Vector	National Wildlife Refuge System (NWRS) Trails
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database	
Birds	American Black Duck	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	American Kestrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps	
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coord.	
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector	
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	List	BCR 22, 24, and 26, pages 38, 40, and 42 respectively.

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Black Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Caspian Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Glaucous Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving; Part of State Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Migratory Bird
Birds	Mississippi Kite	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor; Part of State Migratory Bird
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Diving
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Migratory Bird
Birds	Red-shouldered Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl; Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Waterfowl Birds	USGS GAP	Unknown	https://migbirdapps.fws.gov/	Database	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Migratory Bird
Birds	Wilson's Phalarope	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wilson's Snipe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Wading; Part of State Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Birds, E/T Species	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Gull/Terns; Part of State Migratory Bird; Endangered
Birds, E/T Species	Piping Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	Threatened
Boundaries	Cities (Incorporated Places)	USGS - The National Map	2008	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Boundaries	County Boundaries	Missouri Spatial Data Information Service (MSDIS)	2011	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Cultural Resources	Archaeological sites	Missouri Department of Natural Resources (MDNR)	Unknown	http://www.dnr.mo.gov/shpo/mapgallery.htm	Interactive Map	Requires User ID and Password
Cultural Resources	Historical Sites	Missouri Spatial Data Information Service (MSDIS)	2009	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Cultural Resources	Native American Lands	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	Fire Stations	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	EMS Stations	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Emergency Services	Law Enforcement	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Energy	Oil & Gas Wells	USGS - Energy Resources Program	Unknown	http://certmapper.cr.usgs.gov/erp_datafinder_v1.1/explorer.jsp	Vector	
Energy	Oil and Gas Permits	USGS - Geological Survey Program	2011	http://dnr.mo.gov/geology/geosrv/ogc/index.html#permitted	XLS File with Coord	
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#		Interactive Maps; For Reference Purpose Only
Fish	Trout Management Streams	Missouri Department of Conservation (MDC)	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Fish, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Fish, E/T Species	Critical Habitat	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector	
Fish, E/T Species	Nonindigenous Fish	USGS - Nonindigenous Aquatic Species (NAS)	2011	http://nas.er.usgs.gov/queries/StateSearch.aspx	Interactive Map	
Fish, E/T Species	Neosho Madtom	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Fish, E/T Species	Niangua Darter	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Ozark Cavefish	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Endangered; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File	Endangered; Go to Tools/Point Map
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector	Local Database
Land Management	Landfills	MSDIS	2011	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Land Management	Landuse (Land Cover)	MSDIS	2005	http://www.msdis.missouri.edu/data/lulc/lulc05.html	Raster	
Management Areas	Ecoregions	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Management Areas	Conservation Areas	MDC	Unknown	http://mdc.mo.gov/discover-nature/places-go/google-earth	KMZ File	
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Interactive Map-Vector	
Management Areas	Groundwater Watch	USGS - MO Active Water Level Network	2011	http://groundwaterwatch.usgs.gov/StateMaps/MO.html	KMZ File	
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector	
Management Areas	National Parks	National Park Service (IRMA Portal)	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Management Areas	National Wetlands Inventory (NWI)	USFWS	2011	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB	Wetlands online mapper and data download
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector	
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	
Management Areas	Preserve Boundaries	MSDIS	2009	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Management Areas	Wild Areas	MSDIS	2011	http://www.msdis.missouri.edu/data/themelist.html#admin	Vector	
Management Areas	Terrestrial Ecoregions	World Wildlife Federation (WWF)	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector	
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector	
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector	
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector	
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	KMZ File	Stay Dry v2.0.kmz
Plants, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Recreation	Boat Ramps	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Recreation	Camping	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Docks and Plattforms	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Fishing	MDC	Unknown	http://newmdcgis.mdc.mo.gov/Boat%20Ramps/	Interactive Map	
Recreation	Shooting Range	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	State Parks	USGS - Gap Analysis	Unknown	http://www.gap.uidaho.edu/padusmap.html	Interactive Map - Vector	
Recreation	State Parks and Historic Sites	MSDIS	2011	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Recreation	Trails	MDC	Unknown	http://newmdcgis.mdc.mo.gov/public-maps-gallery-1.4/public-maps-gallery/index.html	GDB	
Recreation	Hunting Areas	MDC	Unknown	http://mdc4.mdc.mo.gov/applications/moatlas/AdvancedSearch.aspx	Database - Maps	Advance Search by Activities
Reptiles/ Amphibians	Northern Leopard Frog	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Reptiles/ Amphibians	Alligator Snapping turtle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Reptiles/ Amphibians, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector	
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector	
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector	

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MISSOURI SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Resource Extraction	Public Water Storage Tanks	Missouri Public Drinking Water Website - CARES	Unknown	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Systems	Missouri Public Drinking Water Website - CARES	Unknown	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Supply Intakes	Missouri Public Drinking Water Website - CARES	2007	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Public Water Treatment Plants	Missouri Public Drinking Water Website - CARES	2007	http://drinkingwater.missouri.edu/	Vector	GIS Data; Password protected website
Resource Extraction	Registered Groundwater Wells	MSDIS	2010	http://www.msdis.missouri.edu/data/datalist.html#statemo	Vector	
Shellfish, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Terrestrial Mammals	North American River Otter	USGS GAP	Unknown	http://www.gap.uidaho.edu/species_viewer.html	Vector	
Terrestrial Mammals, E/T Species	Endangered and Threatened Species	USFWS	2011	http://www.fws.gov/midwest/endangered/lists/state-mo.html	List	
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector	
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	Vector	International Area
Transportation	Railroads	MSDIS	2006	http://www.msdis.missouri.edu/data/themelist.html#	Vector	
Water Supply	Aquifers	National Atlas	2006	http://nationalatlas.gov/mld/aquifrp.html	Vector	

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FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	FORMAT	COMMENTS
Water Supply	Dams	MSDIS	2010	http://www.msdis.missouri.edu/data/datalist.html#mocdc	Vector	
Water Supply	Dams	National Atlas	2006	http://nationalatlas.gov/atlasftp.html#dams00x	Vector	

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Animals & Plants - General	Critical Habitat	U.S. Fish & Wildlife Service (USFWS)	Unknown	http://criticalhabitat.fws.gov/crithab/	Vector
Animals & Plants - General	Endangered and threatened Species	North American Native Fishes Association (NAFNA)	2011	http://outdoornebraska.ne.gov/wildlife/programs/nongame/pdf/E_T_Species_List.pdf	List
Animals & Plants - General	Native Vegetation	University of Nebraska-Lincoln (UNL), School of Natural Resources)	Unknown	http://snr.unl.edu/data/geographygis/NebrGISland.asp	Vector
Animals & Plants - General	Refuge Trail	USFWS	Unknown	http://www.fws.gov/GIS/data/national/index.htm	National Wildlife Refuge System (NWRS) Trails, Vector
Birds	Migratory Birds	Migratory Bird Data Center	Unknown	https://migbirdapps.fws.gov/	Database
Birds	American Kestrel	U.S. Geological Survey (USGS) Gap Analysis Program (GAP)	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Baird's Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory
Birds	Bald Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Barn Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Barred Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Bird database	North American Breeding Bird Survey	Unknown	http://www.pwrc.usgs.gov/bbs/	Database - Maps
Birds	Bird Point Count Database	USGS - Patuxent Wildlife Research Center	Unknown	http://www.pwrc.usgs.gov/point/	Database with coordinates

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Birds Information	Nature Serve	Unknown	http://www.natureserve.org/getData/birdMaps.jsp	Vector
Birds	Birds of Conservation Concern	USFWS	2008	http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf	BCR 11, 17, 18, 19, and 22, pages 27, 33, 34, 35, and 38 respectively.
Birds	Black Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Bonaparte's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Broad-Winged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Part of State Migratory Bird
Birds	Buff-breasted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	Burrowing Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Cackling Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	California Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Canada Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Clark's Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving
Birds	Common Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Migratory Bird
Birds	Common Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Common Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Cooper's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Eared Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Eastern Screech-Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ferruginous Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Forster's Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird

TABLE A.7.4

NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Franklin's Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Golden Eagle	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Great Horned Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Great White-fronted Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Gyrfalcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Herring Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Hooded Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Horned Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Migratory Bird
Birds	Least Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Least Tern	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Part of State Migratory Bird
Birds	Long-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Merlin	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Migratory Bird
Birds	Northern Goshawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Northern Harrier	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Northern Saw-whet Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Osprey	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Migratory Bird
Birds	Pacific Loon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Pectoral Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Peregrine Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor, and Part of State Migratory Bird

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Pied-Billed Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving
Birds	Prairie Falcon	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Red-breasted Merganser	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Migratory Bird
Birds	Red-tailed Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ring-Billed Gull	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Gull/Terns, and Migratory Bird
Birds	Ring-necked Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Migratory Bird
Birds	Ross's Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Rough-legged Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Ruddy Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Semipalmated Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Sharp-shinned Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Short-eared Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Snow Goose	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl, and Part of State Migratory Bird
Birds	Snowy Owl	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Solitary Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Spotted Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading
Birds	Stilt Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Birds	Swainson's Hawk	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Trumpeter Swan	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds	Turkey Vulture	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Raptor
Birds	Upland Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	Waterfowl Birds	USFWS	Unknown	https://migbirdapps.fws.gov/	Database
Birds	Western Grebe	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Diving, and Part of State Migratory Bird
Birds	Western Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Part of State Migratory Bird
Birds	White-rumped Sandpiper	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Wading, and Migratory Bird
Birds	Wood Duck	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Waterfowl
Birds, Endangered/ Threatened (E/T) Species	Mountain Plover	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Endangered
Birds, E/T Species	Piping Plover	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector, Endangered
Birds, E/T Species	Whooping Crane	USFWS	2011	http://criticalhabitat.fws.gov/crithab/	Vector, Endangered
Boundaries	City Boundaries	Nebraska Department of Natural Resources (NDNR) Geographical Information System (GIS)	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector
Boundaries	County Boundaries	NDNR GIS	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Cultural Resources	Archaeological sites	Nebraska State Historical Society (NSHS)	Unknown	http://www.nebraskahistory.org/histpres/nebraska/index.shtml	List
Cultural Resources	Historical Sites	NSHS	Unknown	http://www.nebraskahistory.org/histpres/nebraska/index.shtml	List
Cultural Resources	Historical Sites	National Park Service	Unknown	http://tps.cr.nps.gov/nhl/default.cfm	Database
Cultural Resources	Native American Lands	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Emergency Services	Fire Stations/EMS Station	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Emergency Services	Law Enforcement	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Energy	Oil & Gas Wells	Nebraska Oil and Gas Conservation Commission	2011	http://www.nogcc.ne.gov/NOGCCOnlineGIS/	Database - Maps
Energy	Pipelines	National Pipeline Mapping System (NPMS)	Unknown	https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf#	Interactive Maps; For Reference Purpose Only
Fish	Fish Guide	Nebraska Game and Parks Commission (NGP)	2011	http://outdoornebraska.ne.gov/Fishing/guides/fishguide/pdf/FishGuide.pdf	Guide; Threatened and Endangered Species Pag. 14
Fish, E/T Species	All Threatened and Endangered Species	UNL, School of Natural Resources	Unknown	http://watercenter.unl.edu/watermap/threatenedendangered.asp	Map
Fish, E/T Species	Blacknose Shiner	Nebraska Library Commission (NLC)	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 19
Fish, E/T Species	Blacknose Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Fish, E/T Species	Finescale Dace	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 21
Fish, E/T Species	Finescale Dace	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Lake Sturgeon	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 25
Fish, E/T Species	Lake Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Northern Redbelly Dace	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 23
Fish, E/T Species	Northern Redbelly Dace	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Pallid Sturgeon	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 27
Fish, E/T Species	Pallid Sturgeon	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Sturgeon Chub	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 29
Fish, E/T Species	Sturgeon Chub	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	USFWS	2004	http://criticalhabitat.fws.gov/crithab/	
Fish, E/T Species	Topeka Shiner	Fish Base Consortium	2011	http://www.fishbase.org/search.php	KMZ File, Threatened; Go to Tools/Point Map
Fish, E/T Species	Topeka Shiner	NLC	2001	http://nlc1.nlc.state.ne.us/epubs/R6000/H053-2007.pdf	Map, Pag 31
Hazmat	Federal Response Program (FRP) Facilities	FRP Database, Region 7 (v16r5)	2011		Vector, Local Database
Land Management	Landuse Data	NDNR GIS	2005	http://dnr.ne.gov/databank/landuse.html	Raster

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Management Areas	Federal and State Protected Areas	USGS GAP	Unknown	http://dingo.gapanalysisprogram.com/padus/Map.aspx	Online Map -Vector
Management Areas	Terrestrial Ecosystems	WWF	2006	http://www.worldwildlife.org/science/data/item6373.html	Vector
Management Areas	Groundwater Regions	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/data/geographygis/NebrGISwater.asp#ground	Vector
Management Areas	National Parks	National Park Service, IRMA Portal	2011	https://irma.nps.gov/App/Reference/Profile/2181146	Vector
Management Areas	Reserves	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Management Areas	Wilderness Areas	Wilderness.net	2011	http://www.wilderness.net/index.cfm?fuse=NWPS&sec=geography	Vector
Management Areas	National Cadastral Data	USFWS	2011	http://www.fws.gov/GIS/data/CadastralDB/index.htm	Vector
Management Areas	Realtime Streamflow stations	USGS - National Water Information System	Daily	http://waterdata.usgs.gov/nwis/rt	Vector
Management Areas	Federal Reservoirs	Central Nebraska Public Power and Irrigation District	Unknown	http://www.cnppid.com/Elevation_Flows2.htm	List - Graphs
Management Areas	National Wetlands Inventory (NWI)	USFWS	Unknown	http://www.fws.gov/wetlands/Data/DataDownload.html	GDB, Wetlands online mapper and data download
Management Areas	Water Body High resolution	USGS - National Hydrography Dataset	2010	ftp://nhdftp.usgs.gov/DataSets/Staged/States/	Vector
Management Areas	Water Body	U.S. Census Bureau - TIGER	2011	http://www.census.gov/cgi-bin/geo/shapefiles2011/layers.cgi	Vector

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Natural Hazards	Flood Hazard Areas (KMZ file)	Federal Emergency Management Agency (FEMA)	Unknown	https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload	KMZ File; Stay Dry v2.0.kmz
Plants	Endangered and threatened Species	North American Native Fishes Association (NAFNA)	2011	http://outdoornebraska.ne.gov/wildlife/programs/nongame/pdf/E_T_Species_List.pdf	List; Plants information for Nebraska
Recreation	Boat Ramps	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Campground	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Canoe Access	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Fishing	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Parking	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	State Parks	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Interactive Maps
Recreation	Trails	NGP	Unknown	http://outdoornebraska.ne.gov/gisapps/default.asp	Vector
Reptiles/ Amphibians	Great Plains Skink	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Northern Leopard Frog	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Plains Gartersnake	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Reptiles/ Amphibians	Reptiles & Amphibians of Nebraska Database	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/herpneb/	Database

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Resource Extraction	Mines	UNL, School of Natural Resources	Unknown	http://snr.unl.edu/data/geographygis/nebrgisgeology.asp	Vector
Resource Extraction	Mineral Resources	USGS - Mineral Resources Data System (MRDS)	2005	http://tin.er.usgs.gov/mrds/	Vector
Resource Extraction	Mines and Mineral Plants	USGS	2003	http://tin.er.usgs.gov/mineplant/	Vector
Resource Extraction	Potable Water Facility	USGS - The National Map	Unknown	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd	Vector
Resource Extraction	Registered Groundwater Wells	NDNR GIS	Unknown	http://dnrdata.dnr.ne.gov/OvernightBatch/DataTypeList.aspx	Vector
Terrestrial Mammals	Red Squirrel	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals	Snowshoe Hare	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals, E/T Species	General Species Information	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector
Terrestrial Mammals, E/T Species	Mammals Information	Nature Serve	Unknown	http://www.natureserve.org/getData/mammalMaps.jsp	Vector
Terrestrial Mammals, E/T Species	North American River Otter	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Threatened
Terrestrial Mammals, E/T Species	Swift Fox	USGS GAP	2011	http://www.gap.uidaho.edu/species_viewer.html	Vector, Endangered
Terrestrial Mammals, E/T Species	Threatened species	International Union for Conservation of Nature	2010	http://www.iucnredlist.org/technical-documents/spatial-data	International Area
Transportation	Railroads	NDNR GIS	2010	http://www.dnr.ne.gov/databank/statewide.html	Vector

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NEBRASKA SENSITIVE INFORMATION

FEATURE DATASET	FEATURE CLASS	DATA SOURCE	YEAR	URL/PATH	COMMENTS
Water Supply	Aquifers	UNL School of Natural Resources	1979	http://snr.unl.edu/data/geographygis/NebrGISwater.asp	Vector
Water Supply	Dams	NDNR GIS	Unknown	http://dnrdata.dnr.ne.gov/Dams/index.aspx	Vector

APPENDIX G

MATERIAL SAFETY DATA SHEET(S)

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Keystone Commodities List: Legal Names & Codes

Page #	Commodity Legal Name & Manufacturer	OCC Codes / Synonyms
3	**Alberta Common Synthetic (ACS):** Husky Oil Operations Limited	ACS
4	**Albian Heavy Synthetic Crude:** Shell Canada Limited	AHS
5	**Albian Muskeg River Heavy (AMH):** Shell Canada Limited	AMH
6	**Albian Resid Blend:** Shell Canada Limited	ARB / Albian Residual Blend
7	**Albian Vacuum Gasoil Blend:** Shell Canada Limited	AVB / Albian Vacuum Bottoms
8	**Canadian Sour Crude**: Conoco Phillips Canada Res. Corp.	KCB / Keystone Conoco Blend
9	**Crude Oil Sour (Blended):** MEG Energy Corp	AWB / Access Western Blend
10	**Crude Oil Sweet (Canada):** Conoco Phillips Canada Limited	SW / Mixed Sweet
11	**Diluted Bitumen**: Nexen Canada Inc	PSH / Long Lake Synbit Blend
12	**Heavy Crude Oil/Diluent Mix**: Cenovus Energy Inc	CDB / Christina Lake Dilbit
13	**Heavy Crude Oil/Diluent Mix (Christina Lake/Foster Creek)**: EnCana Corporation	CL / Cold Lake
14	**Horizon Sweet Light Oil:** Canadian Natural Resources Ltd	CNS / CNRL Sweet Syn Blend / CNRL Sweet Synthetic Blend
15	**Mackay River Blend: Cdn** Petro-Canada	MKH / Mackay River Heavy
16	**Mackay River Blend: US** Petro-Canada	MKH / Mackay River Heavy
17	**Petroleum Crude Oil (Sour):** Gibson Energy ULC	BR / Bow River North / SO / Mixed Sour Blend
18	**Petroleum Crude Oil (Sweet):** Husky Oil Operations Limited	LLB / Lloydminister Blend
19	**Petroleum Heavy Crude Oil**: Canadian Natural Resources Ltd.	WH / Wabasca Heavy
20	**Premium Albian Synthetic Crude:** Shell Canada Limited	PAS
21	**Product Gas Oil:** Suncor Energy Inc	OSZ / Suncor - Z
22	**PSC**: Nexen Inc	PSC / Long Lake Light Synthetic
23	**Sour Produced Gas, Sour Produced Water, Sour Crude Oil**: Shell Canada Limited	PH / Peace Heavy
24	**Sales Oil**: Statoil	SCB / Statoil Cheecham Blend
25	**Seal Heavy Crude Oil:** Shell Canada Limited	SH / Seal Heavy
26	**Shell Synthetic Blend:** Shell Canada Limited	SSX / Shell Synthetic Light
27	**Suncor OSA**: Suncor Energy Inc	OSA / Suncor A
28	**Suncor OSB**: Suncor Energy Inc	BHB / Borealis Heavy Blend
29	**Suncor OSC**: Suncor Energy Inc	OSC / Suncor C

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30	**Suncor OSH**: Suncor Energy Inc	OSH
31	**Surmont Phase 1 Synbit Sales Oil (Canada):** Conoco Phillips Canada Limited	SHB / Surmont Heavy Blend
32	**Synthetic Crude Oil / Syncrude Sweet Blend / Syncrude Sweet Premium**: Syncrude Canada Ltd.	SYN / Syncrude
33	**Synthetic Crude Oil:** Husky Oil Operations Limited	HSB / Husky Synthetic Blend
34	**Western Canadian Select (WCS):** Husky Oil Operations Limited	WCS

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Husky Energy — Material Safety Data Sheet

WHMIS	Personal Protection	TDG Road/Rail

Section I. Product Identification and Uses

Common/Trade name	**Alberta Common Synthetic (ACS)**		
Synonyms	Not available.	**CAS #**	8002-05-09
Chemical family	Petroleum Hydrocarbon.	**DSL**	On the DSL list.
Supplier	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111	**Manufacturer**	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111
Material uses	Synthetic Crude Oil - Keystone Pipeline System		

Section 2. First Aid Measures

Eye contact	Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.
Skin contact	Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.
Inhalation	Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.
Ingestion	If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

Section 3. Hazardous Ingredients

		Exposure Limits						
Name	**CAS #**	**TWA (ppm)**	**TWA (Mg/M3)**	**STEL (ppm)**	**STEL (Mg/M3)**	**CEIL (ppm)**	**CEIL (Mg/M3)**	**% by Weight**
Crude Oil (Hydrocarbons C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulphide	7783-06-4	10	14	15	21	20	28	<0.5
Benzene	71-43-2	0.5		2.5				0.1-1
Toluene	108-88-3	20	75					1-5
Xylene	1330-20-7		100		150			1-30

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H2S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat= 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat= 4300 mg/Kg. LC50 Inhalation rat= 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat= 5000 mg/Kg. LC50 Inhalation rat= 8000 ppm for n4 hrs. LD50 Dermal rabbit= 14000 mg/Kg.

Continued on Next Page

Section 4. Physical Data

Physical state and appearance	Liquid. Black/Brown.
Odor	Petroleum Odour
pH (1% soln/water)	Not applicable.
Odor threshold	O.13 ppm H2S
Evaporation rate	Not available.
Freezing point	Not available.
Boiling point	-11°C - >1100°C
Specific gravity	0.8 - 0.9 (Water = 1)
Volatility	100 (%vol)
Vapor density	Not available.
Vapor pressure	Not available.
Water/oil dist. coeff.	Not available.
Solubility	Not available.
Molecular Weight	Not applicable.
Melting Point	Not available.
Density	Not available.

Section 5. Fire and Explosion Data

Auto-ignition temperature	Not available.
Flash points	CLOSED CUP: -40°C (-40°F)
Flammable limits	Not available.
Extinguishing Media	Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special fire fighting procedures	Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.
Flammability	Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded. **Remark** No additional remark.
Risks of explosion	This material is sensitive to static discharge. This product is not sensitive to mechanical impact. **Remark** No additional remark.

Section 6. Reactivity Data

Stability	The product is stable.
Hazardous decomp. products	Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.
Reactivity	Incompatible material: Strong acids, strong oxidizers, chlorine. Hazardous polymerization: Will not occur. **Remark** No additional remark.

Continued on Next Page

Section 7. Toxicological Properties

Routes of entry	Ingestion. Inhalation. Eye contact. Skin contact.
TLV	TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH. Hydrogen Sulfide: TWA: 10 ppm, 14 mg/m3 from ACGIH STEL: 2.5 ppm STEL from ACGIH Toluene TWA: 20 ppm from ACGIH Xylene (o, m, and p isomers) TWA: 100 ppm, STEL: 150 ppm from ACGIH Benzene TWA 0.5 ppm. STEL 2.5 ppm(SKIN) Consult local authorities for acceptable exposure limits.
Toxicity to animals	**Hydrocarbons C5 and C6 Rich** LD50: Not available. LC50: Not available. **Hydrogen Sulphide (H2S)** **LC50 Inhalation Mouse = 673 ppm 1 hour** **LC50 Inhalation Rat = 444 ppm for 4 hours**
	Remark No additional remark.
Chronic effects	This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficent evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has produced fetotoxic effects in animal studies. This product may contain toluene which is known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, parathesis, dermatitis, liver and kidney damage and to affect reproduction. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compound has been associated with the induction of skin and lung tumours.
	Remark No additional remark.
Acute effects	Sensitizing Capabiltiy: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.
Ingestion	Pulmonary aspiration hazard if swallowed and vomitting occurs.
Skin	Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.
Eyes	Eye contact with product or product vapours may result in eye irritation.
Inhalation	May cause headache, dizziness, loss of appetite and loss of consiousness. Product vapours are irritating to the respiratory tract.
	Remark This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.
Synergistic materials	Not available.

Section 8. Preventive Measures

Waste disposal	Dispose of in accordance with all federal, provincial and local regulations.
Storage	Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.
Ventilation	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
Spill and leak	Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

Continued on Next Page

Section 9. Classification/Regulatory Information

TDG road / rail

TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5 C (140.9 F). Closed cup test method.

PIN: 1267 - PETROLEUM CRUDE OIL

Remark
No additional remark.

WHMIS

WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).

Remark
No additional remark.

Other

This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
Refer to federal, provincial, and local legislation for further requirements.

Section 10. Protective Clothing

Eye

Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Skin

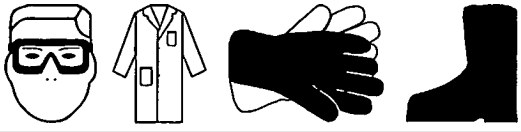
Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Respiratory

Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

Other

As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.



Section 11. Preparation Information

References

-Provisional Domestic Substances List, Canadian Ennvironmental Protection Act, Volume 1-Registry Number Index, April 1990; Environment Canada. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. CCOHS (Chem advi)
CCOHS(Cheminfo) Doccumentation of the Threshold Limit Values and Biological Exposure Indices (ACGIH)
Pocket Guide to Chemical Hazards (NIOSH)
Transportation of Dangerous Goods Shedule II List II

MSDS Status

Acronyms: TLV = Threshold Limit Value N/AP = Not applicable N/AV = Not Available COC = Cleveland Open Cup PMCC = Pensky Martens Closed Cup

Validated by Husky Corporate Hygiene on 12/2/2009.	**Verified by Husky Corporate Hygiene.**
Supersedes: not applicable	**Printed 12/2/2009.**

Continued on Next Page

Emergency Phone # 403-262-2111

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2012-01-24
Supersedes: 2010-11-30

Class B2 Flammable Liquid

Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

Class D2A Chronic Toxic Effects
Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN HEAVY SYNTHETIC CRUDE**
SYNONYMS:	AHS
	Crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-112**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
A component in this product has been classified by IARC as carcinogenic to humans (Group 1).
May affect fetal development.
Prolonged exposure may cause serious health effects.
May be irritating to eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.

015243

Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Hydrocracked Residues	64741-75-9	30 - 50	Yes
Petroleum - Crude Oil	8002-05-9	25 - 70	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 30	Yes
Natural Gas Condensates	68919-39-1	0 - 20	Yes
Natural Gas Condensates (C2 to C20)	64741-47-5	0 - 20	Yes
Residues (Petroleum), Vacuum	64741-56-6	0 - 15	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 12.5	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 12.5	Yes
Naphtha, heavy hydrocracked	64741-78-2	0 - 12	Yes
Clarified Oils (Petroleum), Catalytic Cracked	64741-62-4	2 - 10	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 6	Yes
Naphtha (petroleum), Light Straight-run	64741-46-4	0 - 6	Yes
Distillates (Petroleum), Straight-run Middle	64741-44-2	0 - 5	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes
Ethylbenzene	100-41-4	0.05 - 0.5	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

015244

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

015245

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation:	Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.
Skin Protection:	Avoid contact with skin. Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.
Respiratory Protection:	Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	0 - 930 °C
Density:	930 - 940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.93 - 0.94
pH:	Not available

015246

Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon solvents (benzene, ether, chloroform)

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Hydrocracked Residues	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Petroleum - Crude Oil	LD50 Oral Rat > 4300 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates	LD50 Oral Rat > 3000 mg/kg
Natural Gas Condensates (C2 to C20)	LC50 Inhalation Rat > 5200 mg/m3 for 4hours LD50 Oral Rat = 14000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Residues (Petroleum), Vacuum	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Clarified Oils (Petroleum), Catalytic Cracked	LD50 Oral Rat 4300 mg/kg
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha (petroleum), Light Straight-run	
Distillates (Petroleum), Straight-run Middle	LC50 Inhalation Rat 1700 mg/m3 for 4hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg

015247

	LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Long term intensive exposure to oil mist may cause benign lung fibrosis. Repeated and/or prolonged exposure to cat-cracked clarified oils may cause liver damage.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect. Oral or dermal exposure of pregnant rats to cat-cracked clarified oils produced embryotoxicity and fetal abnormalities at maternally toxic doses.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. Results of Modified Ames tests indicate that this product may have significant carcinogenic properties. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. IARC has listed Ethylbenzene among those materials for which there is limited evidence for carcinogenicity in animals and inadequate evidence in humans. As a result, Ethylbenzene is classified by IARC as a possible human carcinogen (i.e. IARC 2b)

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. In the event of a release, the light fraction will vaporize and cause exposure via breathing and body contact. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

015248

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Additional Information	Marine Pollutant
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I Marine Pollutant

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity Class D2A Chronic Toxic Effects Class D2B Skin Irritation
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. A component in this product has been classified by IARC as carcinogenic to humans (Group 1). May affect fetal development. Prolonged exposure may cause serious health effects.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours.

015249

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated.

015250

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2011-02-16
Supersedes: None

Class B2 Flammable Liquid

Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

Class D2A Mutagenicity
Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN MUSKEG RIVER HEAVY (AMH)**
SYNONYMS:	AMH Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9700-140**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
A component in this product has been classified by IARC as carcinogenic to humans (Group 1).
May affect fetal development.
This product contains a component that has produced mutagenic effects.
May be irritating to eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Avoid inhalation of vapours.

015251

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Residues (Petroleum), Vacuum	64741-56-6	35 - 50	Yes
Distillates (petroleum), petroleum residues vacuum	68955-27-1	10 - 30	Yes
Natural Gas Condensates (C2 to C20)	64741-47-5	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 30	Yes
Distillates (Petroleum), Straight-run Middle	64741-44-2	7 - 15	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 5	Yes
Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Toluene	108-88-3	0 - 3	Yes
n-Hexane	110-54-3	< 1	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes
Ethylbenzene	100-41-4	0.05 - 0.5	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

015252

Extinguishing Media:	Dry Chemical Carbon Dioxide Foam Water Fog
Firefighting Instructions:	Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.
Hazardous Combustion Products:	A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.

015253

Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	35 - 930 °C
Density:	910 - 930 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.91 - 0.93
pH:	Not available
Flash Point:	PMCC 26 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available

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Water Solubility: Insoluble

10. STABILITY AND REACTIVITY

Chemically Stable: Yes
Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Residues (Petroleum), Vacuum	
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates (C2 to C20)	LC50 Inhalation Rat > 5200 mg/m3 for 4hours LD50 Oral Rat = 14000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Distillates (Petroleum), Straight-run Middle	LC50 Inhalation Rat 1700 mg/m3 for 4hours
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

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Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. IARC has listed Ethylbenzene among those materials for which there is limited evidence for carcinogenicity in animals and inadequate evidence in humans. As a result, Ethylbenzene is classified by IARC as a possible human carcinogen (i.e. IARC 2b)

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. In the event of a release, the light fraction will vaporize and cause exposure via breathing and body contact. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG II

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15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity Class D2A Mutagenicity Class D2B Skin Irritation
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. A component in this product has been classified by IARC as carcinogenic to humans (Group 1). May affect fetal development. This product contains a component that has produced mutagenic effects.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This is a new MSDS.

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Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-19

Class B2 Flammable Liquid

Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN RESID BLEND**
SYNONYMS:	ARB Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-332**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Residues (Petroleum), Vacuum	64741-56-6	35 - 45	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 59	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 33	Yes
Gas Oils (Petroleum), Hydrotreated Vacuum	64742-59-2	0 - 26	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 19	Yes
Natural Gas Condensates	68919-39-1	0 - 10	Yes
n-Hexane	110-54-3	1 - 2	Yes
Toluene	108-88-3	< 1	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes

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Ethylbenzene	100-41-4	0.05 - 0.2	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:
Flammable Liquid.
Contains xylene, which may affect fetal development.
May cause cancer.
Irritating to skin.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:
Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required; Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:
Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream

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of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
n-Hexane (skin): 50 ppm

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Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	0 - 930 °C
Density:	930 - 940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.93 - 0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble

10. STABILITY AND REACTIVITY

Chemically Stable: Yes

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Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Residues (Petroleum), Vacuum	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Gas Oils (Petroleum), Hydrotreated Vacuum	
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates	LD50 Oral Rat > 3000 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Long term intensive exposure to oil mist may cause benign lung fibrosis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Peripheral neurotoxicity has been reported in connection with over exposure to n-hexane. Prolonged exposure over a period of weeks or months to levels well above the TLV may cause neurotoxic disease, with symptoms including weakness and lack of sensation in hands and feet.
Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have

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not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:
Class B2 Flammable Liquid
Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

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Class D2B Skin Irritation

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: No Canadian federal standards. Provincial criteria are likely and should be requested when notifying provincial authorities. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Contains xylene, which may affect fetal development.
May cause cancer.
Irritating to skin.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 8 Section 9 Section 11 Section 12 Section 14

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Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-15

Class B2 Flammable Liquid

Class D2B Skin Irritation

Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **ALBIAN VACUUM GASOIL BLEND**
SYNONYMS: AVB
Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE: Base product for Petroleum Refining.
PRODUCT CODE: **873-331**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (petroleum), petroleum residues vacuum	68955-27-1	80 - 90	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	10 - 20	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Hydrocarbon Odour
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.

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Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Do not use a direct stream of water as it may spread fire. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain

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spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Gasoline: 300 ppm (STEL: 500 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges

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in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-25 - 600 °C
Density:	940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Auto-ignition Temperature:	Not available
Viscosity:	350 mm2/s @ 6 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg

Routes of Exposure:	Exposure will most likely occur through skin contact or inhalation.
Irritancy:	Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects:	Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can

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cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class: Class B2 Flammable Liquid
Class D2B Skin Irritation
Class D2A Carcinogenicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as

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required under the Canadian Environmental Protection Act.

Other Regulatory Status: The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
May cause cancer.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 11 Section 15

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Material Safety Data Sheet

1. Product and company identification

Product name

Canadian Heavy Oil

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas.

Note: Released levels of hydrogen sulfide (H2S) are dependent on a variety of factors and cannot be fully predicted based on dissolved H2S levels.

Crude oil is a naturally occurring complex mixture of hydrocarbons whose exact composition and physical properties can vary widely depending upon its source.

MSDS #

0000003736

Code

0000003736

Product use

Refinery feedstock
For specific application advice see appropriate Technical Data Sheet or consult our company representative.

Synonyms

Crude oil; Petroleum distillate; PETROLEUM OIL, Canadian Heavy Oil, Dilbit, Dilsynbit

Supplier

BP Canada Energy Trading Company
240 - 4th Avenue S.W.
P.O. Box 200
Calgary, Alberta
T2P 2H8
Canada

EMERGENCY HEALTH INFORMATION:

1 (800) 447-8735
Outside the US: + 1 703 527 3887(CHEMTREC)

EMERGENCY SPILL INFORMATION:

1 (613) 996-6666 CANUTEC (Canada)

OTHER PRODUCT INFORMATION

1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

2. Hazards identification

Physical state

Viscous liquid.

Color

Brown.

Emergency overview

DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

Flammable liquid. Harmful in contact with skin and if swallowed. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes. Avoid contact with skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which may cause heritable genetic effects. Contains material which can cause birth defects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready

for use. Wash thoroughly after handling.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes Causes eye irritation.

Skin Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. See toxicological information (Section 11) .

Inhalation Vapors may cause drowsiness and dizziness. Can cause central nervous system (CNS) depression. May cause respiratory tract irritation.

Ingestion Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.

See toxicological information (Section 11)

3. Composition/information on ingredients

Contains 20-30% Diluent. (typical value)

Ingredient name	CAS #	%
Crude Oil: complex hydrocarbon mixture comprising mainly of aliphatic, naphthenic and aromatic hydrocarbons.	8002-05-9	60 - 80
Natural gas condensates (petroleum)	64741-47-5	0 - 30
Naphtha (petroleum), light straight-run.	64741-46-4	0 - 20
Naphtha (petroleum), heavy straight-run.	64741-41-9	0 - 20
Naphtha (petroleum), hydrotreated light	64742-49-0	0 - 20
naphtha (petroleum), hydrotreated heavy	64742-48-9	0 - 20
Distillates (petroleum), hydrotreated middle	64742-46-7	0 - 10
Pentane	109-66-0	0 - 10
Butane	106-97-8	0 - 5
Hexane, other isomers	None assigned.	0 - 5
n-hexane	110-54-3	0 - 5
Heptane	142-82-5	0 - 5
methylcyclohexane	108-87-2	0 - 5
Benzene	71-43-2	0 - 1
Toluene	108-88-3	0 - 1
xylene	1330-20-7	0 - 1
Ibenzene	100-41-4	0 - 1
ethylbutane	78-78-4	0 - 1
Cyclohexane	110-82-7	0 - 1
Octane	111-65-9	0 - 1
Polycyclic aromatic hydrocarbons (PAHs)	mixture	0 - 0.1
Hydrogen Sulfide	7783-06-4	0 - 0.1

4. First aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin contact Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.

Inhalation If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product Flammable liquid.

Flash point Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits Lower: 0.6%
Upper: 8%

Fire/explosion hazards In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Unusual fire/explosion hazards	Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	Do not use water jet.
Fire-fighting procedures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous combustion products	Combustion products may include the following: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) Hydrogen Sulfide (H2S)
Protective clothing (fire)	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions	No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
Environmental precautions	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods for cleaning up

Large spill	Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.
Small spill	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling	Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.
Storage	Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks.

This material can contain hydrogen sulphide (H_2S), an extremely toxic and flammable gas. Vapors containing hydrogen sulfide may accumulate during storage or transport and may also be vented during filling of tanks. Hydrogen sulfide has a typical "bad egg" smell but at high concentrations the sense of smell is rapidly lost, therefore do not rely on sense of smell for detecting hydrogen sulfide. Use specially designed measuring instruments for determining its concentration.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Crude oil	**CA Alberta Provincial (Canada).** OEL: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral STEL: 10 mg/m³ 15 minute(s). Form: Oil mist, mineral
Natural gas condensates (petroleum)	**Alberta OH&S (Canada).** OEL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s). **British Columbia OH&S (Canada).** EL: 5 mg/m³ STEL: 10 mg/m³ 15 minute(s).
Naphtha (petroleum), light straight-run.	**ACGIH TLV (United States).** STEL: 1480 mg/m³ 15 minute(s). Form: Gasoline (Recommended) STEL: 500 ppm 15 minute(s). Form: Gasoline (Recommended) TWA: 890 mg/m³ 8 hour(s). Form: Gasoline (Recommended) TWA: 300 ppm 8 hour(s). Form: Gasoline (Recommended) TWA: 100 ppm 8 hour(s). Form: Stoddard Solvent (Recommended) TWA: 525 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended) **OSHA PEL (United States).** TWA: 2900 mg/m³ 8 hour(s). Form: Stoddard Solvent (Recommended)
naphtha (petroleum), hydrotreated heavy	**ACGIH TLV (United States).** TWA: 300 ppm
Distillates (petroleum), hydrotreated middle	**ACGIH (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m³ 8 hour(s). Form: Oil mist, mineral
Pentane	**ACGIH TLV (Canada).** TWA: 600 ppm 8 hour(s). **CA British Columbia Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998 STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010 TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010 STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010 **CA Quebec Provincial (Canada).** TWAEV: 350 mg/m³ 8 hour(s). Issued/Revised: 1/2000 TWAEV: 120 ppm 8 hour(s). Issued/Revised: 1/2000 **CA Alberta Provincial (Canada).** 8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004 8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004
Hydrogen Sulfide	**Alberta OH&S (Canada).** CEIL: 15 ppm OEL: 10 ppm 8 hour(s). **British Columbia OH&S (Canada).** CEIL: 10 ppm **CA Alberta Provincial (Canada).** C: 21 mg/m³ 15 minute(s). Issued/Revised: 7/2009 C: 15 ppm 15 minute(s). Issued/Revised: 7/2009 8 hrs OEL: 10 ppm 8 hour(s). Issued/Revised: 4/2004

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8 hrs OEL: 14 mg/m³ 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
C: 10 ppm 15 minute(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 10 ppm 8 hour(s). Issued/Revised: 1/1990
STEL: 15 ppm 15 minute(s). Issued/Revised: 1/1990
CA Quebec Provincial (Canada).
TWAEV: 10 ppm 8 hour(s). Issued/Revised: 1/2000
TWAEV: 14 mg/m³ 8 hour(s). Issued/Revised: 1/2000
STEV: 15 ppm 15 minute(s). Issued/Revised: 1/2000
STEV: 21 mg/m³ 15 minute(s). Issued/Revised: 1/2000

Hexane, other isomers

ACGIH TLV (United States).
TWA: 500 ppm 8 hour(s).
STEL: 1000 ppm 15 minute(s).

n-hexane

CA Alberta Provincial (Canada). Absorbed through skin.
8 hrs OEL: 176 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada). Absorbed through skin.
TWA: 20 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada). Absorbed through skin.
TWA: 50 ppm 8 hour(s). Issued/Revised: 9/1998
CA Quebec Provincial (Canada). Absorbed through skin.
TWAEV: 176 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000

Heptane

CA Alberta Provincial (Canada).
15 min OEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 500 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 1640 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
STEL: 500 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
STEL: 2050 mg/m³ 15 minute(s). Issued/Revised: 9/1994
STEL: 500 ppm 15 minute(s). Issued/Revised: 9/1994
TWA: 1640 mg/m³ 8 hour(s). Issued/Revised: 9/1994
TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994
CA Quebec Provincial (Canada).
STEV: 2050 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 500 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 1640 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000

methylcyclohexane

CA Alberta Provincial (Canada).
8 hrs OEL: 1610 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 400 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 400 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 1610 mg/m³ 8 hour(s). Issued/Revised: 9/1994
TWA: 400 ppm 8 hour(s). Issued/Revised: 9/1994
CA Quebec Provincial (Canada).
TWAEV: 1610 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 400 ppm 8 hour(s). Issued/Revised: 1/2000

Butane

CA Alberta Provincial (Canada).
8 hrs OEL: 1000 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).
STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2005
TWA: 600 ppm 8 hour(s). Issued/Revised: 7/2005
CA Quebec Provincial (Canada).
TWAEV: 1900 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 800 ppm 8 hour(s). Issued/Revised: 1/2000
CA Ontario Provincial (Canada).
TWA: 800 ppm 8 hour(s). Issued/Revised: 7/2010

Benzene

CA Alberta Provincial (Canada). Absorbed through skin.
15 min OEL: 8 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 1.6 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 0.5 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada). Absorbed through skin.
STEL: 2.5 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 0.5 ppm 8 hour(s). Issued/Revised: 8/2004

CA Ontario Provincial (Canada). Absorbed through skin.
STEL: 2.5 ppm 15 minute(s). Issued/Revised: 7/2010
TWA: 0.5 ppm 8 hour(s). Issued/Revised: 7/2010
CA Quebec Provincial (Canada).
STEV: 15.5 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 5 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 3 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 1 ppm 8 hour(s). Issued/Revised: 1/2000

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CA Alberta Provincial (Canada). Absorbed through skin.
8 hrs OEL: 188 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 50 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 20 ppm 8 hour(s). Issued/Revised: 5/2007
CA Ontario Provincial (Canada).
TWA: 20 ppm 8 hour(s). Issued/Revised: 11/2006
CA Quebec Provincial (Canada). Absorbed through skin.
TWAEV: 188 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 50 ppm 8 hour(s). Issued/Revised: 1/2000

xylene

CA Alberta Provincial (Canada).
15 min OEL: 651 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 150 ppm 15 minute(s). Issued/Revised: 7/2009
8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
STEL: 150 ppm 15 minute(s). Issued/Revised: 8/2004
TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
CA Quebec Provincial (Canada).
STEV: 651 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 150 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 434 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000
CA Ontario Provincial (Canada).
STEL: 651 mg/m³ 15 minute(s). Issued/Revised: 5/1996
STEL: 150 ppm 15 minute(s). Issued/Revised: 5/1996
TWA: 434 mg/m³ 8 hour(s). Issued/Revised: 5/1996
TWA: 100 ppm 8 hour(s). Issued/Revised: 5/1996

·lbenzene

CA Alberta Provincial (Canada).
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 434 mg/m³ 8 hour(s). Issued/Revised: 4/2004
15 min OEL: 543 mg/m³ 15 minute(s). Issued/Revised: 7/2009
15 min OEL: 125 ppm 15 minute(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
STEL: 125 ppm 15 minute(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002
STEL: 125 ppm 15 minute(s). Issued/Revised: 1/2002
CA Quebec Provincial (Canada).
TWAEV: 100 ppm 8 hour(s). Issued/Revised: 1/2000
TWAEV: 434 mg/m³ 8 hour(s)..Issued/Revised: 1/2000
STEV: 125 ppm 15 minute(s). Issued/Revised: 1/2000
STEV: 543 mg/m³ 15 minute(s). Issued/Revised: 1/2000

2-methylbutane

CA British Columbia Provincial (Canada).
TWA: 600 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 600 ppm 8 hour(s). Issued/Revised: 9/1998
STEL: 2210 mg/m³ 15 minute(s). Issued/Revised: 7/2010
TWA: 1770 mg/m³ 8 hour(s). Issued/Revised: 7/2010
STEL: 750 ppm 15 minute(s). Issued/Revised: 7/2010
CA Alberta Provincial (Canada).
8 hrs OEL: 600 ppm 8 hour(s). Issued/Revised: 4/2004
8 hrs OEL: 1770 mg/m³ 8 hour(s). Issued/Revised: 4/2004

Cyclohexane

Alberta OH&S (Canada).
TWA: 300 ppm 8 hour(s).
British Columbia OH&S (Canada).
TWA: 100 ppm 8 hour(s).
CA Alberta Provincial (Canada).
8 hrs OEL: 344 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 100 ppm 8 hour(s). Issued/Revised: 7/2009
CA British Columbia Provincial (Canada).

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TWA: 100 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002
CA Quebec Provincial (Canada).
TWAEV: 1030 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000

Octane

CA Alberta Provincial (Canada). Skin sensitizer.
8 hrs OEL: 1400 mg/m³ 8 hour(s). Issued/Revised: 7/2009
8 hrs OEL: 300 ppm 8 hour(s). Issued/Revised: 4/2004
CA British Columbia Provincial (Canada).
TWA: 300 ppm 8 hour(s). Issued/Revised: 8/2004
CA Ontario Provincial (Canada).
TWA: 300 ppm 8 hour(s). Issued/Revised: 3/1999
CA Quebec Provincial (Canada).
STEV: 1750 mg/m³ 15 minute(s). Issued/Revised: 1/2000
STEV: 375 ppm 15 minute(s). Issued/Revised: 1/2000
TWAEV: 1400 mg/m³ 8 hour(s). Issued/Revised: 1/2000
TWAEV: 300 ppm 8 hour(s). Issued/Revised: 1/2000

Polycyclic aromatic hydrocarbons (PAHs)

ACGIH TLV (United States).
TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble
OSHA PEL (United States).
TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene-soluble

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Control Measures

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes

Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body

Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory

Use adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter. If operating conditions cause high vapor concentrations or the TLV is exceeded, use NIOSH-certified, supplied-air respirator.

Hands

Wear chemical resistant gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state

Viscous liquid.

Color

Brown.

Odor

Pungent.

Odor threshold

Not available.

Flash point

Closed cup: -50 to 100°C (-58 to 212°F) [Pensky-Martens.]

Explosion limits

Lower: 0.6%
Upper: 8%

Specific gravity	Not available.
Density	750 to 1000 kg/m^3 (0.75 to 1 g/cm^3) at 15°C
pH	Not available.
Viscosity	Kinematic: <7 mm^2/s (<7 cSt) at 40°C
Boiling point / Range	-10 to 800°C (14 to 1472°F)
ing point / Range	Not available.
Vapor pressure	39.894 to 698.138 kPa (300 to 5250 mm Hg)
Vapor density	Not available.
Evaporation rate	Not available.
Solubility	insoluble in water.
LogK_{ow}	>3

10. Stability and reactivity

Stability and reactivity	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	Not available.
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced. Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) Hydrogen Sulfide (H2S)
Hazardous polymerization	Under normal conditions of storage and use, hazardous polymerization will not occur.

Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Ethylbenzene	2B	-	-
xylene	3	-	-
Toluene	3	-	-
Benzene	1	Proven.	+
Polycyclic aromatic hydrocarbons (PAHs)	-	Possible	-

IARC :
1 - Carcinogenic to human.
2B - Possible carcinogen to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

Other information

Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

From skin-painting studies in laboratory animals, it has been concluded that most, if not all, petroleum crudes, regardless of source, possess carcinogenic activity to some degree. This means that workers who practice poor personal hygiene and who are repeatedly exposed by direct skin contact to crude oil over many years may potentially be at risk of developing skin cancer. However, intermittent or occasional skin contact with petroleum crude oils is not expected to have serious health effects as long as good personal hygiene measures such as those outlined in this material safety data sheet are followed. Crude oil has not been identified as a carcinogen by NTP, IARC or OSHA.

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Exposure to sunlight may increase the degree of skin irritation.
Crude oil administered orally or dermally to pregnant rats during gestation produced increased numbers of resorptions and decreases in fetal weight at maternally toxic doses. Repeated exposures to some crude oils in rats have produced effects on the blood, liver and thymus.

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.

Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Toluene: Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material. Deliberate inhalation of high concentrations of toluene has been linked to damage of the brain, liver and kidney. Inhalation of very high concentrations of toluene, such as in cases of solvent abuse, has resulted in sudden death which may be a result of cardiac arrhythmia or central nervous system depression. Mental and/or growth retardation has been reported in children of women who deliberately inhale toluene during pregnancy (usually at thousands of ppm). Fetal developmental toxicity was observed when pregnant rats were exposed to toluene at levels of 1500 ppm. Maternal toxicity was also observed at this concentration. Prolonged, high level exposure to toluene in laboratory animals has resulted in hearing loss. Exposure studies in rats have resulted in adverse effects on the kidney, liver and central nervous system. Studies in occupationally exposed individuals indicate that toluene exposure has been associated with impaired color vision and decreased performance in some neurobehavioral tests. There are occupational studies which report an association between inhalation exposure to toluene and adverse effects on reproduction including spontaneous abortion. The methodology of these studies and the reliability of the results have been questioned. In a two-generation study in rats, inhalation of toluene at levels up to 2000 ppm did not produce adverse effects on fertility or reproductive performance.

Xylenes: Xylene has been reported to cause central nervous system effects at concentrations above the recommended exposure limit. Xylene vapor becomes irritating at relatively high levels. In one study, eye irritation was reported at exposures of 460 ppm and in one person at 230 ppm after 15 minutes. In another study, no one reported eyes, nose and throat irritation at mixed xylene exposures up to 230 ppm for 30 minutes. Dermal LD50 is expected to be greater than 10g/kg in rabbits, based on test results from similar materials.

Mixed xylenes caused slight hearing loss in rats exposed to 800 ppm in the air for 14 hours/day for six weeks. There is no information available for lower concentrations; however, similar chemicals that have caused these hearing effects at similar concentrations have not caused effects at lower concentrations.

Pregnant animals exposed to xylene or its isomers have been reported to cause development toxicity in rodents when exposed by inhalation. The developmental effects observed consisted of delayed development and minor skeletal variations, but no malformations. Because of the high exposure levels used in these studies, we do not believe that these results imply an increased risk of reproductive toxicity to workers exposed to xylene levels at or below the exposure limits.

Xylene and its isomers are not genotoxic.

Technical grade xylene has been tested in a National Toxicology Program carcinogenicity study in rats and mice dosed orally for two years. There was no evidence of carcinogenicity.
NTP also exposed male and female rats and mice by inhalation to 0, 75, 250, or 750 ppm ethylbenzene for 2 years. There was a statistically significant increase in the number of kidney tumors in male and female rats at 750 ppm. There were also increased incidences of lung tumors in male mice and liver tumors in female mice that were statistically significant at 750 ppm. Except for the male rat kidney tumors, the incidence of the tumors were within the range observed for non-exposed animals from other studies conducted by NTP. The significance of these findings to humans is unknown. Ethylbenzene produced mixed results in in vitro genotoxicity studies, which were not confirmed when tested in vivo. The International Agency for Research on Cancer (IARC) has evaluated ethylbenzene and found it to be possibly carcinogenic to humans (Group 2B).

This product contains n-hexane. Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. Animal studies have also shown that n-hexane overexposure may cause testicular injury. However, animal studies conducted with commercial hexane, containing 53% n-hexane, showed neither peripheral nervous system damage nor testicular injury at inhalation exposures up to 9000 ppm.

This material may contain significant quantities of polycyclic aromatic hydrocarbons (PCAs), some of which have been shown by experimental studies to induce skin cancer.

Potential chronic health effects

Carcinogenicity	Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	Contains material which may cause heritable genetic effects.
Teratogenicity	Contains material which can cause birth defects.
rtility effects	No known significant effects or critical hazards.
Reproductive effects	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

Persistence/degradability	Inherently biodegradable
Mobility	Spillages may penetrate the soil causing ground water contamination. This material may accumulate in sediments.
Bioaccumulative potential	This product is not expected to bioaccumulate through food chains in the environment.
Other ecological information	Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor

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from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
TDG Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-
IMDG Classification	UN 1267	PETROLEUM CRUDE OIL. Marine pollutant	3	I	**Emergency schedules (EmS)** F-E, S-E
IATA/ICAO Classification	UN 1267	PETROLEUM CRUDE OIL	3	I	-

15. Regulatory information

WHMIS (Canada) Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Other regulations

Canada inventory	All components are listed or exempted.
United States inventory (TSCA 8b)	All components are listed or exempted.
REACH Status	For the REACH status of this product please consult your company contact, as identified in Section 1.
Australia inventory (AICS)	Not determined.
China inventory (IECSC)	Not determined.
Japan inventory (ENCS)	Not determined.
Korea inventory (KECI)	Not determined.
Philippines inventory (PICCS)	At least one component is not listed.

16. Other information

Label requirements DANGER !

FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.
ASPIRATION HAZARD.
BIRTH HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS

History

Date of issue 12/14/2011.

of previous issue No previous validation.

Prepared by Product Stewardship

▽ **Indicates information that has changed from previously issued version.**

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

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Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: **Crude Oil, Sour**
SDS Number: 733721

Synonyms/Other Means of Identification:
Crude Oils, Desalted, Sour
Field Crude, Sour
Petroleum Crude, Sour
Petroleum Oil, Sour
Rock Oil, Sour
Sour Crude

MARPOL Annex I Category: Crude Oils
Intended Use: Refinery Feed

Supplier:
Phillips 66 Company
600 N. Dairy Ashford
Houston, Texas 77079-1175

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Section 2: Hazard(s) Identification

DANGER

Highly flammable liquid and vapor. (H225)*
Causes serious eye irritation. (H319)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause damage to organs through prolonged or repeated exposure. (H373)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

NFPA

Precautionary Statement(s):
Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep away from any possible contact with water, because of violent reaction and possible flash fire. (P223)*
Ground/bond container and receiving equipment. (P240)*
Use with explosion-proof equipment. (P241)*
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN (or hair):
Remove/Take off immediately all contaminated clothing. (P361)*
Rinse skin with water/shower. (P353)*
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
If eye irritation persists:
Get medical advice/attention. (P313)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Store in a well-ventilated place. Keep cool.(P403+P235)*
Dispose of contents/container to approved disposal facility. (P501)*

** (Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Crude Oil (Petroleum)	8002-05-9	100
Naphthalene	91-20-3	0-0.9
Benzene	71-43-2	<1
Hydrogen Sulfide	7783-06-4	<1

Total Sulfur: > 0.5 wt%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

Section 4: First Aid Measures

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% $NaNO_2$ solution (0.5 gm $NaNO_2$ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

Medical Conditions Aggravated by Exposure: Conditions which may be aggravated by exposure include skin disorders, eye disorders, liver disorders and immune system disorders. Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect (see Section 4 - Note to Physicians).

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 2 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: Long-duration fires involving crude or residual fuel oil stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11 or API 2021).

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H2S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. May contain or release dangerous levels of hydrogen sulfide. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H2S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m³ - 8 hr (Phillips 66 Guidelines)
Naphthalene	STEL: 15 ppm TWA: 10 ppm 2 ppm TWA; skin; A3 - confirmed animal carcinogen with unknown relevance to humans; TLV basis: upper respiratory tract irritation Skin	TWA: 10 ppm : 50 mg/m³	TWA: 0.2 mg/m³ (as total of 17 PNAs measured by NIOSH Method 5506) (Phillips 66 Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (Phillips 66 Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure to hydrogen sulfide (H2S) above exposure limits, a NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used. Under conditions where hydrogen sulfide (H2S) is NOT detected, a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readil, available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber to Black
Physical Form:	Liquid
Odor:	Petroleum; Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	0.6-10 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	-128 to 1000 °F / -89 to 538 °C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.7-1.03 @ 60°F (15.6°C)
Bulk Density:	5.83-8.58 lbs/gal
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< 20 °F / < -7 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	6.0
Auto-ignition Temperature:	590 °F / 310 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

Carcinogenicity: May cause cancer. Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available. Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Information on Toxicological Effects of Components

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Xylenes

Target Organs: Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Section 12: Ecological Information

Toxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 2 to over 100 mg/L. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Crude oil should be regarded as harmful to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Persistence per IOPC Fund definition: Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be regarded as having the potential to bioaccumulate.

Mobility in Soil: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	UN1267, Petroleum crude oil, 3, I ***or*** II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.201; 173.243 ***[PG I]*** ***-or-*** 49 CFR 173.150; 173.202; 173.242 ***[PG II]*** ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	128
Note:	***Packing group is dependent on boiling point (BP) of the material:*** **I if BP <=35° C (95° F); II if BP > 35° C (95° F)** ***The following alternate shipping description order may be used until January 1, 2013:*** **Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group** ***Other shipping description elements may be required for DOT compliance.***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, I ***or*** II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
Placards/Marking (Bulk):	Flammable / 1267
Packaging - Non-Bulk:	P001
EMS:	F-E, S-E
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1267
Proper Shipping Name:	Petroleum crude oil
Hazard Class/Division:	3
Subsidiary risk:	None
Packing Group:	I ***or*** II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
ERG Code:	3H
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden - [PG I]* Y341 - *[PG II]*	351 - *[PG I]* 353 - *[PG II]*	361 - *[PG I]* 364 - *[PG II]*
Max. Net Qty. Per Package:	*Forbidden - [PG I]* 1L - *[PG II]*	1L - *[PG I]* 5 L - *[PG II]*	30 L - *[PG I]* 60 L - *[PG II]*

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No

Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration[1]	de minimis
n-Hexane	<5	1.0%
Xylenes	0-3	1.0%
Ethyl Benzene	<2	0.1%
Naphthalene	0-0.9	0.1%
Benzene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Ethyl Benzene	Cancer
Naphthalene	Cancer
Various Polycyclic Aromatic Hydrocarbons	Skin Cancer
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

GHS Classification
H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H319 -- Eye damage/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue: 11-May-2012
Status: FINAL
Previous Issue Date: 15-Jun-2011

Revised Sections or Basis for Revision: Responsible party (Section 1)
SDS Number: 733721

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: **Crude Oil, Sweet**
SDS Number: 724160

Synonyms/Other Means of Identification:
Crude Oils, Desalted, Sweet
Field Crude
Petroleum Crude
Petroleum Oil
Rock Oil
Separator Crude
Sweet Crude

MARPOL Annex I Category: Crude Oils
Intended Use: Refinery Feed

Supplier:
Phillips 66 Company
600 N. Dairy Ashford
Houston, Texas 77079-1175

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Section 2: Hazard(s) Identification

DANGER

Extremely flammable liquid and vapor. (H224)*
Causes serious eye irritation. (H319)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause damage to organs through prolonged or repeated exposure. (H373)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

NFPA

Precautionary Statement(s):
Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep container tightly closed. (P233)*
Ground/bond container and receiving equipment. (P240)*
P241: Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN (or hair):
Remove/Take off immediately all contaminated clothing. (P361)*
Rinse skin with water/shower. (P353)*
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
If eye irritation persists:
Get medical advice/attention. (P313)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Store in a well-ventilated place. Keep cool.(P403+P235)*
Dispose of contents/container to approved disposal facility. (P501)*

** (Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Crude Oil (Petroleum)	8002-05-9	100
Naphthalene	91-20-3	0-0.9
Benzene	71-43-2	<1
Hydrogen Sulfide	7783-06-4	<0.2

Total Sulfur: < 0.5 wt%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

Section 4: First Aid Measures

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% $NaNO_2$ solution (0.5 gm $NaNO_2$ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

Medical Conditions Aggravated by Exposure: Conditions which may be aggravated by exposure include skin disorders, eye disorders, liver disorders and immune system disorders. Exposure to high concentrations of this material may increase the sensitivity of the heart to certain drugs. Persons with pre-existing heart disorders may be more susceptible to this effect (see Section 4 - Note to Physicians).

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: Long-duration fires involving crude or residual fuel oil stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11 or API 2021).

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H2S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. May contain or release dangerous levels of hydrogen sulfide. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Conditions for safe storage: This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H2S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m³ - 8 hr (Phillips 66 Guidelines)
Naphthalene	STEL: 15 ppm TWA: 10 ppm 2 ppm TWA; skin; A3 - confirmed animal carcinogen with unknown relevance to humans; TLV basis: upper respiratory tract irritation Skin	TWA: 10 ppm : 50 mg/m³	TWA: 0.2 mg/m³ (as total of 17 PNAs measured by NIOSH Method 5506) (Phillips 66 Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (Phillips 66 Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure to hydrogen sulfide (H2S) above exposure limits, a NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used. Under conditions where hydrogen sulfide (H2S) is NOT detected, a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readil available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber to Black
Physical Form:	Liquid
Odor:	Petroleum. Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	0.6-10 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	-128 to 1000 °F / -89 to 538 °C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.7-1.03 @ 60°F (15.6°C)
Bulk Density:	5.83-8.58 lbs/gal
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< 20 °F / < -7 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	6.0
Auto-ignition Temperature:	590 °F / 310 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

Carcinogenicity: May cause cancer. Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available. Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Information on Toxicological Effects of Components

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Xylenes

Target Organs: Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Section 12: Ecological Information

Toxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 2 to over 100 mg/L. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Crude oil should be regarded as harmful to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Persistence per IOPC Fund definition: Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be regarded as having the potential to bioaccumulate.

Mobility in Soil: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.201; 173.243 ***[PG I]*** *-or-* 49 CFR 173.150; 173.202; 173.242 ***[PG II]*** ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	128
Note:	***Packing group is dependent on boiling point (BP) of the material:*** **I if BP <=35° C (95° F); II if BP > 35° C (95° F)** ***The following alternate shipping description order may be used until January 1, 2013:*** **Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group** ***Other shipping description elements may be required for DOT compliance.***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, I *or* II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
Placards/Marking (Bulk):	Flammable / 1267
Packaging - Non-Bulk:	P001
EMS:	F-E, S-E
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1267
Proper Shipping Name:	Petroleum crude oil
Hazard Class/Division:	3
Subsidiary risk:	None
Packing Group:	I *or* II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Labels:	Flammable liquid
ERG Code:	3H
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden - [PG I]* Y341 - ***[PG II]***	351 - ***[PG I]*** 353 - ***[PG II]***	361 - ***[PG I]*** 364 - ***[PG II]***
Max. Net Qty. Per Package:	*Forbidden - [PG I]* 1L - ***[PG II]***	1L - ***[PG I]*** 5 L - ***[PG II]***	30 L - ***[PG I]*** 60 L - ***[PG II]***

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No

Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration[1]	de minimis
n-Hexane	0-5	1.0%
Xylenes	0-3	1.0%
Ethyl Benzene	<2	0.1%
Naphthalene	0-0.9	0.1%
Benzene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Ethyl Benzene	Cancer
Naphthalene	Cancer
Various Polycyclic Aromatic Hydrocarbons	Skin Cancer
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

GHS Classification
H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H319 -- Eye damage/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue: 11-May-2012
Status: FINAL
Previous Issue Date: 06-Jul-2011

Revised Sections or Basis for Revision: Responsible party (Section 1)
SDS Number: 724160

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Dilbit
Synonyms:	Diluted Bitumen; AWB – Access Western Blend; Pipeline Sales Oil.
Product Use:	Base product for Petroleum Refining.
Manufacturer/Supplier:	MEG Energy Corp. Christina Lake Regional Project P.O Box 21008 Fort McMurray, AB T9H 5B2
Phone Number:	403-770-5596
Emergency Phone:	MEG Emergency Number: 1-800-575-1400 FOR EMERGENCIES INVOLVING DANGEROUS GOODS Call CANUTEC's 24-hr Number: 613-996-6666
Date of Preparation:	August 31, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES AND SKIN.

Colour: Light to dark brown.
Physical State: Liquid.
Odour: Hydrocarbon.

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide

may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Petroleum	8002-05-9	60 - 100
Hexane	110-54-3	5 - 10
Benzene	71-43-2	1 - 5
Toluene	108-88-3	1 - 5
Xylenes	1330-20-7	0.5 - 1.5
Benzene, ethyl-	100-41-4	0.1 - 1
Hydrogen sulfide (H2S)	7783-06-4	< 0.1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, water fog, carbon dioxide.

Unsuitable Extinguishing Media:	Do not use water except as a fog.
Products of Combustion:	Oxides of carbon. Oxides of sulphur. Aldehydes.
Protection of Firefighters:	Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.

Explosion Data

Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Keep out of drains, sewers, ditches, and waterways.
Methods for Containment:	Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.
Other Information:	Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum
(8002-05-9) **ACGIH:** Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined
(8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]

Hexane
(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)
(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin. 50 ppm (TWA) [Vacated]

Benzene
(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)
(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene
(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)
(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.) 100 ppm (TWA); 150 ppm (STEL) [Vacated]

Xylenes
(1330-20-7) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)
(1330-20-7) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 150 ppm (STEL) [Vacated]

Benzene, ethyl-
(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 125 ppm (STEL) [Vacated]

Hydrogen sulfide (H2S)
(7783-06-4) **ACGIH:** 1 ppm (TWA); 5 ppm (STEL); (2009)
(7783-06-4) **OSHA:** 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.) 10 ppm (TWA); 15 ppm (STEL) [Vacated]

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear safety glasses. Ensure that eyewash stations are close to the workstation location.

Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Viscous liquid.
Colour:	Light to dark brown.
Odour:	Hydrocarbon.
Odour Threshold:	0.00047 ppm, (H_2S)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	60.7 cSt @ 40 °C
Melting Point:	Not available.
Boiling Point:	34.9 °C to 720 °C
Flash Point:	Not available.
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	> 1 (Air = 1)
Specific Gravity:	0.9178 (Water = 1) @ 15 °C
Density:	917.0 kg/m^3 @ 15 °C
Solubility in Water:	Insoluble.
Coefficient of Water/Oil Distribution:	Not measurable. Product is more soluble in oil.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Non-volatile.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong oxidizers.

Hazardous Decomposition Products: Not available.

Possibility of Hazardous Reactions: None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat), 4H
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat), 7H
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, 4H, (rat)
Xylenes	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat), 4H
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat),

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Long term inhalation of Benzene, Toluene or Xylene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities. Immunodepressive effects have also been reported. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Xylenes	A4	Group 3	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Possible risk of impaired fertility. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: 21 and 41 mg/l, 96 hr., Rainbow trout;
2.7 and 4.1 mg/l, 96 hr., Mysid;
122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:

TDG
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Petroleum	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	5000	313 & X	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Xylenes	Not listed.	Not listed.	100	313	U239	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Hydrogen sulfide (H2S)	500	100	100	313s	U135	10000

State Regulations
Massachusetts
US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Xylenes	1330-20-7	Listed.
Benzene, ethyl-	100-41-4	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey
US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Xylenes	1330-20-7	SHHS
Benzene, ethyl-	100-41-4	SHHS
Hydrogen sulfide (H2S)	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania
US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E
Xylenes	1330-20-7	E
Benzene, ethyl-	100-41-4	E
Hydrogen sulfide (H2S)	7783-06-4	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Benzene	developmental, male & cancer
Toluene	developmental & female
Benzene, ethyl-	cancer
Polycyclic Aromatic Hydrocarbons	cancer
Nickel	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: August 30, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Diluted Bitumen

Synonyms: Dilbit, Synbit, PSH. A mixture of bitumen & petroleum naphtha.

Product Use: Feed to refinery, feed to Orcrude.

Manufacturer/Supplier: Nexen Canada Inc.
Synthetic Oil Division
Box 6010
Ft. McMurray, Alberta
T9H 3G2

Emergency Phone: 1 (780) 334-3911

Date of Preparation: June 17, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. IRRITATING TO EYES AND SKIN. CANCER HAZARD – CAN CAUSE CANCER.

Colour: Black.
Physical State: Liquid.
Odour: Hydrocarbon. May have rotten eggs odour.

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May affect the central nervous system and cause headache, dizziness, confusion, loss of appetite and loss of consciousness. High vapor concentrations of p-Xylene are anesthetic and central nervous system depressants. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Very high concentrations may cause unconsciousness and death.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Bone marrow. Liver. Kidneys. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Bitumen	8052-42-4	55 - 75
Naphtha	8030-30-6	0 - 25
Synthetic Crude Oil (SCO) *	(various)	0 - 45
Octane	111-65-9	3 - 7
Heptane	142-82-5	1 - 5
Sulfur	7704-34-9	1 - 5
Pentane	109-66-0	1 - 3
n-Hexane	110-54-3	1 - 3
Cyclohexane, methyl-	108-87-2	1 - 5
p-Xylene	106-42-3	0.1 - 1
Toluene	108-88-3	0.1 - 1
Benzene, ethyl-	100-41-4	0.1 - 1
Benzene	71-43-2	0.1 – 1
Hydrogen sulphide	7783-06-4	Trace

* **Note:** SCO is a commercial petroleum blend consisting of naphtha, diesel, and gasoil supplied by various oilsand Upgraders in Alberta.

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, water fog, carbon dioxide.
Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon. Oxides of sulphur. Hydrogen sulphide.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Bitumen

(8052-42-4) **ACGIH:** 0.5 mg/m³ (TWA); A4; BEI; Inhalable fraction, as benzene-soluble

(8052-42-4) **OSHA:** Not established.

(8052-42-4) **Alberta OEL:** 5 mg/m³ (OEL)

Naphtha

(8030-30-6) **ACGIH:** 100 ppm (TWA);

(8030-30-6) **OSHA:** 100 ppm (TWA), 400 mg/m³ (TWA);

(8030-30-6) **Alberta OEL:** 400 ppm (OEL);

Octane

(111-65-9) **ACGIH:** 300 ppm (TWA); (1979)

(111-65-9) **OSHA:** 500 ppm (TWA), 2350 mg/m³ (TWA);

(111-65-9) **Alberta OEL:** 300 ppm (OEL);

Heptane

(142-82-5) **ACGIH:** 400 ppm (TWA); 500 ppm (STEL); (1979)

(142-82-5) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);

(142-82-5) **Alberta OEL:** 400 ppm (OEL); 500 ppm (STEL);

Sulphur

(7704-34-9) **ACGIH:** 10 mg/m³ (TWA); Inhalable. 3 mg/m³ (Respirable.)

(7704-34-9) **OSHA:** 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); Respirable fraction. 15 mg/m³ (Total dust.)

(7704-34-9) **Alberta OEL:** 10 mg/m³ (OEL)

Pentane

(109-66-0) **ACGIH:** 600 ppm (TWA); (1989)

(109-66-0) **OSHA:** 1000 ppm (TWA), 2950 mg/m³ (TWA);

(109-66-0) **Alberta OEL:** 600 ppm (OEL);

n-Hexane

(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)

(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.

(110-54-3) **Alberta OEL:** 50 ppm (OEL); Skin absorption

Hexane, isomers, other than n-Hexane

(various) **ACGIH:** 500 ppm (TWA); 1000 ppm (STEL); (1979)

(various) **OSHA:** 500 ppm (TWA); 1000 ppm (STEL); (vacated)

(various) **Alberta OEL:** 500 ppm (OEL); 1000 ppm (STEL)

Cyclohexane, methyl-

(108-87-2) **ACGIH:** 400 ppm (TWA); (1962)

(108-87-2) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);

(108-87-2) **Alberta OEL:** 400 ppm (OEL)

p-Xylene

(106-42-3) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

(106-42-3) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);

(106-42-3) **Alberta OEL:** 100 ppm (OEL); 150 ppm (STEL)

Toluene

(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)

(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)

(108-88-3) **Alberta OEL:** 50 ppm (OEL)

Benzene, ethyl-

(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)

(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);

(100-41-4) **Alberta OEL:** 100 ppm (OEL); 125 ppm (STEL);

Benzene

(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

(71-43-2) **Alberta OEL:** 0.5 ppm (OEL); 2.5 ppm (STEL); Skin absorption

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls:	Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.
Personal Protective Equipment	
Eye/Face Protection:	Wear safety glasses.
Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Viscous liquid.
Colour:	Black.
Odour:	Hydrocarbon. May have rotten eggs odour.
Odour Threshold:	Not available.
Physical State:	Liquid.
pH (as supplied):	Not available.
Viscosity:	Not available.

Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	< -13 °C (PMCC)
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	5 kPa (calculated)
Vapor Density:	3 (Air = 1)
Specific Gravity:	Not available.
Density:	Not available.
Solubility in Water:	Not available.
Coefficient of Water/Oil Distribution:	< 1
Auto-ignition Temperature:	537 °C
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Strong acids. Bases. Strong oxidizers. Alkali metals. Metals. Zinc. Oxides of nitrogen. Chlorine. Halogens. Nitrates. Phosphorus. Ammonia.
Hazardous Decomposition Products:	Not available.
Possibility of Hazardous Reactions:	Contact between heated Bitumen and water can cause a violent eruption.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Bitumen	8052-42-4	Not available.	Not available.	Not available.
Naphtha	8030-30-6	>5000 mg/kg, (rat)	>3000 mg/kg, (rabbit)	>10600 mg/m³, (rat)
Octane	111-65-9	Not available.	Not available.	118000 mg/m³, (rat)
Heptane	142-82-5	Not available.	Not available.	103000 mg/m³, (rat)
Sulfur	7704-34-9	>8437 mg/kg, (rat)	Not available.	Not available.
Pentane	109-66-0	400 mg/kg, (rat)	Not available.	364000 mg/m³, (rat)
n-Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat)
Cyclohexane, methyl-	108-87-2	>3200 mg/kg, (rat)	>86700 mg/kg, (rabbit)	15227 ppm, (rabbit)

p-Xylene	106-42-3	5000 mg/kg, (rat)	Not available.	4550 ppm, (rat)
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, (rat)
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May affect the central nervous system and cause headache, dizziness, confusion, loss of appetite and loss of consciousness. High vapor concentrations of p-Xylene are anesthetic and central nervous system depressants. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Very high concentrations may cause unconsciousness and death.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. This material contains n-Hexane which is known to cause damage to the peripheral nervous system (peripheral neuropathy). Long term inhalation of Benzene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Bitumen	A4	Group 2B	Not listed.	OSHA Carcinogen	Not listed.
Naphtha	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Sulfur	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
n-Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
p-Xylene	A4	Not listed.	Not listed.	Not listed.	Not listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Not listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria. This material contains n-Hexane which may impair fertility at doses which produce other toxic effects.

Developmental Effects Teratogenicity: Not hazardous by OSHA/WHMIS criteria. P-Xylene may cause teratogenic effects. Exposure to Toluene may affect the developing fetus. Benzene has caused adverse fetal effects in laboratory animals.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR
Proper Shipping Name: TARS, LIQUID, (Diluted Bitumen), 3, UN 1999, II

Class: 3

UN Number: 1999

Packing Group: II

Label Code:

TDG
Proper Shipping Name: TARS, LIQUID, (Diluted Bitumen), 3, UN 1999, II

Class: 3

UN Number: 1999

Packing Group: II

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Bitumen	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Sulfur	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
n-Hexane	Not listed.	Not listed.	5000	313 & X	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
P-Xylene	Not listed.	Not listed.	100	313 & X	U239	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	Listed.
n-Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
P-Xylene	106-42-3	Listed.
Toluene	108-88-3	Listed.
Benzene, ethyl-	100-41-4	Listed.
Benzene	71-43-2	E

Note: E = Extraordinarily hazardous substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	SHHS
Octane	111-65-9	SHHS
Heptane	142-82-5	SHHS
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	SHHS
n-Hexane	110-54-3	SHHS
Cyclohexane, methyl-	108-87-2	SHHS
P-Xylene	106-42-3	SHHS
Toluene	108-88-3	SHHS
Benzene, ethyl-	100-41-4	SHHS
Benzene	71-43-2	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Bitumen	8052-42-4	Listed.
Naphtha	8030-30-6	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Sulfur	7704-34-9	Listed.
Pentane	109-66-0	Listed.
n-Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
P-Xylene	106-42-3	E
Toluene	108-88-3	E
Benzene, ethyl-	100-41-4	E
Benzene	71-43-2	ES

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Bitumen	cancer
Toluene	developmental & female
Benzene, ethyl-	cancer
Benzene	developmental, male

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: June 16, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name:	HEAVY CRUDE OIL/DILUENT MIX
Synonyms:	Bow River (BR); Cold Lake Blend (CLB) from Foster Creek; Christina Lake Blend (CSB); Western Canadian Blend (WCB) or Wainwright; Western Canadian Select (WCS); Wabasca Heavy (WH) from Pelican Lake
Use:	Process stream, fuels and lubricants production
WHMIS Classification:	Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA:	**Fire:** 2 **Reactivity:** 0 **Health:** 3
TDG Shipping Name:	Petroleum Crude Oil
TDG Class:	3 **UN:** 1267
TDG Packing Group:	II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier:	CENOVUS ENERGY INC. 421 - 7 Ave SW PO Box 766 Calgary, AB T2P 0M5
Emergency Telephone:	1-877-458-8080
Chemical Description:	A naturally occurring mixture of paraffins, naphthalenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds mixed with condensate

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Crude oil	50 – 90	8002-05-9	LD50, rat, skin, >2 g/kg	5 mg/m^3 (OEL,TLV)
Hydrocarbon Diluent	10 – 50	N.Av.	N.Av.	900 mg/m^3 (OEL)*
Benzene	0.03 - 0.3	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hr, 13200 ppm	1 ppm (OEL), 0.5 ppm (TLV)
Hydrogen Sulphide§	<0.1	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL,TLV)

OEL = Alberta Occupational Exposure Limit (8hrs); TLV = ACGIH Threshold Limit Value *OEL for gasoline
§Hydrogen Sulfide in liquid, vapour phase may contain higher concentrations

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State:	Liquid	**Vapour Pressure (kPa):**	2.5 – 36.5 @ 20°C
Specific Gravity:	0.91 – 0.94	**Odour Threshold (ppm):**	N.Av.
Vapour Density (air=1):	2.5 -5.0 (estimated)	**Evaporation Rate:**	N.Av.
Percent Volatiles, (v/v):	15 - 30 (estimated)	**Boiling Pt. (deg.C):**	35 – 180°C
pH: N.Av.		**Freezing Pt. (deg.C):**	<20

Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions:** Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated) **Sensitivity to Impact:** No
Lower Explosive Limit (% by vol.): 0.8 (estimated) **Sensitivity to Static Discharge:** Yes, at normal temperatures
Auto-Ignition Temp. (deg.C): 250 (estimated) **TDG Flammability Classification:** 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions:** Heat
Incompatibility: Yes **Substances:** Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions:** Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 0.5 ppm (Alberta 8 hr OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficiency or IDLH situations) – see also Storage below).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

Caution: hydrogen sulphide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Overexposure to hydrogen sulphide may cause dizziness, headache, nausea and possibly knock-down and death. Factors increasing this risk include heating, agitation and contact of the liquid with acids or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-877-458-8080
Preparation Date: March 29, 2011 Expiry Date: March 29, 2014

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name: HEAVY CRUDE OIL/DILUENT MIX (CHRISTINA LAKE/FOSTER CREEK)
Use: Process stream, fuels and lubricants production
WHMIS Classification: Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA: Fire: 2 **Reactivity:** 0 **Health:** 3
TDG: **UN:** 1267 **Class:** 3
Packing Group: I (boiling point less than 35 deg. C)
II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: ENCANA CORPORATION
#1800, 855 - 2nd Street S.W., P.O. BOX 2850,
CALGARY, ALBERTA, T2P 2S5
Emergency Telephone: 403-645-3333
Chemical Family: Crude oil/condensate mix

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Crude oil	50 - 70	8002-05-9	LD50,rat, skin,>2 g/kg	5 mg/m3 (OEL,TLV)
Hydrocarbon Diluent	30 - 50	N.Av.	N.Av.	900 mg/m3 (OEL)*
Benzene	0.05 - 0.1	71-43-2	LD50,rat,oral,930 mg/kg LC50,rat,4 hr,13200 ppm	1 ppm (OEL), 0.5 ppm (TLV)
Hydrogen Sulphide	<20 ppm	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL,TLV)

OEL = 8 hr. Alberta Occupational Exposure Limit; TLV = Threshold Limit Value (8 hrs) *OEL for gasoline

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid
Specific Gravity: 0.92 – 0.94
Vapour Density (air=1): 2.5 -5.0
Percent Volatiles, by volume: 20 - 30 (estimated)
pH: N.Av.
Vapour Pressure (mmHg): approx. 300 @ 20C
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): initial B.Pt. variable (16 – 30C)
Freezing Pt. (deg.C): <0
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions:** Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated) **Sensitivity to Impact:** No
Lower Explosive Limit (% by vol.): 0.8 (estimated) **Sensitivity to Static Discharge:** Yes, at elevated temperatures
Auto-Ignition Temp. (deg.C): 250 (estimated) **TDG Flammability Classification:** N.App.
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions:** Heat
Incompatibility: Yes **Substances:** Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions:** Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation/burns.
Effects of Chronic Exposure: Due to presence of benzene, long term exposure may increase the risk of anaemia and leukemia. Repeated skin contact may increase the risk of skin cancer.
Sensitization to Product: No.
Exposure Limits of Product: 1 ppm (Alberta 8 hr OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for oxygen deficiency or IDLH situations).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: EnCana Environment, Health and Safety (EHS)
Phone Number: (403) 645-2000 Preparation Date: August 19, 2009 Expiry Date: August 19, 2012

MATERIAL SAFETY DATA SHEET

Canadian Natural

Manufacturer/Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada
T2P 4J8

24 Hour Emergency Telephone Number:
1-780-828-3000

1. PRODUCT IDENTIFICATION

HORIZON SWEET LIGHT OIL

SYNONYMS:
1. Synthetic Crude Oil
2. Sweet Light Oil
3. Horizon Sweet Oil
4. Horizon Light Oil

WHIMIS	
Class B: Division 2 Flammable Liquid	Class D Division 2: Material Causing Other Toxic Effects

TDG	
FLAMMABLE LIQUID: 3 	SHIPPING NAME: Synthetic Crude Oil UN NUMBER: UN1267 Class 3, PG II or III

DESCRIPTION: Complex mixture of hydrocarbons derived from Upgrading processing of Extra Heavy Crude Oil.

PRODUCT USE: Refinery feedstock.

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a)(I) to (iv) or paragraph 14(a) of the Hazardous Product Act:

NAME	%	CAS#
Hydrocarbons(aromatic and paraffinic)	100	8002-05-9
Benzene	0.05 (LV%)	71-43-2

LD50: not available
LC50: not available
All components of this material are either on the Domestic Substances List (DSL) or exempt.

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
ODOUR AND APPEARANCE:	Aromatic or petroleum odour. Usually light brown or light green liquid
ODOUR THRESHOLD:	Not available
SPECIFIC GRAVITY:	0.838 (water = 1)
VAPOUR PRESSURE (RVP):	35 kPa(ab) @ 37.8 °C
VAPOUR DENSITY:	Not available
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	-18 °C to 538 °C
FREEZING / MELTING POINT:	Not available
pH IN WATER	Not available
SOLUBILITY IN WATER:	0%
MOLECULAR FORMULA:	Not applicable - mixture
MOLECULAR WEIGHT:	Not applicable - mixture

4. HEALTH HAZARD INFORMATION

RELEVANT ROUTES OF ENTRY:
Inhalation, skin contact, eye contact, ingestion

ACUTE AND CHRONIC EFFECTS OF EXPOSURE:
INHALATION:
Inhalation of vapours can lead to irritation upper respiratory system and depression of the central nervous system.

EYE CONTACT:
Contact with vapours and/or mists can lead to irritation.

SKIN CONTACT:
Can cause defatting of the skin as well as skin irritation.

INGESTION:
Ingestion may lead to irritation of mucous membranes as well as nausea and vomiting.

IRRITANCY OF PRODUCT:
See acute and chronic effects of exposure; inhalation, eye contact, ingestion and skin contact.

SENZITATION OF PRODUCT: Not available

CARCINOGENICITY: Benzene: IARC Group 1: Carcinogenic to humans

REPRODUCTIVE TOXICITY: Not available

TERATOGENICITY: Not available

MUTAGENICITY: Not available

NAME OF TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not available

OCCUPATIONAL EXPOSURE LIMITS (OELs) RECOMMENDED:

Alberta (Stoddard Solvent)	100 ppm

THRESHOLD LIMIT VALUES:

ACGIH (Stoddard Solvent)	100 ppm

015330

Manufacturer/Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada
T2P 4J8

24 Hour Emergency Telephone Number:
1-780-828-3000

5. FIRST AID MEASURES

INHALATION:
If inhalation causes adverse effects remove victim to fresh air and seek medical attention immediately.

EYE CONTACT:
Flush immediately with water for at least 15 min. Seek medical attention immediately.

SKIN CONTACT:
Flush with water and soap. Remove contaminated clothing and shoes. Seek medical attention if necessary.

INGESTION:
Do not induce vomiting, seek medical attention immediately.

6. PREVENTATIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

SKIN PROTECTION: Wear long sleeves, chemical resistant gloves, chemical safety goggles and CSA approved work boots.

RESPIRATORY PROTECTION: If OEL are likely to be exceeded wear NIOSH approved respiratory protection.

EYE PROTECTION: Wear CSA or ANSI approved eye protection where required.

ENGINEERING CONTROL:
Ensure adequate ventilation.

HANDLING, STORAGE:
Always use personal protective equipment as specified above. Avoid sources of ignition where LEL limits have been reached. Store only in approved containers.

LAND SPILL:
Ensure clean up and disposal in compliance with government requirements and ensure conformity to local disposal regulations. Follow proper notification requirements.

WATER SPILL:
Ensure clean up and disposal in compliance with government requirements and ensure conformity to local disposal regulations. Follow proper notification requirements.

WASTE DISPOSAL:
Dispose of as per local and federal regulations.

7. FIRE AND EXPLOSION HAZARD

CONDITIONS OF FLAMMABILITY	Temperature above flash point, open flame or sources of ignition
MEANS OF EXTINCTION	Foam, water and/or dry chemical
FLASH-POINT (Test Method):	Below -18 °C (Tag Closed Cup)
FLAMMABLE LIMITS (% Volume):	Not available
AUTO-IGNITION:	245 °C
HAZARDOUS COMBUSTION PRODUCTS	Carbon monoxide and dioxide, oxides of sulphur and acrid fumes
SENSITIVITY TO MECHANICAL IMPACT	Stable (do not expose to sparks - highly flammable)
SENSITIVITY TO STATIC DISCHARGE	Low. Highly flammable

8. REACTIVITY DATA

CONDITIONS UNDER WHICH PRODUCT IS CHEMICALLY UNSTABLE:
Chemical is stable under normal conditions. Hazardous polymerization is not known to occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:
Strong oxidizing agents, heat

CONDITIONS OF REACTIVITY:
Heat, sparks, flames, sources of ignition

9. PREPARATION

Prepared by:	CNRL Horizon Industrial Hygiene
Phone:	780-828-2555
Preparation Date:	June 2011
Expiration Date:	May 2014

CAUTION

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individuals or if the products or material is used for a purpose or under conditions which are abnormal or not reasonable foreseeable. For greater certainty, uses other that those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safely and to comply with all applicable laws and regulations. The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.

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SUNCOR ENERGY | ÉNERGIE

SUNCOR MKH

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR MKH

Product type : Suncor Product
MSDS Number : OS0000000003
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	50 - 80 %
Naphtha (oil sand), hydrotreated	128683-33-0	4 - 15 %
FUEL, DIESEL NO.2	68476-34-6	4 - 15 %
SULPHUR	7704-34-9	<= 3.5 %
BENZENE	71-43-2	0.04 - 0.12 %
Xylene, All Isomers	1330-20-7	0.40 - 0.80 %
BUTANE	106-97-8	0 - 1.2 %
HYDROGEN SULPHIDE	7783-06-4	0 - 40 PPM
sec-Butyl Mercaptan	513-53-1	50 - 300 PPM
1-Propanethiol	107-03-9	30 - 120 PPM

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ETHANETHIOL	75-08-1	30 - 120 PPM
Isopropyl Mercaptan	75-33-2	20 - 80 PPM
Butyl Mercaptan	109-79-5	15 - 60 PPM
METHANETHIOL	74-93-1	5 - 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : May cause eye irritation.
Liquid may cause severe irritation, reddening and swelling.

Skin : Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
May cause irritation, drying and blistering.
Component of product may cause skin sensitization.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : Chronic exposure causes drying effect on the skin and eczema.
May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

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Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	Contains benzene, a confirmed human carcinogen. IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen
Reproductive toxicity	:	Components in the product have demonstrated reproductive effects, teratogenicity and embryo toxicity in animal tests.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Seek medical advice. Thoroughly clean shoes before reuse. Wash contaminated clothing before reuse.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated8 - 175 °C (46 - 347 °F)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.

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Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container.

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Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable to 50 times the exposure limit. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BITUMEN	128683-24-9		TWA	5 mg/m3
		Expressed as		Bitumen fume
		Remarks		OEL Established in agreement with Alberta Occupational Health and Safety, and Suncor Energy Inc., Oil Sands
FUEL, DIESEL NO.2	68476-34-6	CAD ON OEL	TWA	100 mg/m3
		Expressed as		as total hydrocarbons
		Form of exposure		Vapor and aerosol.
		ACGIH	TWA	100 mg/m3
		Expressed as		as total hydrocarbons
		Form of exposure		Vapor and aerosol.
SULPHUR	7704-34-9	CAD AB OEL	TWA	10 mg/m3

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BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
Xylene, All Isomers	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3
		CAD ON OEL	TWA	1,000 ppm	
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL	CEILING	10 ppm	
		CAD SK OEL	8 HR ACL	10 ppm	
		CAD SK OEL	15 MIN ACL	15 ppm	
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	

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NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
Physical state	:	liquid
Vapour pressure	:	Estimated 11.8 kPa Method: ASTM D 323A
Density	:	Estimated 0.92 - 0.94 g/cm3
Specific gravity	:	Estimated 0.92 - 0.94
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: Estimated< 1
Viscosity, kinematic	:	Estimated 63.5 mm2/s at 40 °C (104 °F) Estimated 268.5 mm2/s at 15.5 °C (59.9 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY.

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

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Acute oral toxicity	:	LD50 Rat Dose: 930 mg/kg Test substance: Benzene
Acute dermal toxicity	:	LD50 Rabbit Dose: > 8,240 mg/kg Test substance: Benzene
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 13700 ppm Test substance: Benzene LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide
Further information	:	Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells and DNA damage in mammalian cells in vitro.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	: **Flammable liquid, n.o.s.**
	UN-Number	: 1993
	Class	: 3
	Packing group	: II
TDG	Proper shipping name	: Flammable liquid, n.o.s.
	UN-Number	: 1993
	Class	: 3
	Packing group	: II
IATA	UN Number	: 1993
	Description of the goods	: Flammable liquid, n.o.s.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3

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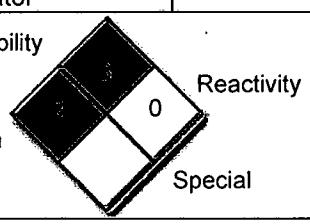
	Packing instruction (cargo aircraft)	:	307
	Packing instruction (passenger aircraft)	:	305
	Packing instruction (passenger aircraft)	:	Y305
IMDG	Substance No.	:	UN 1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	II
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 10/17/2012

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SUNCOR ENERGY | ÉNERGIE TM/MC

References	:	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.
Validation date of previous version	:	12/07/2009
General contact information	:	B. Burrell: (519) 383-3657

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PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)	Rating	Protective Clothing	DOT (pictograms)
	Health Hazard 2* Fire Hazard 3 Reactivity 0 Personal Protection H	0 Insignificant 1 Slight 2 Moderate 3 High 4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**MACKAY RIVER BLEND**	**Code**	90000125
		DSL	See Section 15
Synonym	MacKay River Bitumen/Synthetic Crude Oil Blend, Synbit Blend	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as refinery feedstock.		

Section II. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Synthetic crude oil *	64742-59-2	45 - 55	Not available	Not available	Not available
2) Bitumen	8052-42-4	45 - 55	0.5 mg/m³	Not available	Not available
3) Sulphur	7704-34-9	2.7	Not available	Not available	Not available
4) * A complex combination of hydrocarbons extracted from oil sands. Contains small amounts of benzene, polynuclear aromatic hydrocarbons (PNAs), sulphur compounds and oxygenated compounds.					

Manufacturer Recommendation	If an aerosol or mist, Petro-Canada recommends an allowable exposure for 8 hours time weighted average (TWA) of 0.2 mg/m³ for Particulate polycyclic aromatic hydrocarbons (PPAH) (Coal tar pitch volatiles, as benzene soluble aerosol).
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Can irritate eyes, skin and respiratory tract. Inhalation of vapours or mist may cause headache, coughing, nausea, vomiting, dizziness, fatigue, light-headedness, reduced coordination and unconciousness; central nervous system depressant; kidney and liver damage from long-term exposure. May be narcotic in high concentrations. Harmful if swallowed. This product contains a cancer causing agent. For more information, refer to Section 11.

Section IV. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section V. Fire-fighting Measures

Flammability	Flammable.	**Flammable Limits**	Not available
Flash Points	CLOSED CUP: <0°C (32°F).	**Auto-Ignition Temperature**	Not available

Continued on Next Page

Available in French

Fire Hazards in Presence of Various Substances	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back. Hydrogen sulphide may be released if product is overheated.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). CAUTION: This product has a low flash point, use of water spray when fighting fire may be inefficient. SMALL FIRE: Use DRY chemicals, CO2, water spray or foam. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. DO NOT extinguish a leaking gas flame unless leak can be stopped. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. Avoid flushing spilled material into sewers, streams or other bodies of water. Self-contained breathing apparatus (SCBA) will be required if approaching the fire from downwind, or to enter enclosed areas or buildings.		

Section VI. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). Evacuate in a downwind direction for at least 300 meters (1000 feet). ELIMINATE ALL IGNITION SOURCES. Ventilate closed spaces before entering. By forced ventilation, maintain concentration of vapour below the range of explosive mixture. Avoid contact, fully-encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire. Stop leak if without risk. Remove the leaking container to an open area and allow it to bleeds off into the atmosphere. Use vapour suppressing foam or water spray to reduce vapours; it may reduce vapour, but it may not prevent ignition in closed spaces; isolate area until vapour has dispersed. Contain spill. Absorb with inert absorbents such as dry clay, or diatomaceous earth, or recover using electrically grounded explosion-proof pumps. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section VII. Handling and Storage

Handling	Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. DO NOT ingest. Do not breathe vapours. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
Storage	Keep containers closed and store in a cool, well-ventilated place away from heat, spark, open flames and other sources of ignition. Store away from incompatible materials.

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - *The selection of personal protective equipment varies, depending upon conditions of use.*	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

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Section IX. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	90 cSt @ 40°C (104°F)
Colour	Black.	**Pour Point**	<-27°C (-16.6°F).
Odour	Pungent.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Initial boiling point: 25°C (77°F)	**Penetration**	Not applicable.
Density	940 kg/m³ @ 15°C (59°F).	**Oil / Water Dist. Coeff.**	Not measurable. The product is more soluble in oil.
Vapour Density	Heavier than air.	**Ionicity (in water)**	Insoluble in water.
Vapour Pressure	Not available	**Dispersion Properties**	Nonvolatile and immobile.
Volatility	Not available	**Solubility**	Insoluble in water.

Section X. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Can react with oxidizing agents and halogens.	**Decomposition Products**	Releases of COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

Section XI. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Synthetic crude oil: Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >3000 mg/kg (rabbit). Benzene: Acute oral toxicity (LD50): 4700 mg/kg (mouse). Acute dermal toxicity (LD50): 48 mg/kg (mouse). Acute inhalation toxicity (LC50): 13200 ppm/4h (rat).
Chronic or Other Toxic Effects	
Dermal Route:	Can cause irritation to the skin, no permanent damage.
Inhalation Route:	Inhalation can cause irritation of the upper respiratory tract. Inhalation of vapours can cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death.
Oral Route:	Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. Can cause CNS depression. (See Inhalation Route for symptoms).
Eye Irritation/Inflammation:	Can cause irritation to the eyes, no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Positive results have been obtained for mutagenic effects. (Benzene)
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	Fetotoxicity was observed in the presence of maternal toxicity. (Benzene)
Carcinogenicity (ACGIH):	ACGIH A1: confirmed human carcinogen. (Benzene, PNA's)
Carcinogenicity (IARC):	IARC Group 1: carcinogenic to Humans. (Benzene) IARC Group 2A: probably carcinogenic to Humans. (PNA's)
Carcinogenicity (NTP):	NTP Group 1: known to be a carcinogen. (Benzene) NTP Group 2B: sufficient evidence of carcinogenicity from studies in experimental animals. (PNA's)
Carcinogenicity (IRIS):	EPA/IRIS Class A: human carcinogen. (Benzene)
Carcinogenicity (OSHA):	OSHA Group X: carcinogen defined with no further categorization. (Benzene) PNA's are an OSHA suspected carcinogen.
Other Considerations	Synthetic crude oil is carcinogenic by RTEC criteria.

Continued on Next Page

Section XII. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section XIII. Disposal Considerations

Waste Disposal	Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section XIV. Transport Information

DOT Classification	PETROLEUM CRUDE OIL, 3, UN 1267, PG I	**Special Provisions for Transport**	See 49 CFR

Section XV. Regulatory Information

Other Regulations	CEPA: This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). EPA: All components of this formulation are listed on the US EPA-TSCA Inventory. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. Please contact Product Safety for more information.		
DSD/DPD (EEC)	Not evaluated.	**WHMIS (Canada)**	B-2, D-2A, D-2B
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**TDG (Canada) (Pictograms)**	

Section XVI. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca

WCDO:
Western Canada, telephone: 403-296-7672; fax: 403-296-5147

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TAR on 8/20/2002.

Data entry by Product Safety - TAR.

Continued on Next Page

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To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

GIBSON ENERGY LTD.
MATERIAL SAFETY DATA SHEET
PETROLEUM CRUDE OIL (SOUR)

1. PRODUCT INFORMATION

NAME: PETROLEUM CRUDE OUL (SOUR)

SYNONYMS: Crude, Petroleum Hydrocarbon

APPLICATIONS AND USE: Refinery feed stock

PRODUCT DESCRIPTION: A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. The composition and properties will vary significantly according to source of crude. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

REGULATORY CLASSIFICATION:

WHMIS: Class B, Division 2, Flammable Liquid
Class D, Division 1, Subdivision A: Very Toxic Material
Class D, Division 2, Subdivision B: Toxic Material

TRANSPORTATION OF DANGEROUS GOODS INFORMATION: (CANADA)

Shipping Name:	Petroleum Crude Oil
Primary TDG:	3
Secondary TDG:	3
P.I.N.:	UN1267
Packing Group:	II
Guide Number:	128

EMERGENCY TELEPHONE NUMBERS:

Name of MFG/SUPPLIER:

Gibson Energy Ltd.
1700, 440 – 2nd Ave. SW
Calgary, Alberta T2P 5E9

24 Hour Exchange: (780) 888-8222
Health: (403) 206-4188

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with subparagraph 13(a), (I) to (iv) or paragraph 14(a) of the Hazardous Product Act.

Component	*%*	*CAS #*
Hydrocarbons (aromatic and paraffinic hydrocarbons)	100	8002-05-9
Toluene	100 ppm	108-88-3
Benzene	10 ppm	71-43-2
Xylene	100 ppm	1330-20-7
Hydrogen Sulphide(H_2S)	10 ppm	7783-06-4

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid @ 25° C
RELATIVE DENSITY:	0.8 - 1.1
DENSITY:	0.8 - 1.0 g/cc
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	10° C - 1100° C
SOLUBILITY IN WATER:	0%
VAPOUR PRESSURE:	10 - 80 kPa(a) @ 20° C
APPEARANCE/ODOUR:	Aromatic or sulphide (rotten egg) odour. Usually black or green liquid.
ODOUR THRESHOLD:	Not available
EVAPORATION RATE:	Variable:
FREEZING/MELTING PT.:	Not available
VISCOSITY:	Not applicable
pH:	Not available
VOLATILE BY VOL.:	100%
CO-EFFICIENT OF WATER/ OIL DISTRIBUTION:	Not Available
PERCENT VOLATILE:	100%
MOLECULAR FORMULA:	Not Applicable - mixture
MOLECULAR WEIGHT:	Not Applicable - mixture

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION: May cause headache, dizziness, loss of appetite, weakness, loss of coordination, and unconsciousness. Crude oil vapours are irritating to the upper respiratory tract.

EYE CONTACT: Crude oil vapours are moderately irritating to the eyes.

SKIN CONTACT: Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

INGESTION: Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC EFFECTS: Benzene is a known human carcinogen and may cause damage to the bone marrow/blood making system and may result in leukemia.

TOXICITY DATA: product is not listed as a carcinogen by any agen but individual components have been associated with carcinogenicity, mutagenicity, reproductive and teratogenicity properties in animal experiments.

OCCUPATIONAL EXPOSURE LIMITS:

ACGIH Recommends:

For oil mists, 5 mg/m^3
For Hydrogen sulphide, 10 ppm (24 mg/m^3)
For Benzene, the ACGIH recommends a TLV of 10 ppm (30 mg/m^3) and describe it as a substance of suspect carcinogenic potential in man.

Manufacturer Recommends:

For total hydrocarbons, 100 ppm recommended.

5. FIRST AID MEASURES

INHALATION: Remove individual to fresh air immediately. If breathing stops, administer artificial resuscitation. Keep victim warm and at rest, seek medical attention.

EYE CONTACT: Flush eyes with large amounts of water for at least 15 minutes and seek medical attention.

SKIN CONTACT: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

INGESTION: DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Get prompt medical attention. Never give anything by mouth to an unconscious person.

5. FIRST AID MEASURES (Cont.)

EMERGENCY PROCEDURES: Because hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full face piece, self contained or supplied air NIOSH approve respirators before attempting the rescue.

6. PREVENTATIVE AND CORRECTIVE MEASURES

SPECIAL PROTECTION INFORMATION:

Use in a well ventilated area. Adequate ventilation should be provided in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below the applicable occupational exposure level.

Under normal conditions respiratory protection is not required. Respiratory protection may be required in poorly ventilated areas. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10x the occupational exposure limit or when high concentration of H_2S may be present.

Non-vented chemical goggles should be worn to prevent eye injury. Chemical resistant gloves, apron and/or clothing should be worn if direct contact with liquid is likely to occur. Neoprene or nitrile materials have been shown to provided effective protection against crude oil liquid.

SPILL CONTROL AND DISPOSAL:

Evacuate personnel. Eliminate all ignition sources. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution.

WASTE DISPOSAL METHOD:

Contaminated material should be placed in disposable containers and disposed in compliance with federal, provincial and local regulations.

7. FIRE AND EXPLOSION HAZARD

Flash-point (Test Method):	<40 deg C (PMCC)
Auto-ignition:	Not Available
Flammable Limits (% volume):	Not Available

GENERAL HAZARDS:

Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

FIREFIGHTING:

Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If leak or spill has not ignited, use water spray to disperse vapours. Use full protective equipment and self-contained breathing apparatus (SCBA) for fires in enclosed areas.

EXPLOSION/SENSITIVITY DATA:

Stable under normal conditions of temperature and pressure.

8. REACTIVITY DATA:

This material is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Oxidizing material.

HAZARDOUS DECOMPOSITION

May release hydrogen sulphide gas when agitated. See health hazard information. Overheating or incomplete combustion may result in carbon dioxide, carbon monoxide, acrid fumes or decomposition and oxides of sulphur.

Avoid heat, open flame or sources of ignition.

Maintain temperature below the flash-point and keep away from all ignition sources. Head spaces in storage tanks may contain toxic hydrocarbon vapours and hydrogen sulphide gas.

9. NOTES

This product contains benzene. Repeated or prolonged breathing of benzene vapours has been associated with the development of chromosomal damage in experimental animals and various blood disorders in humans ranging from aplastic anemia to leukemia.

This product may also contain polycyclic aromatic hydrocarbons, which have been associated with skin and lung cancers.

ACUTE EFFECTS:

Vary with concentration of hydrogen sulphide release, from mild eye, nose and throat irritation at approximately 100 ppm, to sudden unconsciousness or death at 500 ppm.

INHALATION:

H_2S release may occur in the vapour space of storage tanks. Abnormal behavior or sudden paralysis of breathing and unconsciousness can occur.

10. PREPARATION INFORMATION

Prepared by: GIBSON ENERGY LTD.
1700, 440 – 2nd Avenue SW
CALGARY, AB T2P 5E9

Issued by: HEALTH, SAFETY & ENVIRONMENT DEPT.

Telephone: (403) 206-4000

Date Prepared: August 1, 2008

CAUTION:

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain of the information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product or material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individual deliveries or if the product or material is used for a purpose or under conditions which are abnormal or not reasonably foreseeable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safely and to comply with all applicable laws and regulations.

The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Petroleum Crude Oil (Sour)
Synonyms:	Petroleum (CAS No. 8002-05-9)
Product Use:	Chemical feedstock.
Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	877-262-2111
Date of Preparation:	December 15, 2010

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. MAY BE FATAL IF INHALED. IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE.

Colour:	Black/Brown
Physical State:	Liquid.
Odour:	Petroleum. Rotten eggs.

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact, skin contact, inhalation, and ingestion.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Very toxic by inhalation. Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May

cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin, eyes, gastrointestinal tract, and respiratory system. Central nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	60 - 100
Benzene, dimethyl-	1330-20-7	10 - 30
Benzene, methyl-	108-88-3	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	1 - 2
Benzene	71-43-2	0.1 - 1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. Get medical attention immediately.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

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Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction

Suitable Extinguishing Media:	Dry chemical, foam, or carbon dioxide.
Unsuitable Extinguishing Media:	Water may not be an effective medium to extinguish fire.
Products of Combustion:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Protection of Firefighters:	Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.

Explosion Data

Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Don full-face, positive pressure, self-contained breathing apparatus. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Environmental Precautions:	Keep out of drains, sewers, ditches, and waterways.
Methods for Containment:	Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.
Other Information:	Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not breathe vapour/gas. Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Head spaces in storage containers may contain toxic hydrogen sulphide gas. Limit quantity of material in storage. Restrict access to storage area. Post appropriate warning signs. Keep storage area separate from populated work areas. Consider leak detection and alarm systems, as required. Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Structural materials and lighting and ventilation systems should be corrosion resistant. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Ingredient		TWA	STEL	Ceiling	Notes
Petroleum	ACGIH	5 mg/m³ *	10 mg/m³ *	Not available.	* Oil mist, mineral.
Petroleum	OSHA	5 mg/m³ *	Not available.	Not available.	* Oil mist, mineral.
Hydrocarbons, C>=5, C5-6-rich	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Hydrocarbons, C>=5, C5-6-rich	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Benzene, dimethyl-	ACGIH	100 ppm	150 ppm	Not available.	Not available.
Benzene, dimethyl-	OSHA	100 ppm (435 mg/m³)	Not available.	Not available.	Not available.
Benzene, methyl-	ACGIH	20 ppm	Not available.	Not available.	Not available.
Benzene, methyl-	OSHA	200 ppm	Not available.	300 ppm	PEAK = 500 ppm (for a 10 minute interval during an 8 hour shift)
Hydrogen sulfide (H2S)	ACGIH	1 ppm	5 ppm	Not available.	Not available.
Hydrogen sulfide (H2S)	OSHA	Not available.	Not available.	20 ppm	50 ppm (10 mins. once only if no other meas. exp. occurs.)
Benzene	ACGIH	0.5 ppm	2.5 ppm	Not available.	Skin.
Benzene	OSHA	1 ppm	5 ppm	Not available.	Not available.
Polycyclic Aromatic Hydrocarbons	ACGIH	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Polycyclic Aromatic Hydrocarbons	OSHA	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear chemical goggles.

Hand Protection: Wear impervious gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators. Where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels a NIOSH-approved supplied air respirator or self-contained breathing apparatus

(SCBA) is necessary.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Opaque.
Colour:	Black/Brown
Odour:	Petroleum. Rotten eggs.
Odour Threshold:	0.00047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	10 to > 1100 °C
Flash Point:	-40 °C (PMCC)
Evaporation Rate:	(Water = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Specific Gravity:	0.7 to 1.1 (Water = 1)
Density:	Not available.
Solubility in Water:	Slightly soluble.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	100
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition.
Incompatible Materials:	Strong acids. Strong oxidizers. Chlorine.
Hazardous Decomposition Products:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Possibility of Hazardous Reactions:	None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Ingredient	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not available.	Not available.	Not available.
Benzene, dimethyl-	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat)
Benzene, methyl-	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, (rat)
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat)
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Very toxic by inhalation. Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm. Memory loss, paralysis of facial muscles, and nerve tissue damage may occur after severe exposures near 500 ppm.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Respiratory system. Skin. Blood. Kidney. Liver. Central nervous system. Cardiovascular system. Peripheral nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated or prolonged exposure to H2S at 50 ppm or greater include respiratory illnesses such as bronchitis and pulmonary edema. Epidemiological studies indicate that long term inhalation of benzene vapours can result in leukemia. Exposure to toluene is

known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, parathesis, dermatitis, anemia, cause damage to the liver, kidneys, as well as the central and peripheral nervous systems. Xylene can damage bone marrow thus causing anemia, and can also damage the liver and kidneys, as well as the central and peripheral nervous systems. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Benzene has been classified by the International Agency for Research on Cancer as carcinogenic to humans (IARC Group 1).

Component Carcinogenicity

Ingredient	ACGIH	IARC	OSHA	NTP	Prop 65
Petroleum	Not listed.	Group 3	Not listed.	Not listed.	Not listed.
Hydrocarbons, C>=5, C5-6-rich	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, dimethyl-	A4	Group 3	Listed.	Not listed.	Not listed.
Benzene, methyl-	A4	Group 3	Listed.	Not listed.	Not listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Listed.	Not listed.	Not listed.
Benzene	A1	Group 1	Listed.	List 1	Not listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	Listed.	List 2	Listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Exposure to xylene has produced fetotoxic effects in animal studies.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name:	PETROLEUM CRUDE OIL, 3, UN 1267, I
Class:	3
UN Number:	1267
Packing Group:	I
Label Code:	

TDG

Proper Shipping Name:	PETROLEUM CRUDE OIL, 3, UN 1267, I
Class:	3
UN Number:	1267
Packing Group:	I
Label Code:	

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D1A - Very Toxic Material.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

United States
This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

State Regulations
Massachusetts
US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Not listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Not listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

New Jersey
US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Not listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Pennsylvania
US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Ingredient	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hydrocarbons, C>=5, C5-6-rich	68476-50-6	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.
Benzene, methyl-	108-88-3	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Ingredient	Type of Toxicity
Benzene, methyl-	female
Benzene, methyl-	developmental
Benzene	developmental, male
Benzene	cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: December 14, 2013

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Material Safety Data Sheet

1. Product and company identification

Product name

Petroleum Crude Oil - Sweet

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas.

The amount of dissolved H2S can vary considerably with the crude oil source.

MSDS #

0000001688

Historic MSDS #:

03885

Code

0000001688

Product use

Industrial

Manufacturer

BP Canada Energy Company
240 - 4 Avenue S.W.
P.O. Box 200, Station M
Calgary, Alberta T2P 2H8
CANADA

Supplier

BP Canada Energy Company
240 - 4 Avenue S.W.
P.O. Box 200, Station M
Calgary, Alberta T2P 2H8
CANADA

EMERGENCY HEALTH INFORMATION:

1 (800) 447-8735

Outside the US: +1 703-527-3887 (CHEMTREC)

EMERGENCY SPILL INFORMATION:

1 (613) 996-6666 CANUTEC (Canada)

OTHER PRODUCT INFORMATION

1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

2. Hazards identification

Physical state

Liquid.

Color

Brown. to Black.

Emergency overview

DANGER !

EXTREMELY FLAMMABLE LIQUID AND VAPOR.
FLAMMABLE.
VAPOR MAY CAUSE FLASH FIRE.
MAY BE FATAL IF INHALED.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
ASPIRATION HAZARD.

Extremely flammable liquid. Very toxic by inhalation. Harmful in contact with skin. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes or on skin or clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry

Dermal contact. Eye contact. Inhalation. Ingestion.

015359

Potential health effects

Eyes	Causes eye irritation.
Skin	Harmful if absorbed through the skin. Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	May be fatal if inhaled. Vapors may cause drowsiness and dizziness. Can cause central nervous system (CNS) depression. Causes respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. Ingestion may cause gastrointestinal irritation and diarrhea.

See toxicological information (Section 11)

3. Composition/information on ingredients

Ingredient name	CAS #	%
Crude Oil: complex hydrocarbon mixture comprising mainly of aliphatic, naphthenic and aromatic hydrocarbons.	8002-05-9	98 - 100
Contains:		
Benzene	71-43-2	0 - 2
Hydrogen Sulfide	7783-06-4	< 0.1
Polycyclic aromatic hydrocarbons (PAHs)	mixture	< 0.1

4. First aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Skin contact	Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product	Extremely flammable liquid.
Flash point	Open cup: <4°C (<39.2°F) [Cleveland.]
Explosion limits	Lower: 1.1% Upper: 5.9%
Fire/explosion hazards	In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.
Unusual fire/explosion hazards	Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	Do not use water jet.
Fire-fighting procedures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Hazardous combustion products	Combustion products may include the following: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide) sulfur oxides (SO_2, SO_3 etc.) nitrogen oxides (NO, NO_2 etc.) Hydrogen Sulfide (H2S)

Protective clothing (fire)

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Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Large spill

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill

Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling

Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure equipment used is properly earthed or bonded to the tank structure.

This material can contain hydrogen sulfide (H_2S), a very toxic and extremely flammable gas. Vapors containing hydrogen sulfide may accumulate during storage or transport and may also be vented during filling of tanks. Hydrogen sulfide has a typical "bad egg" smell but at high concentrations the sense of smell is rapidly lost, therefore do not rely on sense of smell for detecting hydrogen sulfide. Use specially designed measuring instruments for determining its concentration.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Crude Oil: complex hydrocarbon mixture consisting mainly of aliphatic, naphthenic and aromatic hydrocarbons.	**Alberta OH&S (Canada).** OEL: 5 mg/m³ 8 hour(s). Form: OIL MIST, MINERAL STEL: 10 mg/m³ 15 minute(s). Form: OIL MIST, MINERAL
Contains: Benzene	**Alberta OH&S (Canada).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). **British Columbia OH&S (Canada).** STEL: 2.5 ppm 15 minute(s). TWA: 0.5 ppm 8 hour(s). **CA Alberta Provincial (Canada). Absorbed through skin.** 15 min OEL: 16 mg/m³ 15 minute(s). 15 min OEL: 5 ppm 15 minute(s). 8 hrs OEL: 3.2 mg/m³ 8 hour(s). 8 hrs OEL: 1 ppm 8 hour(s). **CA British Columbia Provincial (Canada). Absorbed through skin.** STEL: 2.5 ppm 15 minute(s). TWA: 0.5 ppm 8 hour(s). **CA Ontario Provincial (Canada).** STEV: 2.5 ppm 15 minute(s). TWAEV: 0.5 ppm 8 hour(s). **CA Quebec Provincial (Canada).** STEV: 15.5 mg/m³ 15 minute(s). STEV: 5 ppm 15 minute(s). TWAEV: 3 mg/m³ 8 hour(s). TWAEV: 1 ppm 8 hour(s).
Hydrogen Sulfide	**Alberta OH&S (Canada).** CEIL: 15 ppm OEL: 10 ppm 8 hour(s). **British Columbia OH&S (Canada).** CEIL: 10 ppm **CA Alberta Provincial (Canada).** 15 min OEL: 21 mg/m³ 15 minute(s). 15 min OEL: 15 ppm 15 minute(s). 8 hrs OEL: 14 mg/m³ 8 hour(s). 8 hrs OEL: 10 ppm 8 hour(s). **CA British Columbia Provincial (Canada).** STEL: 10 ppm 15 minute(s). **CA Ontario Provincial (Canada).** STEV: 21 mg/m³ 15 minute(s). STEV: 15 ppm 15 minute(s). TWAEV: 14 mg/m³ 8 hour(s). TWAEV: 10 ppm 8 hour(s). **CA Quebec Provincial (Canada).** STEV: 21 mg/m³ 15 minute(s). STEV: 15 ppm 15 minute(s). TWAEV: 14 mg/m³ 8 hour(s). TWAEV: 10 ppm 8 hour(s).
Other applicable Exposure limit values: pitch, coal tar, high-temp.	**CA British Columbia Provincial (Canada).** TWA: 0.2 mg/m³, (as benzene-soluble aerosol) 8 hour(s). Issued/Revised: 8/2004 **CA Ontario Provincial (Canada).** TWAEV: 0.2 mg/m³, (as total benzene-soluble compounds) 8 hour(s). Issued/Revised: 2/2005 **CA Quebec Provincial (Canada).** TWAEV: 0.2 mg/m³ 8 hour(s). Issued/Revised: 1/2000 **CA Alberta Provincial (Canada).** 8 hrs OEL: 0.2 mg/m³ 8 hour(s). Issued/Revised: 4/2004 **Alberta OH&S (Canada).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene soluble **British Columbia OH&S (Canada).** TWA: 0.2 mg/m³ 8 hour(s). Form: Benzene soluble Aerosol.

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Control Measures

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes

Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body

Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory

Use adequate ventilation. Do not breathe vapor or mist. Approved air-supplied breathing apparatus must be worn where there is a risk of inhaling hydrogen sulfide gas. Personal gas monitors may also provide early warning of hydrogen sulfide. Air supplied respiratory protection should be worn whenever it is required for the worker's face to be within 3 feet of an open hatch.

Hands

Recommended: Gloves made from Viton or comparable material resistant to hydrocarbons. Nitrile gloves. Butyl rubber gloves.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state	Liquid.
Color	Brown. to Black.
Odor	Petroleum Hydrocarbon, Rotten eggs.
Odor threshold	Not available.
Flash point	Open cup: <4°C (<39.2°F) [Cleveland.]
Explosion limits	Lower: 1.1% Upper: 5.9%
Specific gravity	0.74 to 1.03
pH	Not available.
Viscosity	SUS: 31 to 9000 SUS at 20°C
Boiling point / Range	-17.8 to 537.8°C (-0.04 to 1000°F)
Melting point / Range	-60 to -20°C (-76 to -4°F)
Vapor pressure	>0.359 kPa (>2.7 mm Hg)
Vapor density	>1 [Air = 1]
Evaporation rate	Not available.
Solubility	insoluble in water.
$LogK_{ow}$	Not available.

10. Stability and reactivity

Stability and reactivity	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
ditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. hydrogen fluoride
Hazardous decomposition products	Decomposition products may include the following materials: carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide), sulfur oxides (SO_2, SO_3 etc.) Vapor may contain hydrogen sulfide (H2S) gas which can be harmful or fatal if inhaled.
Hazardous polymerization	Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
Crude oil	3	-	-
Benzene	1	Proven.	+
Polycyclic aromatic hydrocarbons (PAHs)	-	Possible	-

IARC :
1 - Carcinogenic to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

er information

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

Crude oil is a naturally occurring complex mixture of hydrocarbons whose exact composition and physical properties can vary widely depending upon its source.

From skin-painting studies in laboratory animals, it has been concluded that most, if not all, petroleum crudes, regardless of source, possess carcinogenic activity to some degree. This means that workers who practice poor personal hygiene and who are repeatedly exposed by direct skin contact to crude oil over many years may potentially be at risk of developing skin cancer. However, intermittent or occasional skin contact with petroleum crude oils is not expected to have serious health effects as long as good personal hygiene measures such as those outlined in this material safety data sheet are followed. Crude oil has not been identified as a carcinogen by NTP, IARC or OSHA.

Exposure to sunlight may increase the degree of skin irritation.
Crude oil administered orally or dermally to pregnant rats during gestation produced increased numbers of resorptions and decreases in fetal weight at maternally toxic doses. Repeated exposures to some crude oils in rats have produced effects on the blood, liver and thymus.

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene

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at levels up to 300 ppm did not produce birth defects in animal studies, however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Hydrogen sulfide (H2S) gas may accumulate in storage tanks of bulk transport compartments containing this material. Contact with eyes causes painful conjunctivitis, sensitivity to light, tearing and clouding of vision. Inhalation of low concentrations causes a runny nose with a loss of sense of smell, labored breathing and shortness of breath. Direct contact with skin causes pain and redness. Other symptoms of exposure include profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, dizziness, confusion, rapid breathing, rapid heart rate, sweating, weakness, sudden collapse, unconsciousness and death due to respiratory paralysis.

Cardiac neurological effects have also been reported. Prolonged breathing (greater than one hour) of concentrations of H2S around 50 ppm can produce eye and respiratory tract irritation. Levels of 250 to 600 ppm will result in fluid in the lungs, and concentrations around 1,000 ppm will cause unconsciousness and death in a short period of time. Since the sense of smell rapidly becomes insensitive to this toxic, colorless gas, odor cannot be relied upon as an indicator of concentrations of the gas. Always exercise caution when working around closed containers.

Potential chronic health effects

Carcinogenicity	Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	No known significant effects or critical hazards.
Teratogenicity	No known significant effects or critical hazards.
Fertility effects	No known significant effects or critical hazards.
Reproductive effects	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	None known.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	Reportable quantity 10 lbs. (4.54 kg)
TDG ssification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	-
IMDG Classification	UN1267	PETROLEUM CRUDE OIL (Hydrogen Sulfide)	3	II	-
IATA/ICAO Classification	UN1267	PETROLEUM CRUDE OIL (Crude oil)	3	II	-

15. Regulatory information

WHMIS (Canada)

Class B-2: Flammable liquid
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Other regulations

Canada inventory	All components are listed or exempted.
United States inventory (TSCA 8b)	All components are listed or exempted.
REACH Status	For the REACH status of this product please consult your company contact, as identified in Section 1.
Australia inventory (AICS)	All components are listed or exempted.
China inventory (IECSC)	Not determined.
Japan inventory (ENCS)	Not determined.
Korea inventory (KECI)	Not determined.
Philippines inventory (PICCS)	Not determined.

16. Other information

Label requirements

DANGER !

EXTREMELY FLAMMABLE LIQUID AND VAPOR.
FLAMMABLE.
VAPOR MAY CAUSE FLASH FIRE.
MAY BE FATAL IF INHALED.
HARMFUL IF ABSORBED THROUGH SKIN.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
HARMFUL OR FATAL IF SWALLOWED.
CAN ENTER LUNGS AND CAUSE DAMAGE.
CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
ASPIRATION HAZARD.

History

Date of issue 02/07/2012.

Date of previous issue 02/02/2009.

Prepared by Product Stewardship

ndicates information that has changed from previously issued version.

ce to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

MATERIAL SAFETY DATA SHEET

Canadian Natural
Supplier: Canadian Natural Resources Ltd.
2500, 855 2nd Street S.W.
Calgary, Alberta, Canada T2P 4J8

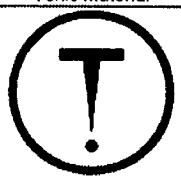
24 Hour Emergency Telephone Number:
1-888-878-3700

1. PRODUCT IDENTIFICATION

PETROLEUM HEAVY CRUDE OIL

SYNONYMS:
1. Crude Oil Tank Bottom Sludge
2. Crude Oil
3. Sour Crude
4. Sweet Crude
5. Mineral Oil
6. Rock Oil
7. Coal Oil
8. Heavy Crude Oil

WHIMIS

Class B, Division 2: Flammable Liquid	Class D, Division 1, Subdivision A: Very Toxic Effects	Class D, Division 2, Subdivision B: Toxic Material
		

TDG

PRIMARY TDG: 3.1
SECONDARY TDG: 3.2

SHIPPING NAME: Petroleum Crude Oil
CLASS: Flammable Liquids
P.I.N.: UN1267
PACKING GROUP: II or III

DESCRIPTION: A naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds. The composition and properties will vary significantly according to source of crude. Crude oil with a sulphur content greater than 0.5 weight percent is considered sour.

APPLICATION: Used as a refinery feedstock.

2. HAZARDOUS INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a)(I) to (iv) or paragraph 14(a) of the Hazardous Product Act:

NAME	%	CAS#
Hydrocarbons (aromatic and paraffinic hydrocarbons)	100	8002-05-9
Toluene	100 ppm	108-88-3
Benzene	10 ppm	71-43-2
Xylene	100 ppm	1330-20-7
Hydrogen sulphide (H2S)	10 ppm	7783-06-4

3. TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
SPECIFIC GRAVITY:	0.7 to 1.1
DENSITY:	0.8 to 1.0
APPEARANCE/ODOUR:	Aromatic or sulphide (rotten egg) odour.
ODOUR THRESHOLD:	Not available
VAPOUR PRESSURE:	10-80 kPa @ 20°C
VAPOUR DENSITY:	Not available
EVAPORATION RATE:	Variable
BOILING POINT/RANGE:	10°C – 1100°C
FREEZING/MELTING POINT:	Not available
VISCOSITY:	Not applicable
pH:	Not available
SOLUBILITY IN WATER:	0%
COEFF. OF WATER / OIL DIST.:	Not available
PERCENT VOLATILE:	100%
MOLECULAR FORMULA:	Not applicable - mixture
MOLECULAR WEIGHT:	Not applicable – mixture

4. HEALTH HAZARD INFORMATION

Nature of Hazard

INHALATION:
May cause headache, dizziness, loss of appetite, weakness, loss of coordination, and unconsciousness. Crude oil vapours are irritating to the upper respiratory tract.

EYE CONTACT:
Crude oil vapours are moderately irritating to the eyes.

SKIN CONTACT:
Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

INGESTION:
Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC EFFECTS:
Benzene is a known human carcinogen and may cause damage to the bone marrow/blood making system and may result in leukemia.

TOXICITY DATA:
Product is not listed as a carcinogen by any agent, but individual components have been associated with carcinogenicity, mutagenicity, reproductive and teratogenicity properties in animal experiments.

OCCUPATIONAL EXPOSURE LIMITS (OELs) RECOMMENDED:

ACGIH:	For oil mists	5mg/m³
	For Hydrogen sulphide	10 ppm (14mg/m³)
	For Benzene	a TLV of 10 ppm (30 mg/m3), and it is described as a substance of suspect carcinogenic potential in man.
Manufacturer:	For total hydrocarbons	100 ppm

5. FIRST AID MEASURES

INHALATION:
Remove individual to fresh air immediately. If breathing stops, administer artificial resuscitation. Keep victim warm and at rest. Seek medical attention.

...OVER

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EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

SKIN CONTACT:
Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

INGESTION:
If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

EMERGENCY PROCEDURES:
Because Hydrogen sulphide inhalation can be fatal, rescuers must wear positive pressure full face piece, self-contained or supplied air NIOSH approved respirators before attempting the rescue.

6. PREVENTATIVE AND CORRECTIVE MEASURES

SPECIAL PROTECTION INFORMATION:
Use in a well ventilated area. Adequate ventilation should be provide in the workplace to maintain the hydrocarbon vapours and hydrogen sulphide below the applicable occupational exposure level. Under normal conditions respiratory protection is not required. Respiratory protection may be required in poorly ventilated areas. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed the 10x the occupational exposure limit or when high concentration of H_2S may be present. Non-vented chemical goggles should be worn to prevent eye injury. Chemical resistant gloves, apron and/or clothing should be worn if direct contact with liquid is likely to occur. Neoprene or nitrile materials have been shown to provide effective protection against crude oil liquid.

SPILL CONTROL AND DISPOSAL:
Evacuate personnel. Eliminate all ignition sources. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution.

WASTE DISPOSAL METHOD:
Contaminated material should be placed in disposable containers and disposed in compliance with federal, provincial and local regulations.

7. FIRE AND EXPLOSION HAZARD

FLASH-POINT (Test Method):	-18C°
AUTO-IGNITION:	Not available
FLAMMABLE LIMITS (% Volume):	Not available

GENERAL HAZARDS:
Static discharge: Highly flammable, vapours are heavier than air and may collect in low-lying areas. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

FIRE FIGHTING:
Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours. Use full protective equipment and self-contained breathing apparatus (SCBA) for fires in enclosed areas.

EXPLOSION/SENSITIVITY DATA:
Stable under normal conditions of temperatures and pressure..

8. REACTIVITY DATA

STABILITY:
This material is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:
Oxidizing material

HAZARDOUS DECOMPOSITION:
May release hydrogen sulphide gas when agitated. See health hazard information. Overheating or incomplete combustion may result in carbon dioxide, carbon monoxide, acrid fumes of decomposition and oxides of sulphur. Avoid head, open flame or sources of ignition. Maintain temperature below the flash-point and keep away from all ignition sources. Head spaces in storage tanks may contain toxic hydrocarbon vapours and hydrogen sulphide gas.

9. NOTES

This product contains benzene. Repeated or prolonged breathing of benzene vapours has been associated with the development of chromosomal damage in experimental animals and various blood disorders in humans ranging from aplastic anemia to leukemia. This product may also contain polycyclic aromatic hydrocarbons, which have been associated with skin and lung cancers.

ACCUTE EFFECTS:
Very with concentration of hydrogen sulphide released, from mild eye, nose and throat irritation at approximately 100 ppm, to sudden unconsciousness or death at 500 ppm.

INHALATION:
H_2S release may occur in the vapour space of storage tanks. Abnormal behavior or sudden paralysis of breathing and unconsciousness can occur.

10. PREPARATION

Prepared by:	CNRL HEALTH AND SAFETY
Date:	January 1, 2011
Expires:	March 31, 2013

CAUTION

The information contained herein is provided free of charge and is offered to the user in good faith as accurate. Certain of the information has been obtained from sources outside of the supplier and while the supplier believes such information to be correct, it cannot guarantee its accuracy or completeness.

The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individuals or if the products or material is used for a purpose or under conditions which are abnormal or not reasonable foreseeable. For greater certainty, uses other that those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate and verify the information, to use the product safety and to comply with all applicable laws and regulations. The supplier makes no warranties, guarantees or conditions express or implied in respect of the information contained herein.

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Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-02-26

Class B2 Flammable Liquid

Class D2B Skin Irritation

Class D2A Embryo/Fetotoxicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **PREMIUM ALBIAN SYNTHETIC CRUDE**
SYNONYMS: PAS
Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE: Base product for Petroleum Refining.
PRODUCT CODE: **873-111**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	45 - 50	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	45 - 50	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 6	Yes
n-Hexane	110-54-3	< 1	Yes
Toluene	108-88-3	< 1	Yes
Butane (n-Butane)	106-97-8	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.5 - 1	Yes
Benzene	71-43-2	< 0.1	Yes
Ethylbenzene	100-41-4	< 0.1	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

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See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Liquid Brown Colour Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Clear area of unprotected personnel. Do not use a direct stream of water as it may spread fire. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container

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rupture. Vapours may travel along ground and flashback along vapour trail may occur. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Gasoline: 300 ppm (STEL: 500 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where

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general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Brown Colour
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-42 - 500 °C
Density:	845 - 860 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.845 - 0.86
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	4 mm2/s @ 30 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.

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Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Butane (n-Butane)	LC50 Inhalation Mouse = 680000 mg/m3 for 2 hours LC50 Inhalation Rat = 658000 mg/m3 for 4hours
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Middle distillates have caused skin cancers in laboratory animals when applied repeatedly and left in place between applications. This effect is believed to be caused by the continuous irritation of the skin. Good personal hygiene should be maintained to avoid this risk. Based on an Ames mutagenicity assay, this product would not be predicted to produce tumours via skin contact.

12. ECOLOGICAL INFORMATION

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Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class: Class B2 Flammable Liquid
Class D2B Skin Irritation
Class D2A Embryo/Fetotoxicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: No Canadian federal standards. Provincial criteria are likely and should be requested when notifying provincial authorities. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.

Handling Statement: Eliminate all ignition sources.

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Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 4 Section 8 Section 11

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SUNCOR ENERGY

Material Safety Data Sheet

PRODUCT GAS OIL

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B3 - Combustible Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	2	Flashpoint below 200 F	Flammability	2
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	PRODUCT GAS OIL
Product type	:	Suncor Product
MSDS Number	:	V00000000448
CAS-No.	:	128683-29-4
Synonyms	:	Hydrotreated Gas Oil, Treated Gas Oil
Intended Use	:	Process Stream Component of synthetic crude
Manufacturer	:	Suncor Energy Inc., Oil Sands P.O. Box 4001 Fort McMurray, Alberta Canada T9H 3E3
Telephone	:	(780) 790-7001 (24-hr)

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	99 - 100 %
HYDROGEN SULPHIDE	7783-06-4	< 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Flammable.Avoid breathing vapors, mist or gas.

Potential Health Effects

Eyes : May cause eye irritation.

Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness. May cause respiratory tract irritation.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact
Target Organs	:	Respiratory system Central nervous system

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	55 - 93 °C (131 - 199 °F)

		Method: ASTM D 93
Autoignition temperature	:	255 °C (491 °F) Method: ASTM E659
Lower explosion limit	:	0.32 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	Hydrogen sulphide, carbon monoxide, Carbon dioxide (CO2), nitrogen oxides, sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition.

Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits.
When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage : Store in a cool, well ventilated area away from incompatible materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection : Chemical resistant goggles must be worn.
Wear face-shield if splashing hazard is likely.

Hand protection : Wear suitable gloves.
The following materials are acceptable:
Neoprene
Nitrile rubber

Skin and body protection : Wear as appropriate:
Long sleeved clothing
A neoprene or nitrile rain suit may be needed in certain situations.
(e.g., vessel cleaning).

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Odour	:	hydrocarbon-like
Physical state	:	liquid
Boiling point/range	:	110 - 620 °C (230 - 1,148 °F) Method: ASTM D-2887
Vapour pressure	:	< 0.1 kPa Method: ASTM D 323A
Density	:	0.91 - 0.92 g/cm3
Specific gravity	:	0.91 - 0.92
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents Peroxides Strong acids
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide

sulfur dioxide
nitrogen oxides (NOx)

Hazardous reactions : Hazardous polymerization does not occur.
Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity : LD50 rat
Dose: > 5,000 mg/kg

Acute dermal toxicity : LD50 rabbit
Dose: > 2,000 mg/kg

Skin irritation : rabbit
Result: Moderate skin irritation

Sensitization : Remarks: Did not cause sensitization on laboratory animals.

Further information : Information given is based on data obtained from similar substances.
Prolonged skin contact caused cancerous skin tumors in animals.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT
Proper shipping name : PETROLEUM DISTILLATES, N.O.S.
UN-No. : 1268
Class : 3
Packing group : II

TDG
Proper shipping name : PETROLEUM DISTILLATES, N.O.S.
UN-No. : 1268
Class : 3
Packing group : II

IATA
UN Number : 1268
Description of the goods : PETROLEUM DISTILLATES, N.O.S.
Class : 3
Packaging group : II

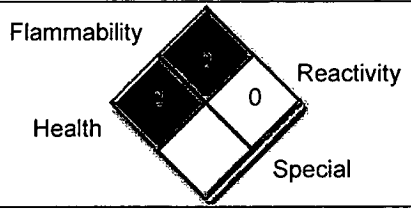
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 307
	Packing instruction (passenger aircraft)	: 305
	Packing instruction (passenger aircraft)	: Y305
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	EmS Number	: F-E

Further information for transport

Special provisions for transport : not regulated

SECTION 15: REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	2
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B3 - Combustible Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed on TSCA
HYDROGEN SULPHIDE 7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16: OTHER INFORMATION

Date Validated : 02/14/2007

References :
Core laboratory and Maxxam laboratory analysis, 1999.
Chemex Labs Alberta Inc., Analysis Results for Product Gas Oil, 1989.
Maxxam Analytics Inc. Laboratory Analysis 2006
The Petroleum HPV Testing Group, Test Plan Gas Oils Category, November 3, 2003
Kidde Fenwal Combustion Research Center Laboratory Analysis 2006
Kidde Fenwal Combustion Research Centre Laboratory Analysis 2007

General contact information : B. Burrell: (519) 383-3657

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Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: PSC

Synonyms: Hydrocarbon Product; Sales Oil; Premium Synthetic Crude.

Product Use: Gas Plant/Refinery Feed.

Manufacturer/Supplier: Nexen Inc.
Synthetic Oil
Box 6010
Fort McMurray, Alberta
Canada T9H 4V9

Emergency Phone: 1 (780) 334-3911

Date of Preparation: August 18, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
EXTREMELY FLAMMABLE LIQUID AND VAPOR - VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN CAUSE CANCER. IRRITATING TO EYES, UPPER RESPIRATORY TRACT AND SKIN.

Colour: Light yellow.
Physical State: Liquid.
Odour: Petroleum.

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Petroleum	8002-05-9	100
Decane	124-18-5	3 - 7
Nonane	111-84-2	3 - 7
Octane	111-65-9	1 - 5
Heptane	142-82-5	1 - 5
Hexane	110-54-3	1 - 5
Cyclohexane, methyl-	108-87-2	1 - 5
m,p-Xylene	179601-23-1	0.1 - 1
O-Xylene	95-47-6	0.1 - 1
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 - 1
Toluene	108-88-3	0.1 - 1
Cyclohexane	110-82-7	0.1 - 1
Benzene, ethyl-	100-41-4	0.1 - 1
Benzene	71-43-2	0.1 - 1

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, water spray, foam, carbon dioxide.
Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon. Aldehydes.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking.
Storage:
Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Petroleum
(8002-05-9) **ACGIH:** A2; Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined
(8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]
(8002-05-9) **Alberta OEL:** 5 mg/m³ (OEL); 10 mg/m³ (STEL); For Oil mist, mineral

Decane

(124-18-5) **ACGIH:** No TLV established.

(124-18-5) **OSHA:** No PEL established.

(124-18-5) **Alberta OEL:** No OEL established.

Nonane

(111-84-2) **ACGIH:** 200 ppm (TWA); (1992)

(111-84-2) **OSHA:** 200 ppm (TWA) [Vacated]

(111-84-2) **Alberta OEL:** 200 ppm (OEL); 1050 mg/m³ (OEL)

Octane

(111-65-9) **ACGIH:** 300 ppm (TWA); (1979)

(111-65-9) **OSHA:** 500 ppm (TWA), 2350 mg/m³ (TWA); 300 ppm (TWA); 375 ppm (STEL) [Vacated]

(111-65-9) **Alberta OEL:** 300 ppm (OEL); 1400 mg/m³ (STEL)

Heptane

(142-82-5) **ACGIH:** 400 ppm (TWA); 500 ppm (STEL); (1979)

(142-82-5) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA); 500 ppm (STEL) [Vacated]

(142-82-5) **Alberta OEL:** 400 ppm (OEL); 1640 mg/m³ (OEL); 500 ppm (STEL); 2050 mg/m³ (STEL)

Hexane

(110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)

(110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin. 50 ppm (TWA) [Vacated]

(110-54-3) **Alberta OEL:** 50 ppm (OEL); 176 mg/m³ (OEL); Substance may be readily absorbed through intact skin

Cyclohexane, methyl-

(108-87-2) **ACGIH:** 400 ppm (TWA); (1962)

(108-87-2) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA); 400 ppm (TWA) [Vacated]

(110-82-7) **Alberta OEL:** 100 ppm (OEL); 344 mg/m³ (OEL)

m,p-Xylene

(179601-23-1) **ACGIH:** No TLV established.

(179601-23-1) **OSHA:** No PEL established.

(179601-23-1) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 150 ppm (STEL); 651 mg/m³ (STEL)

o-Xylene

(95-47-6) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

(95-47-6) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA); 150 ppm (STEL) [Vacated]

(95-47-6) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 150 ppm (STEL); 651 mg/m³ (STEL)

Benzene, 1,2,4-trimethyl-

(95-63-6) **ACGIH:** 25 ppm (TWA); (1970)

(95-63-6) **OSHA:** 25 ppm (TWA) [Vacated]

(95-63-6) **Alberta OEL:** No OEL established.

Toluene

(108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)

(108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated]
(108-88-3) **Alberta OEL:** 50 ppm (OEL); 188 mg/m³ (OEL); Substance may be readily absorbed through intact skin

Cyclohexane

(110-82-7) **ACGIH:** 100 ppm (TWA); (1964)

(110-82-7) **OSHA:** 300 ppm (TWA), 1050 mg/m³ (TWA);

(110-82-7) **Alberta OEL:** 100 ppm (OEL); 344 mg/m³ (OEL)

Benzene, ethyl-

(100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
(100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated]
(100-41-4) **Alberta OEL:** 100 ppm (OEL); 434 mg/m³ (OEL); 125 ppm (STEL); 543 mg/m³ (STEL)

Benzene

(71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

(71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);
(71-43-2) **Alberta OEL:** 0.5 ppm (OEL); 1.6 mg/m³ (OEL); 2.5 ppm (STEL); 8 mg/m³ (STEL); Substance may be readily absorbed through intact skin

Polycyclic Aromatic Hydrocarbons

(130498-29-2) **ACGIH:** A2; BEI; Exposure by all routes should be carefully controlled to levels as low as possible (1990); For Benz[a]anthracene

(130498-29-2) **OSHA:** 0.2 mg/m³ (TWA); For benzene-soluble fraction.

(130498-29-2) **Alberta OEL:** 0.2 mg/m³ (OEL)

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls:	Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.
Personal Protective Equipment	
Eye/Face Protection:	Wear safety glasses. Ensure that eyewash stations are close to the workstation location.
Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations

are low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Light yellow.
Colour:	Light yellow.
Odour:	Petroleum.
Odour Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Viscosity:	4.0352 cSt @ 20 °C
Melting Point:	Not available.
Boiling Point:	35.4 to 561.9 °C (1 atm)
Flash Point:	< -13 °C
Evaporation Rate:	> 1(Water = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	30.3 kPa gauge (37.8 °C) (RVP)
Vapor Density:	3 (Air = 1) 1 atm
Specific Gravity:	0.848 (Water = 1) @ 15°C (1 atm)
Density:	Not available.
Solubility in Water:	Not available.
Coefficient of Water/Oil Distribution:	< 1
Auto-ignition Temperature:	537 °C
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
API Gravity:	39 API @ 15 °C

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong oxidizers.

Hazardous Decomposition Products: Not available.

Possibility of Hazardous Reactions: None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Decane	124-18-5	Not available.	Not available.	>1369 ppm, (rat), 8H
Nonane	111-84-2	Not available.	Not available.	3200 ppm, (rat), 4H
Octane	111-65-9	Not available.	Not available.	118000 mg/m³, (rat), 4H
Heptane	142-82-5	Not available.	Not available.	103000 mg/m³, (rat), 4H
Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat), 4H
Cyclohexane, methyl-	108-87-2	>3200 mg/kg, (rat)	>86700 mg/kg, (rabbit)	15227 ppm, (rabbit), 1H
m,p-Xylene	179601-23-1	5000 mg/kg, (rat)	Not available.	4550 ppm, (rat), 4H
O-Xylene	95-47-6	5000 mg/kg, (rat)	Not available.	6125 ppm, (rat), 12H
Benzene, 1,2,4-trimethyl-	95-63-6	5000 mg/kg, (rat)	Not available.	18000 mg/m³, (rat), 4H
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m³, (rat), 4H
Cyclohexane	110-82-7	813 mg/kg, (mouse)	180000 mg/kg, (rabbit)	Not available.
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat), 7H
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause

peripheral nerve disorders and central nervous system effects. Exposure to Xylene, Toluene or Ethylbenzene may cause liver and kidney damage. Long term inhalation of Benzene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities, including leukemia.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	Not listed.	OSHA Carcinogen	Not listed.
Decane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Nonane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
m,p-Xylene	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
O-Xylene	A4	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, 1,2,4-trimethyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Cyclohexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	List 2	OSHA Carcinogen	Listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Exposure to Toluene may affect the developing fetus. P-Xylene may cause teratogenic effects. Benzene has caused adverse fetal effects in laboratory animals.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumors. Benzene has caused adverse fetal effects in laboratory animals.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: 21 and 41 mg/l, 96 hr., Rainbow trout;
2.7 and 4.1 mg/l, 96 hr., Mysid;
122 and 528 ml/kg, 96 hr., Algae.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II
Class: 3
UN Number: 1267
Packing Group: II
Label Code:

TDG
Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II
Class: 3
UN Number: 1267
Packing Group: II
Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2A - Chronic toxic effects.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Petroleum	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Decane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Nonane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Octane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	5000	313 & x	Not listed.	Not listed.
Cyclohexane, methyl-	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
m,p-Xylene	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
O-Xylene	Not listed.	Not listed.	1000	313 & X	U239	Not listed.
Benzene, 1,2,4-trimethyl-	Not listed.	Not listed.	Not listed.	313	Not listed.	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Cyclohexane	Not listed.	Not listed.	1000	313	U056	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Polycyclic Aromatic Hydrocarbons	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Decane	124-18-5	Not listed.
Nonane	111-84-2	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.
m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	Listed.
Benzene, 1,2,4-trimethyl-	95-63-6	Listed.
Toluene	108-88-3	Listed.
Cyclohexane	110-82-7	Listed.
Benzene, ethyl-	100-41-4	Listed.
Benzene	71-43-2	E
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Decane	124-18-5	Listed.
Nonane	111-84-2	SHHS
Octane	111-65-9	SHHS
Heptane	142-82-5	SHHS
Hexane	110-54-3	SHHS
Cyclohexane, methyl-	108-87-2	SHHS
m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	SHHS
Benzene, 1,2,4-trimethyl-	95-63-6	Listed.
Toluene	108-88-3	SHHS
Cyclohexane	110-82-7	SHHS
Benzene, ethyl-	100-41-4	SHHS
Benzene	71-43-2	SHHS
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Decane	124-18-5	Listed.
Nonane	111-84-2	Listed.
Octane	111-65-9	Listed.
Heptane	142-82-5	Listed.
Hexane	110-54-3	Listed.
Cyclohexane, methyl-	108-87-2	Listed.

m,p-Xylene	179601-23-1	Not listed.
O-Xylene	95-47-6	E
Benzene, 1,2,4-trimethyl-	95-63-6	E
Toluene	108-88-3	E
Cyclohexane	110-82-7	E
Benzene, ethyl-	100-41-4	E
Benzene	71-43-2	ES
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Toluene	developmental & female
Benzene, ethyl-	cancer
Benzene	developmental, male & cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: August 17, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

STATOIL
LEISMER SE2-079-10-W4M
Material Safety Data Sheet

SECTION 1 – PRODUCT IDENTIFICATION & USE

Product Identifier: Sales Oil

Product Use: Refinery Feed

Manufacturer/Supplier: Statoil
Leismer SE2-079-10-W4M
Conklin, Alberta
T0A 2C0
Emergency Telephone Number: 1-403-268-7461

Chemical Name & Synonym: Crude Oil, Hydrocarbon Liquids, Treater Oil

Chemical Name & Formula: C5-C30+ Hydrocarbons

WHMIS Class: Class B, Division 2, Flammable Liquid

TDG Description: Class 3, UN 1267, Packing Group 3

SECTION 2 COMPOSITION

Ingredients	% W/W	CAS Number	UN Number	Exposure Limits(ppm)
Butane	0.15-0.40	106-97-8	1011	800
Pentane	3.50-4.00	109-66-0	1265	600
Hexanes	2.50-3.00	110-54-3	1208	*
Heptanes	2.00-2.50	142-82-5	1206	400
Octanes	2.25-2.75	111-65-9	1262	300
Benzene	0.20-0.40	71-43-2	1114	1(skin)
Toluene	0.75-1.25	108-88-3	1294	100(skin)
Xylenes	0.75-1.00	106-42-3	1307	100
1,2,4 TMBenzene	0.15-0.25	95-63-6	2325	25
MethylCyclopentane	0.50-0.75	96-37-7	2298	n. av.
Cyclohexane	0.75-1.00	110-82-7	1145	300
Methyl Cyclohexane	1.25-1.75	108-87-2	2296	400
Ethylbenzene	0.05-0.15	100-41-4	1175	100

*Note: nHexane 8 hour OEL = 50 ppm Isomers = 500 ppm

SECTION 3 – PHYSICAL DATA

Physical State: Liquid	Odour and Appearance: Viscous liquid Black	Odour Threshold: n. av.
Vapour Pressure: 12 kPa calc.	Vapour Density: (Air = 1) >3.0	Evaporation Rate: <1
Boiling Point: 35 ->716 °C	Pour Point: -45 C	Critical Temperature n. av.
Specific Gravity: (Water = 1) 0.914	Solubility in Water: Not Soluble	Coeff. of Water/Oil Dist.: <1

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SECTION 4 – REACTIVITY, FIRE AND EXPLOSIVE DATA

Flash Point:
<-35 °C (est)

Auto Ignition:
537 est

LEL/UEL%:
n. ap.

Hazardous Combustion Products:
CO2, NOx, CO, SO_2

Sensitivity to Mechanical Impact:
Not Sensitive

Sensitivity to Static Electricity:
Static Spark may cause Ignition

Flammability:
Flammable

Fire Fighting Procedures – Means of Extinguishing:
DRY CHEMICAL, WATER FOG, FOAM, SHUT FUEL SUPPLY OFF

Special Fire Fighting Procedures: n. ap.

Chemical Stability: Stable Mixture

Hazardous Polymerisation:
Will not occur

Sensitivity to Mechanical Impact: Not sensitive

Incompatibility:
Strong Oxidizing Agents

Reactivity: Chlorine Dioxide

SECTION 5 – TOXICOGICAL PROPERTIES

Routes of Entry:

Inhalation: X

Eye Contact: X

Skin Contact: X.

Ingestion: n. ap.

Effects of Acute Exposure:

Inhalation – Primary route of exposure. High vapour concentrations are irritating to the eyes, nose, throat and lungs. May cause headaches, and dizziness. May be anesthetic and may cause other central nervous system effects.

Skin/Eye Contact – May cause eye and/or skin irritation

Ingestion – n. ap.

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Effects of Chronic Exposure:

Specific Species & Route

Ingredients	LD50 OF INGREDIENT	LC50 OF INGREDIENT
Butane	n. av.	6583 ppm - rats
Pentane	446 ppm IVN mouse	n. av.
Hexanes	28710 mg/kg oral rat	n. av.
Heptanes	n. av.	n. av.
Octanes	n. av.	n. av.
Nonanes	218 mg/kg (IVN mouse)	3200 ppm (4 hr INH rat)
Benzene	930 mg/kg oral rat	13,228 ppm rat
Toluene	7.53 g/kg (oral rat)	n. av.
Xylenes	7.71 mL/kg (oral rat)	n. av.
1,2,4 Trimethylbenzene	n. av.	n. av.
Methyl Cyclopentane	n. av.	n. av.
Cyclohexane	n. av.	n. av.
Methyl Cyclohexane	3.8 mL/kg (oral rat)	41500 mg/m^3 (2 hr INH mouse)
Ethylbenzene	3500 mg/kg (oral rat)	n .av.
Benzene	930 mg/kg oral rat	13,228 ppm rat

Exposure Limits:
(8 hours) Occupational Exposure Limit
See list

Carcinogenicity:
Contains small amount of Benzene, a known carcinogen

Reproductive Effects:
n. av.

Synergistic Materials:
n. av.

Sensitizing Capabilities:
n. av.

SECTION 6 – PREVENTATIVE MEASURES

Engineering Controls: USE EXPLOSION-PROOF VENTILATION TO CONTROL VAPOUR CONCENTRATION, FOR PERSONNEL ENTRY INTO CONFINED SPACE, ENTRY PROCEDURE MUST INCLUDE VENTILATION AND TESTING OF ATMOSPHERE. MAKE UP AIR MUST BE SUPPLIED TO BALANCE AIR EXHAUSTED.

Personal Protective Equipment:

Respiratory Protection: SCBA should be worn in areas of insufficient oxygen or when H_2S levels exceed 15 ppm.

Body Protection: Flame retardant clothing should be worn,

Eye Protection: Safety glasses with side shields

Leak and Spill Handling: ELIMINATE SOURCE OF IGNITION. PREVENT ADDITIONAL DISCHARGE OF MATERIAL. EVACUATE PERSONNEL NOT EQUIPPED WITH PROTECTIVE CLOTHING AND NIOSH APPROVED RESPIRATORY EQUIPMENT. CONTAIN SPILL WITH NONCOMBUSTABLE ABSORBENTS.

Environmental Effects and Hazards: CONSULT AN EXPERT AND ENSURE DISPOSAL IS IN COMPLIANCE WITH GOVERNMENT REQUIREMENTS.

Handling Procedure and Equipment: KEEP CONTAINERS CLOSED. STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. DO NOT PRESSURIZE, HEAT, OR WELD EMPTY CONTAINERS. KEEP AWAY FROM OPEN FLAMES AND USE PROPER GROUNDING PROCEDURES.

Storage Requirements: STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS.

Special Shipping Information:

Per Transportation of Dangerous Goods Legislation.

SECTION 7 - FIRST AID MEASURES

Inhalation: IN EMERGENCY SITUATIONS USE PROPER RESPIRATORY PROTECTION AND IMMEDIATELY REMOVE THE VICTIM FROM EXPOSURE. ADMINISTER ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. KEEP AT REST AND CALL FOR MEDICAL ATTENTION.

Skin Contact: FLUSH AREA WITH LARGE AMOUNTS OF WATER AND USE SOAP IF AVAILABLE. REMOVE SEVERELY CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE.

Eye Contact: FLUSH EYES WITH LARGE AMOUNTS OF WATER UNTIL IRRITATION SUBSIDES. CALL FOR MEDICAL ATTENTION IF IRRITATION PERSISTS.

SECTION 8 – PREPARATION INFORMATION

Prepared by: Maxxam Analytics Inc.

Reference: GPSA SI Engineering Data Book

Date Prepared 2010-11-09

This MSDS information was developed for employees, customers and agents of Statoil Canada Ltd. to provide safety information of the described product or material. The information may not be valid or complete if the product or material is used in combination with other products or materials, or in any process. This information is intended for reasonable normal usage and recommended practices, or does underscore the hazard inherent in the nature of the product or material. Although every effort is made to insure accuracy and completeness of the contained information, it is understood that Statoil Canada Ltd. makes no warranty as to the accuracy or completeness of information and assumes no liability or any damage or loss suffered as result of any inaccuracy or incompleteness therein. This information is considered to accurate as of the date of preparation. Updated information will be forwarded to employees, customers or agents, however the reader is invited to contact Statoil Canada Ltd. at the address shown to insure the most up to date information or obtain information related to an unusual or other use.

n. ap. = not applicable
n. av. = not available
calc. = calculated
est. = estimated

015400

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-07-29
Supersedes: 2007-07-09

Class B2 Flammable Liquid

Class D2B Skin Irritation

Class D2A Embryo/Fetotoxicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **SEAL HEAVY CRUDE OIL**
SYNONYMS: Crude oil is a naturally occurring mixture of paraffins, naphthenes, aromatic hydrocarbons, small amounts of sulphur and nitrogen compounds.
PRODUCT USE: Base product for Petroleum Refining.
PRODUCT CODE: **9500-145**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS
Shell Emergency Number 1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER 1-613-996-6666
For general information: 1-800-661-1600
www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Petroleum - Crude Oil	8002-05-9	100	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 1.0	Yes
Hydrogen Sulfide (H2S)	7783-06-4	< 10 ppm	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Mild Hydrocarbon Odour
Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.
Hazards:

Flammable Liquid.
Irritating to skin.
Contains xylene, which may affect fetal development.

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Handling: Eliminate all ignition sources.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid prolonged exposure to vapours.
Wear suitable gloves and eye protection.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wipe excess from skin. Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Avoid inhalation of smoke. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Product will float and can be reignited on surface of water. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat may rupture. Use water to cool fire exposed containers. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Isolate hazard area and restrict access. Wear appropriate breathing apparatus (if applicable) and protective clothing. Eliminate all ignition sources. Handling equipment must be grounded. Avoid direct contact with material. Stop leak only if safe to do so. Dike and contain land spills; contain spills

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to water by booming. Work upwind of spill if it is safe to do so. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Use water fog to knock down vapours; contain runoff. Notify appropriate environmental agency(ies). After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours may accumulate and travel to distant ignition sources and flashback. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Do not pressurize drum containers to empty them. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Hydrogen Sulfide: 1 ppm (STEL: 5 ppm)
Xylene: 100 ppm (STEL: 150 ppm)

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.

Skin Protection: Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Safety showers should be available for emergency use.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour

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cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Mild Hydrocarbon Odour
Boiling Point:	> 25 - 600 °C
Density:	932 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	Not available
pH:	Not available
Flash Point:	Not available
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	251 mm2/s @ 15 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{ow}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon solvents (benzene, ether, chloroform)

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	Thermal decomposition products are highly dependent on combustion conditions.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Petroleum - Crude Oil	LD50 Oral Rat > 4300 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Hydrogen Sulfide (H2S)	LC50 Inhalation Mouse = 673 ppm for 1 hour LC50 Inhalation Rat = 444 ppm for 4 hours

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

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Irritancy:	Based on the ingredients, this product is expected to be irritating to skin.
Feto/Teratogenicity:	High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.
Pre-existing Conditions:	Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity and Mutagenicity:	The International Agency for Research on Cancer (IARC) indicates that there is little evidence for the carcinogenicity in humans of crude oil. Various components of crude oil have been tested independently and have been shown to cause serious long-term effects.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. May cause physical fouling of aquatic and avian organisms.

Biodegradability: Not available.
Bioaccumulation: Not available.
Partition Coefficient (log K_{OW}): Not available

Ingredient:	Toxicological Data
Petroleum - Crude Oil	
Xylene (Mixed Isomers)	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 1 - 10 mg/L.
Hydrogen Sulfide (H2S)	LL50 Rainbow Trout (96hr) < 1 mg/L. EL50 Daphnia Magna (48hr) < 1 mg/L. EL50 - growth rate Algae (72hr) < 1 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1267
Proper Shipping Name	PETROLEUM CRUDE OIL
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	Classification as PG II determined in accordance with TDGR 2.19 (2) (b).
Shipping Description	PETROLEUM CRUDE OIL Class 3 UN1267 PG II

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Classification as PG II determined in accordance with TDGR 2.19 (2) (b).

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2B Skin Irritation Class D2A Embryo/Fetotoxicity
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. Contains xylene, which may affect fetal development.
Handling Statement:	Eliminate all ignition sources. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Avoid prolonged exposure to vapours. Wear suitable gloves and eye protection.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 1 Section 3 Section 4 Section 5 Section 6 Section 7 Section 8 Section 10 Section 11 Section 15

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Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-11-30
Supersedes: 2010-03-31

Class B2 Flammable Liquid

Class D2B Skin Irritation

Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**SHELL SYNTHETIC BLEND**
SYNONYMS:	SSX Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9200-100**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Hydrocracked Residues	64741-75-9	0 - 100	Yes
Gas Oils (Petroleum), Heavy Atmospheric	68783-08-4	0 - 100	Yes
Distillates (Petroleum), Hydrotreated Middle	64742-46-7	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Heavy	64742-48-9	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 10	Yes
Xylene (Mixed Isomers)	1330-20-7	1 - 2	Yes
Benzene	71-43-2	< 1.6	Yes
n-Hexane	110-54-3	< 1	Yes
Toluene	108-88-3	< 1	Yes
Naphtha (petroleum), heavy straight-	64741-41-9	0 - 5	Yes

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Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Ethylbenzene	100-41-4	< 0.1	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.
Contains xylene, which may affect fetal development.
Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Avoid inhalation of vapours.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

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Firefighting Instructions: Flammable. Clear area of unprotected personnel. Do not use a direct stream of water as it may spread fire. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total

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exposure.
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-15 - 590 °C
Density:	860 - 900 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.86 - 0.9
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	16 mm2/s @ 30 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

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Chemically Stable: Yes
Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Hydrocracked Residues	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Gas Oils (Petroleum), Heavy Atmospheric	
Distillates (Petroleum), Hydrotreated Middle	LD50 Dermal Rat > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg
Naphtha (Petroleum), Hydrotreated Heavy	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 3160 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.
Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung

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fibrosis. Myelodysplastic syndrome (MDS) has been observed in people exposed to very high levels (50 to 300 ppm) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products*

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***Regulations* (CPR) and the MSDS contains all the information required by the CPR.**

WHMIS Class:	Class B2 Flammable Liquid Class D2B Skin Irritation Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. May cause cancer. Contains xylene, which may affect fetal development.
Handling Statement:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Avoid inhalation of vapours.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 2 Section 8 Section 11 Section 15

015413

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2011-08-25
Supersedes: 2008-09-03

Class D1A Very Acutely Toxic Material

Class B2 Flammable Liquid
Class B1 Flammable Gas

Class D2A Carcinogenicity
Class D2A Embryo/Fetotoxicity
Class D2B Chronic Toxic Effects

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: **SOUR PRODUCED GAS, SOUR PRODUCED WATER, SOUR CRUDE OIL**
PRODUCT USE: Gas plant intermediate
PRODUCT CODE: **9050-122**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Liquid and gas phases Rotten egg odour
Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Hazards:

Exposure to hydrogen sulphide can result in irritation to eyes and respiratory tract.
Hydrogen sulphide acts as a cellular poison and overexposure may result in loss of consciousness and possible death.
Compressed Gas.
Flammable Liquid.
Flammable Gas.
Contains Hydrogen Sulfide.
Single high level exposures may lead to immediate and serious health effects.
Contains Benzene.
May cause cancer.
Contains xylene, which may affect fetal development.
Prolonged exposure may cause serious health effects.
Exposure to this product can produce damage to the:
Nervous system.

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May be irritating to eyes.
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
May be absorbed by skin contact. Overexposure to hydrogen sulphide can result in irritation of the skin.
Inhaled H2S may cause central nervous system depression resulting in headache, dizziness, nausea, unconsciousness, and death. Supplied air respiratory protection must be worn if the airborne H2S concentration is greater than 20 ppm. Hydrogen sulphide, at 150 ppm or greater, may deaden sense of smell. Hydrogen sulphide (H2S) may arise from excessive heating, agitation or from contact with acids or acid salts. Excessive exposure to benzene may cause leukemia in man.

Handling: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
Minimize skin contact.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Methane	74-82-8	1 - 76	Yes
Hydrocarbons, C6 - C30	69430-33-7	1 - 75	Yes
Ethane	74-84-0	1 - 12	Yes
Propane	74-98-6	1 - 5	Yes
Xylene (Mixed Isomers)	1330-20-7	1 - 5	Yes
Butane (n-Butane)	106-97-8	1 - 5	Yes
Benzene	71-43-2	0.1 - 1	Yes
Hydrogen Sulfide (H2S)	7783-06-4	< 50 ppm	Yes

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. Obtain medical attention as soon as possible after first aid has been initiated and completed.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY.
Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Take proper precautions to ensure your own safety before attempting rescue. Obtain medical attention immediately.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the

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lungs producing chemical pneumonitis. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered. At high concentrations, hydrocarbon gases may cause cardiac sensitization and arrhythmia. This effect may be enhanced by stress and hypoxia. Administration of oxygen is recommended.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Carbon Dioxide Dry Chemical Foam Water Fog
Firefighting Instructions:	Flammable. Extremely toxic. Evacuate hazard area. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Allow gas to burn if flow cannot be shut off safely. Fight fire from maximum distance. Avoid breathing vapours. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Collects in lower, poorly ventilated areas. Vapours may travel along ground and flashback along vapour trail may occur. Use water fog to disperse vapours. Containers exposed to intense heat may rupture. Use water to cool fire exposed containers. Exposure to these gases can cause severe lung damage and may cause death. Avoid inhalation of smoke.
Hazardous Combustion Products:	Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion. Oxides of sulphur on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Be alert for the presence of hydrogen sulphide gas. Eliminate all ignition sources. Isolate hazard area and restrict access. Wear appropriate breathing apparatus (if applicable) and protective clothing. Avoid direct contact with material. Handling equipment must be grounded. Stop leak only if safe to do so. Dike and contain land spills; contain spills to water by booming. Use water fog to knock down vapours; contain runoff. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Notify appropriate environmental agency(ies). After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Use buddy system; avoid working alone. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Hydrogen sulphide may readily cause pipes and valves to corrode or become brittle. Do not pressurize drum containers to empty them. Provide adequate ventilation. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Protect against physical damage to containers.

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Xylene: 100 ppm (STEL: 150 ppm)
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.
Hydrogen Sulfide: 1 ppm (STEL: 5 ppm)
n-Hexane (skin): 50 ppm
Toluene: 20 ppm
Aliphatic Hydrocarbon Gases Alkane (C1 - C4): 1000 ppm

Mechanical Ventilation:	Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.
Skin Protection:	Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. Impervious clothing (apron, coveralls) should also be worn in confined workspaces or where the risk of skin exposure is much higher. Safety showers should be available for emergency use.
Respiratory Protection:	If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH-approved respirator. Supplied air respiratory protection must be worn if the airborne H2S concentration is greater than 10 ppm. Avoid working alone; use the buddy system.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid and gas phases
Odour:	Rotten egg odour
Odour Threshold:	Not available
Freezing/Pour Point:	Not available
Boiling Point:	Not available

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Density:	799 - 837 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	Not available
pH:	Not available
Flash Point:	Not available
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	Not available
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Negligible
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition may emit toxic and corrosive fumes of sulfur oxides.
Incompatible Materials:	Avoid contact with strong oxidizing agents and acids. Avoid Metal oxides Metals.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources. May explode if ignited in an enclosed area.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Methane	
Hydrocarbons, C6 - C30	
Ethane	
Propane	LD50 Dermal Rat = 658 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Butane (n-Butane)	LC50 Inhalation Mouse = 680000 mg/m3 for 2 hours LC50 Inhalation Rat = 658000 mg/m3 for 4hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Hydrogen Sulfide (H2S)	LC50 Inhalation Mouse = 673 ppm for 1 hour LC50 Inhalation Rat = 444 ppm for 4 hours

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

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Formulation: No data is specifically available for this product and therefore this toxicological information is based on data available for the ingredients. This product contains n-hexane.

Acute Toxicity: Exposure to hydrogen sulphide can result in irritation to eyes and respiratory tract. Hydrogen sulphide acts as a cellular poison and overexposure may result in loss of consciousness and possible death.

Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated exposure may cause serious injury to blood forming organs, resulting in anemia and similar conditions. Prolonged exposure over a period of weeks or months to levels well above the TLV may cause neurotoxic disease, with symptoms including weakness and lack of sensation in hands and feet. Peripheral neurotoxicity has been reported in connection with over exposure to n-hexane. Peripheral nerve damage may be evidenced by muscular weakness and loss of sensation in the arms and legs.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

Carcinogenicity and Mutagenicity: This product contains benzene. Carcinogenic hazard. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Notify authorities if any exposure to the general public or environment occurs or is likely to occur. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities.

Biodegradability: Not available.
Rapid volatilization.

Bioaccumulation: Not available.

Partition Coefficient (log K_{ow}): Not available

Aquatic Toxicity: Product is expected to be toxic to aquatic organisms.

Ingredient:	Toxicological Data
Methane	LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 Daphnia Magna (48hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.
Hydrocarbons, C6 - C30	
Ethane	LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 Daphnia Magna (48hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.

Propane	EL50 Daphnia Magna (48hr) > 100 mg/L. LL50 Rainbow Trout (96hr) > 100 mg/L. EL50 - growth rate Algae (72hr) > 100 mg/L.
Xylene (Mixed Isomers)	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 1 - 10 mg/L.
Butane (n-Butane)	LC50 Inhalation Rainbow Trout (96hr) 10 - 100 mg/L. EL50 - growth rate Daphnia Magna (48hr) 10 - 100 mg/L.
Benzene	LL50 Rainbow Trout (96hr) 1 - 10 mg/L. EL50 Daphnia Magna (48hr) 10 - 100 mg/L. EL50 - growth rate Algae (72hr) 10 - 100 mg/L.
Hydrogen Sulfide (H2S)	LL50 Rainbow Trout (96hr) < 1 mg/L. EL50 Daphnia Magna (48hr) < 1 mg/L. EL50 - growth rate Algae (72hr) < 1 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred into water and the insoluble portions are removed. The remaining solution is the water accommodated fraction.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:
THE TDG classification for this product is not available.

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:
Class D1A Very Acutely Toxic Material
Class B2 Flammable Liquid
Class B1 Flammable Gas
Class D2A Carcinogenicity
Class D2A Embryo/Fetotoxicity
Class D2B Chronic Toxic Effects

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: Provincial criteria are likely and should be requested when notifying provincial authorities. The regulatory information is not intended to be

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comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Compressed Gas. Flammable Liquid. Flammable Gas. Contains Hydrogen Sulfide. Single high level exposures may lead to immediate and serious health effects. Contains Benzene. May cause cancer. Contains xylene, which may affect fetal development. Prolonged exposure may cause serious health effects. Exposure to this product can produce damage to the: Nervous system.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames. Minimize skin contact.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention IMMEDIATELY.
Revisions:	This MSDS has been reviewed and updated.

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SUNCOR ENERGY | ÉNERGIE

SUNCOR OSA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSA

Product type : Suncor Product
MSDS Number : V00000000948
Synonyms : Sweet Crude Oil, Blended Synthetic Oil, Petroleum Crude

Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc., Oil Sands
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3
Telephone : (780)790-7001

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	60 - 70 %
FUEL, DIESEL NO.2	68476-34-6	10 - 25 %
Naphtha (oil sand), hydrotreated	128683-33-0	10 - 25 %
BUTANE	106-97-8	0 - 3 %

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Avoid breathing vapors, mist or gas.Vapor

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

accumulation could flash and/or explode if in contact with open flame.Exposure to fire can generate highly toxic fumes.

Potential Health Effects

Eyes	:	May cause eye irritation.
Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness.
Ingestion	:	Ingestion may cause irritation to mucous membranes. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	May damage the peripheral nervous system. Symptoms include tingling sensations in fingers and toes and muscle weakness.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	ACGIH A3 - Confirmed Animal Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek medical advice. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	< -35 °C (< -31 °F) Method: ASTM D 93
Autoignition temperature	:	247 °C (477 °F) Method: ASTM E659
Lower explosion limit	:	0.41 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical, Water fog.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition.

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Ensure adequate ventilation.
Turn off source, if possible.
Soak up with inert absorbent material.
Keep in suitable, closed containers for disposal.

SECTION 7: HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn.
Hand protection	:	Wear gloves as a standard industrial handling procedure. The following materials are acceptable: Neoprene Nitrile rubber
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

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Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

FUEL, DIESEL NO.2	68476-34-6	CAD ON OEL	TWA	100 mg/m3	
		Expressed as		as total hydrocarbons	
		Form of exposure		Vapor and aerosol.	
		ACGIH	TWA	100 mg/m3	
		Expressed as		as total hydrocarbons	
		Form of exposure		Vapor and aerosol.	
BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3
		CAD ON OEL	TWA	1,000 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	amber
Odour	:	Petroleum Spirits
Physical state	:	liquid
Boiling point/boiling range	:	30 - 550 °C (86 - 1,022 °F) Method: ASTM D6352
Evaporation rate	:	1.1 compared to Butyl Acetate
Density	:	0.86 - 0.87 g/cm3
Specific gravity	:	0.86 - 0.87
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: < 1
Viscosity, kinematic	:	4.4 mm2/s at 30 °C (86 °F)

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3.5 mm2/s at 40 °C (104 °F)

2.9 mm2/s at 50 °C (122 °F)
Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	static charge will ignite rising vapor
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide Hydrocarbons
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	There is no data available for this product.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	: **PETROLEUM CRUDE OIL**
	UN-Number	: 1267
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-Number	: 1267
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3

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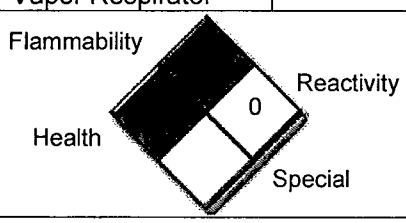
	Packaging group	:	I
	ADR/RID-Labels	:	3
	Packing instruction (cargo aircraft)	:	303
	Packing instruction (passenger aircraft)	:	302
IMDG	Substance No.	:	UN 1267
	Description of the goods	:	PETROLEUM CRUDE OIL
	Class	:	3
	Packaging group	:	I
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 05/31/2012

References : This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the

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SUNCOR ENERGY | ÉNERGIE

CPR.

Validation date of previous version	:	06/16/2009
General contact information	:	B. Burrell: (519) 383-3657

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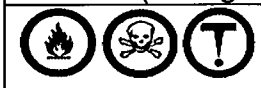
SUNCOR ENERGY

Material Safety Data Sheet

SUNCOR OSB

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1A - Materials causing immediate and serious toxic effects, Very Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSB
Product type : Suncor Product
MSDS Number : V00000003973
Synonyms : Sour Bitumen Blend
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	40 - 60 %
Light Vacuum Gas Oil	64741-58-8	25 - 40 %
Naphtha (oil sand)	128683-32-9	10 - 20 %
Naphtha (oil sand), hydrotreated	128683-33-0	10 - 20 %
HYDROGEN SULPHIDE	7783-06-4	0 - 40 PPM
sec-Butyl Mercaptan	513-53-1	50 - 300 PPM
1-Propanethiol	107-03-9	30 - 120 PPM
ETHANETHIOL	75-08-1	30 - 120 PPM
Isopropyl Mercaptan	75-33-2	20 - 80 PPM
Butyl Mercaptan	109-79-5	15 - 60 PPM

015430

METHANETHIOL	74-93-1	5 - 30 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : May cause eye irritation.
Liquid may cause severe irritation, reddening and swelling.

Skin : Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
May cause irritation, drying and blistering.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : Chronic exposure causes drying effect on the skin and eczema.
May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
May cause kidney damage and enlargement of the liver.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system

Carcinogenic Effects	:	There is no data available for this product.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated8 - 175 °C (46 - 347 °F)
Lower explosion limit	:	Note: no data available
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene
Skin and body protection	:	Wear as appropriate: Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
Physical state	:	liquid
Vapour pressure	:	11.8 kPa Method: ASTM D 323A
Density	:	0.92 - 0.94 g/cm3
Specific gravity	:	0.92 - 0.94
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1
Viscosity, kinematic	:	63.5 mm2/s at 40 °C (104 °F) 268.5 mm2/s at 15.5 °C (59.9 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation	:	rabbit Result: Mild skin irritation Method: OECD Test Guideline 404 Exposure time: 4 h Test substance: Bitumen
Eye irritation	:	rabbit Result: slight irritation Method: OECD Test Guideline 405

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : no data available

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT

Proper shipping name	: Flammable liquid, n.o.s.
UN-No.	: 1993
Class	: 3
Packing group	: II

TDG

Proper shipping name	: Flammable liquid, n.o.s.
UN-No.	: 1993
Class	: 3
Packing group	: II

IATA

UN Number	: 1993
Description of the goods	: Flammable liquid, n.o.s.
Class	: 3
Packaging group	: II
ADR/RID-Labels	: 3
Packing instruction (cargo aircraft)	: 307
Packing instruction (passenger aircraft)	: 305
Packing instruction (passenger aircraft)	: Y305

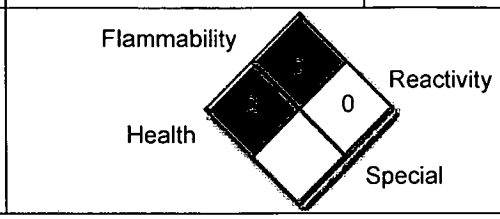
IMDG

Substance No.	: UN 1993
Description of the goods	: Flammable liquid, n.o.s.
Class	: 3
Packaging group	: II
ADR/RID-Labels	: 3
EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0

Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1A - Materials causing immediate and serious toxic effects, Very Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed on TSCA

Light Vacuum Gas Oil	64741-58-8
HYDROGEN SULPHIDE	7783-06-4
sec-Butyl Mercaptan	513-53-1
1-Propanethiol	107-03-9
ETHANETHIOL	75-08-1
Isopropyl Mercaptan	75-33-2
Butyl Mercaptan	109-79-5
METHANETHIOL	74-93-1

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/13/2007

References : Maxxam Analytics Inc. analysis, 2002
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY

SUNCOR OSC

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSC
Product type : Suncor Product
MSDS Number : V00000005743
Synonyms : Sweet Crude Oil, Synthetic Crude Oil, Petroleum Crude
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Gas oils (oil sand), hydrotreated	128683-29-4	0 - 100 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 100 %
DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE	64742-46-7	0 - 100 %
BUTANE	106-97-8	0 - 3 %

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Highly flammable.Avoid breathing vapors, mist or gas.Vapor accumulation could flash and/or explode if in contact with open flame.Exposure to fire can generate highly toxic fumes.

Potential Health Effects

Eyes	:	May cause eye irritation.
Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness.
Ingestion	:	Ingestion may cause irritation to mucous membranes. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	May damage the peripheral nervous system. Symptoms include tingling sensations in fingers and toes and muscle weakness.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	No data is available on the product itself.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk

of aspiration.
Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated< -35 °C (< -31 °F)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Vapors can accumulate and travel to distant ignition sources and flash back. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical, Water fog.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing

measures and use conductive hose material.

Storage

Advice on mixed storage : Store in a cool, well ventilated area away from incompatible materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection : Chemical resistant goggles must be worn.

Hand protection : Wear suitable gloves.
The following materials are acceptable:
Neoprene
Nitrile rubber

Skin and body protection : Wear as appropriate:
Long sleeved clothing
A neoprene or nitrile rain suit may be needed in certain situations.
(e.g., vessel cleaning).

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit.
Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Use an air-supplied or self-contained breathing apparatus in confined spaces or in emergency or high-exposure situations.

Hygiene measures : Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BUTANE	106-97-8	CAD AB OEL	TWA	800 ppm	1,900 mg/m3
		NIOSH	REL	800 ppm	1,900 mg/m3
		ACGIH	TWA	1,000 ppm	
		CAD ON OEL	TWA	800 ppm	1,900 mg/m3

CAD ON OEL TWA 1,000 ppm

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	amber
Odour	:	Petroleum Spirits
Physical state	:	liquid
Boiling point/range	:	Estimated 30 - 550 °C (86 - 1,022 °F)
Vapour pressure	:	Note: no data available
Density	:	Estimated 0.71 - 0.91 g/cm3
Specific gravity	:	Estimated 0.71 - 0.91
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	static charge will ignite rising vapor
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide Hydrocarbons
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	No data is available on the product itself.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

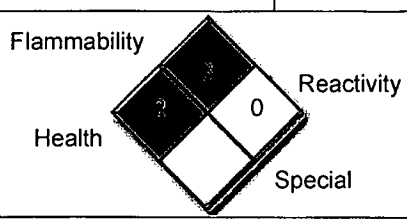
Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-No.	: 1267
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-No.	: 1267
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 303
	Packing instruction (passenger aircraft)	: 302
IMDG	Substance No.	: UN 1267
	Description of the goods	: PETROLEUM CRUDE OIL
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed on TSCA

DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE	64742-46-7
BUTANE	106-97-8

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/14/2007

References : Information derived from component Material Safety Data Sheets

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY

Material Safety Data Sheet

SUNCOR OSH

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSH
Product type : Suncor Product
MSDS Number : V00000003972
Synonyms : Sour Crude Blend, Sour Crude Oil
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc., Oil Sands
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3
Telephone : (780) 790-7001 (24-hr)

EMERGENCY CONTACT INFORMATION

(780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
GAS OILS (PETROLEUM), HEAVY VACUUM	64741-57-7	75 - 85 %
Naphtha (oil sand), hydrotreated	128683-33-0	8 - 15 %
Light Vacuum Gas Oil	64741-58-8	0 - 15 %
HYDROGEN SULPHIDE	7783-06-4	0 - 20 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Flammable.May liberate highly toxic and flammable hydrogen sulfide gas.Avoid breathing vapors, mist or gas.

015446

Potential Health Effects

Eyes	:	May cause eye irritation. Liquid may cause severe irritation, reddening and swelling.
Skin	:	May cause irritation, drying and blistering. Can be absorbed through the skin in toxic amounts resulting in vomiting, diarrhea, and respiratory disorders.
Inhalation	:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness. May cause respiratory tract irritation. Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath. In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Chronic Exposure	:	May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory. May cause kidney damage and enlargement of the liver. Chronic exposure causes drying effect on the skin and eczema.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	There is no data available for this product.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Seek medical advice.

Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5: FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: ASTM D 93
Autoignition temperature	:	267 °C (513 °F) Method: ASTM E659
Lower explosion limit	:	0.35 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	sulfur dioxide, nitrogen oxides, Hydrogen sulphide, carbon monoxide, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO_2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene polyvinyl alcohol
Skin and body protection	:	Wear as appropriate: Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Physical state	:	liquid
Boiling point/range	:	35 - 600 °C (95 - 1,112 °F) Method: ASTM D6352

Vapour pressure	:	18.4 kPa Method: ASTM D 323A
Density	:	0.9 - 0.94 g/cm3
Specific gravity	:	0.9 - 0.94
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: < 1
Viscosity, kinematic	:	35.4 mm2/s at 30 °C (86 °F)
		22.5 mm2/s at 40 °C (104 °F)
		14.6 mm2/s at 50 °C (122 °F)

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Further information	:	There is no data available for this product.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

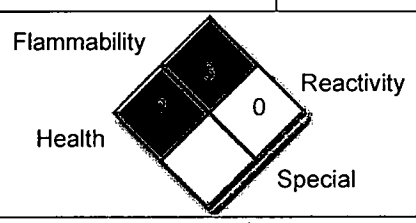
SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
	UN-No.	:	1268
	Class	:	3

	Packing group	: II
TDG	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-No.	: 1268
	Class	: 3
	Packing group	: II
IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 307
	Packing instruction (passenger aircraft)	: 305
	Packing instruction (passenger aircraft)	: Y305
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status	: Listed on TSCA	
	GAS OILS (PETROLEUM), HEAVY VACUUM	64741-57-7
	Light Vacuum Gas Oil	64741-58-8
	HYDROGEN SULPHIDE	7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 02/20/2007

References : The Petroleum HPV Testing Group, Test Plan Heavy Fuel Oils Category, June 17, 2004
Suncor lab data, August 1998 (R. Blackmore).
Core Lab data (Sept 16, 1999).
Maxxam data (May 18, 1999).
Maxxam Analytics Inc. Laboratory Analysis 2006
Kidde Fenwal Combustion Research Center Laboratory Analysis 2006
Kidde Fenwal Combustion Research Centre Laboratory Analysis 2007

General contact information : B. Burrell: (519) 383-3657

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SUNCOR ENERGY | ÉNERGIE TM/MC

SUNCOR OSY

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSY

Product type : Suncor Product
MSDS Number : OS0000000013
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	10 - 65 %
DISTILLATES (PETROLEUM), HEAVY THERMAL CRACKED	64741-81-7	5 - 55 %
Naphtha (oil sand)	128683-32-9	15 - 35 %
SULPHUR	7704-34-9	1 - 5 %
Xylene, All Isomers	1330-20-7	0.1 - 1 %
TOLUENE	108-88-3	0.1 - 1 %
BENZENE	71-43-2	0.1 - 0.5 %
sec-Butyl Mercaptan	513-53-1	150 - 450 PPM
ETHANETHIOL	75-08-1	90 - 180 PPM
1-Propanethiol	107-03-9	90 - 180 PPM

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Isopropyl Mercaptan	75-33-2	60 - 120 PPM
HYDROGEN SULPHIDE	7783-06-4	<= 100 PPM
n-Butyl Mercaptan	109-79-5	45 - 90 PPM
METHANETHIOL	74-93-1	15 - 45 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Extremely flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : Causes eye irritation.

Skin : Causes skin irritation.
Sulfur may cause skin allergy.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
Chronic exposure causes drying effect on the skin and eczema.

Primary Routes of Entry : Inhalation
Eye contact
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system
Blood
Skin

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Carcinogenic Effects	:	IARC Group 2A - Probable human carcinogen Contains benzene. IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek medical advice. Wash contaminated clothing before reuse. Thoroughly clean shoes before reuse.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: ASTM D 93
Autoignition temperature	:	253 °C (487 °F) Method: ASTM E659
Lower explosion limit	:	0.39 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.

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Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials.

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Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear gloves as a standard industrial handling procedure. The following materials are acceptable: Nitrile rubber Neoprene polyvinyl alcohol
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BITUMEN	128683-24-9		5 mg/m3
		Expressed as	Bitumen fume
		Remarks	OEL Established in agreement with Alberta Occupational Health and Safety, and Suncor Energy

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SULPHUR	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
Xylene, All Isomers	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
TOLUENE	108-88-3	CAD AB OEL	TWA	50 ppm	188 mg/m3
		ACGIH	TWA	20 ppm	
		NIOSH	REL	100 ppm	375 mg/m3
		NIOSH	STEL	150 ppm	560 mg/m3
		OSHA Z2	TWA	200 ppm	
		OSHA Z2	Ceiling	300 ppm	
		OSHA Z2	MAX. CONC	500 ppm	
		OEL (QUE)	TWA	50 ppm	188 mg/m3
		CAD BC OEL	TWA	20 ppm	
		CAD ON OEL	TWA	20 ppm	
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	

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		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL		10 ppm	
		CAD SK OEL		10 ppm	
		CAD SK OEL		15 ppm	
n-Butyl Mercaptan	109-79-5	CAD AB OEL	TWA	0.5 ppm	1.8 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.8 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.8 mg/m3
		OSHA Z1	PEL	10 ppm	35 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	: brown
Odour	: Petroleum-like odor
Physical state	: liquid
Boiling point/boiling range	: -12 - 711 °C (10 - 1,312 °F) Method: ASTM D 5307
Vapour pressure	: 7.9 kPa Method: ASTM D 323A
Density	: 0.89 - 0.94 g/cm3
Specific gravity	: 0.89 - 0.94
Water solubility	: insoluble
Partition coefficient: n-octanol/water	: POW: < 1
Viscosity, kinematic	: 62 mm2/s at 30 °C (86 °F) 40 mm2/s at 40 °C (104 °F) 26 mm2/s at 50 °C (122 °F) Method: ASTM D 445

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide Hydrogen sulphide polycyclic aromatic hydrocarbons
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 Rat Dose: 5,000 mg/kg Test substance: Petroleum distillates
Acute dermal toxicity	:	LD50 Rabbit Dose: > 2,000 mg/kg Test substance: Petroleum distillates
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide LC 50 Exposure time: 4 h Dose: 13700 ppm Test substance: Benzene

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

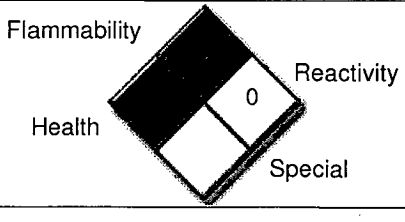
DOT Proper shipping name : **PETROLEUM DISTILLATES, N.O.S.**

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

	UN-Number	: 1268
	Class	: 3
	Packing group	: I
TDG	Proper shipping name	: PETROLEUM DISTILLATES, N.O.S.
	UN-Number	: 1268
	Class	: 3
	Packing group	: I
IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 303
	Packing instruction (passenger aircraft)	: 302
IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: I
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TM/MC Marque de commerce de Suncor Énergie Inc. – Trademark

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 01/08/2013

References : This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Validation date of previous version : 04/16/2009

General contact information : B. Burrell: (519) 383-3657

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ConocoPhillips

Surmont Phase 1 Synbit Sales Oil (Canada)

Material Safety Data Sheet

1. Product and Company Identification

Product Name:	Surmont Phase 1 Synbit Sales Oil (Canada)
MSDS Number:	778998
Synonyms:	Sales Oil
Intended Use:	Feedstock
Manufacturer/Supplier:	ConocoPhillips Canada Limited or its Affiliates PO Box 130, 401 9th Ave. SW Calgary, Alberta T2P 2H7 Canada
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	403-233-4000
Technical Information:	403-233-4000
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. Hazards Identification

Emergency Overview

WARNING!

Flammable Liquid and Vapor
Possible Cancer Hazard (Component)
Target Organ Hazard (Component)

NFPA

Appearance: Dark brown
Physical Form: Liquid
Odor: Petroleum

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin, and possibly dermatitis (inflammation). No harmful effects from skin absorption have been reported.

Inhalation (Breathing): Low to moderate degree of toxicity by inhalation.

Ingestion (Swallowing): No harmful effects reported from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Other Comments: This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Pre-Existing Medical Conditions: Conditions which may be aggravated by exposure include skin disorders, respiratory (asthma-like) disorders and nervous system disorders.

See Section 11 for additional Toxicity Information.

3. Composition / Information on Ingredients

Component	CASRN	Concentration*
Crude Oil (Petroleum)	8002-05-9	100
Benzene	71-43-2	<2
Ethyl Benzene	100-41-4	<1
Naphthalene	91-20-3	<1

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

5. Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 3 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

6. Accidental Release Measures

Personal Precautions: Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons and shipping down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802). If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents).

7. Handling and Storage

Precautions for safe handling: Do not eat, drink, or smoke when using this product. Wash thoroughly after handling. Do not breathe vapors or mists. Use good personal hygiene practices and wear appropriate personal protective equipment. Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Use only non-sparking tools.

Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Conditions for safe storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

8. Exposure Controls / Personal Protection

Component	US-ACGIH	OSHA	Other
Crude Oil (Petroleum)	---	---	TWA:100 mg/m^3 - 8 hr. ConocoPhillips (ConocoPhillips Guidelines)
Benzene	STEL: 2.5 ppm Skin TWA: 0.5 ppm	Ceiling: 25 ppm STEL: 5 ppm TWA: 1 ppm TWA: 10 ppm	---
Ethyl Benzene	STEL: 125 ppm TWA: 100 ppm	TWA: 435 mg/m^3 TWA: 100 ppm	---
Naphthalene	STEL: 15 ppm Skin TWA: 10 ppm	TWA: 10 ppm TWA: 50 mg/m^3	TWA: 0.2 mg/m^3 (as total of 17 PNA's measured by NIOSH Method 5506) (ConocoPhillips Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Dark brown
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	25.6 kPa @ 104°F / 40°C
Vapor Density (air=1):	>1
Boiling Point/Range:	13155
Melting/Freezing Point:	-33°F / -36°C
Solubility in Water:	Insoluble
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.913 @ 60°F (15.6°C)
Viscosity:	180.66 mPa°s @ 15°C; 43.21 mPa°s @ 40°C
Percent Volatile:	Varies
Evaporation Rate (nBuAc=1):	No data
Molecular Weight:	277.2 g/mole
Flash Point:	<43°F / <6°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL (vol % in air):	0.6
UEL (vol % in air):	15.0
Autoignition Temperature:	>752°F / >400°C

10. Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. Toxicological Information

Chronic Toxicity:

Crude Oil (Petroleum)

Carcinogenicity: Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. IARC concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Reproductive Toxicity: Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Xylenes

Target Organs: Rats exposed to 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP, or OSHA.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Acute Toxicity:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Crude Oil (Petroleum)	> 5 g/kg	> 2 g/kg	> 5 mg/L

Component	Oral LD50	Dermal LD50	Inhalation LC50
Xylenes	4300 mg/kg	>3.16 ml/kg	5000 ppm/4 hr
Toluene	5.6 g/kg	12.4 g/kg	28.1 mg/L
Benzene	3.3 g/kg	> 9.4 g/kg	45 mg/L
Ethyl Benzene	3500 mg/kg, 4.7 g/kg (Rat)	17,800 mg/kg, 77.4 g/kg (Rabbit)	4000 ppm/4 hr.; 13367 ppm (Rat)
Naphthalene	> 2 g/kg	>2.5 g/kg	> 1 mg/L

12. Ecological Information

Ecotoxicity: Experimental studies of acute aquatic toxicity show values for crude oil in the range of 10 to over 100 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. Should be regarded as harmful to aquatic organisms - may cause long term adverse effects in the aquatic environment.

Mobility: Crude oil spreads as a film on the surface of water, facilitating loss of its lighter components by volatilization. In air, the volatile hydrocarbons are photodegraded by reaction with hydroxyl radicals with half-lives varying from 0.5 days for n-dodecane to 6.5 days for benzene. The lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from water involving the heavier fraction is agglomeration to form tars, some of which sink.

Persistence and degradability: Most crude oils are not regarded as readily biodegradable. Most of the non-volatile constituents are inherently biodegradable; some of the highest molecular weight components are persistent in water.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 2 to over 6, and therefore regarded as having the potential to bioaccumulate.

13. Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

14. Transportation Information

Canadian (TDG)

Shipping Description:	UN1267, Petroleum crude oil, 3, II
Small Means of Containment	
Package Marking:	Petroleum crude oil, UN1267
Package Labeling:	Flammable liquid
Large Means of Containment	
Package Placard/Marking:	Flammable liquids / 1267
ERAP Index:	None
Emergency Response Guide:	128

U.S. Department of Transportation (DOT)

Shipping Description:	Petroleum crude oil, 3, UN1267, II
Non-Bulk Package Marking:	Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	Flammable liquid
Bulk Package/Placard Marking:	Flammable / 1267
Packaging - References:	49 CFR 173.150; 173.202; 173.242 ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s

14. Transportation Information

Emergency Response Guide: 128
Note: ***Shipping description may be modified by placing the UN or NA number as the first element. This order becomes mandatory on January 1, 2013.***

International Maritime Dangerous Goods (IMDG)

Shipping Description: UN1267, Petroleum crude oil, 3, II, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking: Petroleum crude oil, UN1267
Labels: Flammable liquid
Placards/Marking (Bulk): Flammable / 1267
Packaging - Non-Bulk: P001
EMS: F-E, S-E

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: UN1267
Proper Shipping Name: Petroleum crude oil
Hazard Class/Division: 3
Packing Group: II
Non-Bulk Package Marking: Petroleum crude oil, UN1267
Labels: Flammable liquid
ERG Code: 3L

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	Y305	305	307
Max. Net Qty. Per Package:	1 L	5 L	60 L

15. Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: No
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration*	de minimis
Xylenes	<6	1.0%
Toluene	<3	1.0%
Benzene	<2	0.1%
Ethyl Benzene	<1	0.1%
Naphthalene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant

Component	Type of Toxicity
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Ethyl Benzene	Cancer
Naphthalene	Cancer

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: 1C981

16. Other Information

Date of Issue:	09-Feb-2009
Status:	Final
Revised Sections or Basis for Revision:	New MSDS
MSDS Number:	778998

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Syncrude
Securing Canada's Energy Future

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT: **Synthetic Crude Oil** **SAN 0930**
Syncrude Sweet Blend; Syncrude Sweet Premium

MANUFACTURER:
Syncrude Canada Ltd.
P.O. Bag 4009
Fort McMurray, AB
Canada T9H 3L1
Emergency Telephone No. (780) 790-5094

SYNONYMS: Synthetic Crude Oil; SSB; SSP
Syncrude sample Tag # 200000

PRODUCT USE: Refinery feedstock for petroleum and petrochemical refining.

PREPARED BY: Industrial Hygiene
(780) 790-5249

DATE OF PREPARATION/REVISION: November 28, 2012

2. COMPOSITION, INFORMATION ON INGREDIENTS

CAS #: 8002-05-9

A low sulfur blend of treated naphtha, light gas oil, and heavy gas oil petroleum fractions derived from bitumen. It consists predominantly of paraffins, cyclic paraffins, and cyclic aromatic hydrocarbons having carbon numbers predominantly in the range of C3 to C50, boiling between -20 and 550 °C. It may also contain small amounts of benzene and oxygenated compounds.

Hazardous Ingredients	Composition	CAS #
Benzene	0.2 Wt.%	CAS # 71-43-2

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A yellow, translucent, slightly viscous liquid with a hydrocarbon odour. Extremely flammable. Crude oil can cause eye, skin, gastrointestinal, and respiratory tract irritation. May cause serious health effects if inhaled or swallowed. Aspirated crude oil is a threat to life.

ROUTE OF ENTRY: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

EFFECTS OF ACUTE EXPOSURE:

EYES: May cause irritation.

015472

SKIN: May cause irritation. May cause moderate inflammatory redness, fluid build-up, and slight burning on exposed skin. May damage the liver and kidneys.

INGESTION: May cause irritation and inflammation of the gastrointestinal tract. May cause vomiting, bloating, weight loss, mild mental depression, decreased plasma glucose level, nausea, diarrhea, and abdominal pain. May cause liver and kidney damage. May cause excitement of the central nervous system, as expressed by jerking eye movements, muscle tremors, and short sudden seizures. May affect blood clotting and cellular respiration. May affect reproduction, and cause developmental effects.

Ingestion of crude oil may result in aspiration into the lungs. Symptoms of aspiration may include coughing, choking, shortness of breath, increased respiration, chemical pneumonitis, and pulmonary edema. Liver and kidney damage can occur following aspiration.

INHALATION: Inhalation of crude oil may cause respiratory tract irritation. May cause central nervous system depression, chemical pneumonitis, respiratory arrest, euphoria, and cardiac dysrythmia. May damage the liver, kidneys, and lungs.

EFFECTS OF CHRONIC EXPOSURE:

EYES: Effects not reported.

SKIN: May cause irritation characterized by inflammation, dryness, pigmentation, and/or lesions of the hair follicles. May aggravate existing skin conditions. May affect the blood, liver, and kidneys. May cause changes to the skin.

INGESTION: Effects not reported.

INHALATION: May cause irritation.

4. FIRST AID MEASURES

INHALATION: Move victim to uncontaminated area. If breathing has stopped, trained personnel should begin artificial respiration, or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Apply oxygen if available. Obtain medical attention.

EYES: Immediately flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN: Remove contaminated clothing. Wash affected area with soap and water. If irritation persists, seek medical attention.

INGESTION: DO NOT INDUCE VOMITING BECAUSE OF DANGER OF ASPIRATING LIQUID INTO LUNGS. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

GENERAL: In all cases seek medical attention.

5. FIRE FIGHTING MEASURES

FLASH POINT (Tag Closed Cup):	below -20 °C
FLAMMABLE LIMITS IN AIR:	Not available
AUTO-IGNITION TEMPERATURE:	245 °C

FIRE & EXPLOSION HAZARDS:
Flammable near any source of ignition with vapour concentration within explosion limits.

EXTINGUISHING MEDIA:
Class B fire extinguishers: Carbon Dioxide, dry powder, foam, and polymer foam. Water fog can be used by trained fire prevention personnel.

FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Exposed firefighters must wear full bunker gear, including a NIOSH approved positive pressure self-contained breathing apparatus with full-face mask. Shut off sources of fuel and ignition. Stop flow of material, and contain spill. Cover with extinguishing media. Use water spray to cool fire-exposed containers, and as a protective screen. To avoid spreading fire, do not point solid water stream directly into burning material.

6. ACCIDENTAL RELEASE MEASURES

LEAK AND SPILL PROCEDURE:
Shut off all sources of ignition and evacuate area. Ventilate area of spill. Dike large spill with non-flammable material. Absorb on inert material and place in closed container for recycling or disposal. Personal Protective Equipment must be worn by clean-up crew.

7. HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
Avoid prolonged or repeated exposure to vapours. Avoid skin contact. Wash thoroughly after handling. Contact lens may absorb vapours and cause eye irritation.

STORAGE REQUIREMENTS:
Keep away from direct sunlight, heat, flame, or sources of spark. Do not store near oxidizing material. Provide adequate ventilation. Keep containers tightly closed and grounded.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
Ventilate confined space before entry. Provide local exhaust where appropriate to minimize fugitive vapours or mists. Provide adequate general ventilation to dilute vapour concentrations within buildings.

PERSONAL PROTECTIVE EQUIPMENT:

Gloves:	Nitrile or neoprene
Respirator:	NIOSH approved air purifying respirator with organic vapour cartridges and P100 (HEPA) particulate filters at low concentrations (< 1000 ppm).
Eyes:	Safety glasses, monogoggles, or faceshield as determined by task and area owner requirements.
Body:	Wear appropriate protective clothing consistent with area owner and trade specific body protection requirements. Coveralls, apron, rain suit, or disposable coveralls as required.
Footwear:	Standard work boots or rubber boots as determined by task.

EXPOSURE LIMITS:

AB 8-hour OEL total hydrocarbon = 300 ppm
AB 8-hour OEL oil mist = 5 mg/m^3
AB 8-hour OEL benzene = 0.5 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow translucent, slightly viscous
ODOUR: Hydrocarbon odour
PHYSICAL STATE: Liquid
pH: Not applicable
VAPOUR PRESSURE: 3 - 6 psi (Reid Method)
VAPOUR DENSITY (Air = 1): 2.7
FREEZING POINT: -45 °C
BOILING RANGE: -20 to 560 °C
SPECIFIC GRAVITY: 0.85 to 0.87 at 20 °C
EVAPORATION RATE (n-Butyl Acetate = 1): 0.28
COEFFICIENT OF WATER/OIL DISTRIBUTION: Water insoluble, Oil soluble
ODOUR THRESHOLD: Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Avoid exposure to sources of ignition

MATERIALS TO AVOID: Strong oxidizing materials. This material might soften or dissolve some plastics.

HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, carbon monoxide, uncombusted hydrocarbons, soot.

11. TOXICOLOGICAL INFORMATION

LD50: >2 g/kg (dermal) - species not reported
>3.16 g/kg (dermal) - rabbits
>5 g/kg (oral) - mice, rats

LC50: 4 g/m3 (6 hr) - mice

ACUTE:
An acute oral, dermal, ocular and inhalation toxicity study was performed using synthetic crude oil from the Alberta oil sands. No animals (rats and mice) died following a single oral dose of 5 g/kg. No animals (rabbits) died following a single dermal dose of 3.16 g/kg. The rabbits did experience moderate skin irritation (Draize score of 3/8), desquamation, ocular discharge and decreased food consumption. Rabbits experienced slight eye irritation (Draize score of 4/110) with conjunctival redness. Five of 10 mice and no rats died following a 6-hour exposure to 4.0 g/m3. Additional effects following inhalation included extreme hair loss in mice, possible liver and kidney involvement, increased liver weight in mice and female rats and decreased lung weight in female rats. (Reference 1)

CHRONIC:
Observed skin effects among petroleum field workers and crude oil transport workers include dryness, pigmentation, hyperkeratosis, pigmented plane warts, eczematous reaction and follicular lesions.

Two crude oils were dermally applied to rats at doses of 30, 125 and 500 mg/kg (5 day/wk) for 13 weeks. At the 500 mg/kg dose level, observed effects included a reduced weight gain, depressed red blood cell counts, hemoglobin, hematocrit and platelet counts, increased relative and absolute liver weights, decreased absolute and relative thymus weight, changes in the relative kidney, spleen and adrenal weights and atrophy of the thymus. Hyperplasia and an associated dermal inflammatory cell infiltration at the site of application and hypertrophy and hyperplasia of the follicular epithelium in the thyroid gland were observed at all dose levels. (Reference 2)

SENSITIZATION TO PRODUCT:
An acute dermal toxicity study was performed to assess the effect of ultraviolet light on petroleum oil toxicity. Mice were painted with 50 L of oil 5 days per week for 2 weeks. The petroleum oil was found to be non-toxic to the skin of mice, however, the mice that were painted with the oil and then exposed to ultraviolet light for 2 hours experienced some skin damage (distinct erythema). (Reference 3)

CARCINOGENICITY:
Crude oil was applied to the skin of mice (3 times/wk, 6 months followed by 2 times/wk for life) for up to 13 months. Hyperkeratosis was observed at the site of treatment. Many cases of keratotic changes and epithelioma on the exposed skin of workers exposed to crude oil. (Reference 4)

An evaluation of the dermal carcinogenic potential of synthetic crude oil from the Athabasca oil sands was conducted. Mice were dermally applied crude oil three times per week (75 mL/wk) for life. Out of fifty animals 13 developed tumors with a mean latency of 113 weeks. This was significantly different from the controls. The authors concluded that synthetic crude oil from the Athabasca oil sands is a moderately active dermal carcinogen, however, results are consistent with conventional crude oil. (Reference 1)

REPRODUCTIVE TOXICITY:
A single dose (5 mL/kg bw) of crude oil to pregnant rats on gestation days 11, 15 or 17 resulted in induction in both placental and fetal hepatic enzyme systems. (Reference 4)

Oral administration to pregnant rats as a single dose (5 mL/kg bw on gestation days 3, 6, 11, 15 or 17), as a single variable dose (2-10 mL/kg bw on gestation day 6), or as daily doses (1 or 2 mL/kg bw on gestation days 6-17) resulted in significantly increased number of resorptions and decreased fetal weight and length. Daily doses of crude oil also caused a significant reductive in maternal body weight. (Reference 4)

TERATOGENICITY:
Crude oil was dermally applied to pregnant rats on days 0-19 of gestation. Parturition was delayed in the dams at 500 mg/kg. Fetal body weight was decreased at 500 mg/kg and the 4-day viability index was decreased at all dose levels (30, 125 and 500 mg/kg). Also observed were increased in utero death and reduced ossification. (Reference 5)

MUTAGENICITY:
Several studies have reported on the mutagenicity of crude oil to Salmonella typhimurium. Crude oil did not induce mutagenicity either in the presence or absence of an exogenous metabolic system, however, some neutral/aromatic fractions were mutagenic. (Reference 4)

A weak positive result was reported for two crude oil samples in the Syrian hamster embryo cell-transformation assay. (Reference 6)

No significant differences were noted in the number of spontaneous streptomycin-resistant mutants in Chlamydomonas reinhardtii. (Reference 7)

The photomutagenicity of crude oil was assessed using a modification of the Salmonella histidine reversion test. Crude oil was non-mutagenic without the added light and was non-mutagenic in the presence of visible light. (Reference 8)

SYNERGISTIC EFFECTS:
May act as a synergist to pesticides. The combination of crude oil and ultraviolet radiation may potentiate the suppressive effect on Langerhans cell density and contact hypersensitivity. (Reference 9)

Ultraviolet light may increase the severity of the effects to the skin. (Reference 10)

12. ECOLOGICAL INFORMATION

Not available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Recover for reuse and recycling. Comply with relevant regulations with regards to disposal, recycling, treatment, transportation and storage.
This material would be considered a hazardous waste in Alberta due to its low flashpoint.

14. TRANSPORT INFORMATION:

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

Hazard Class: 3 **Packing Group:** I

PRODUCT IDENTIFICATION NUMBER (PIN): UN1268

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.

15. REGULATORY INFORMATION

WHMIS CLASS: B-2, D-2B

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

All compounds in this product are listed in the Canada Domestic Substances List (DSL) and the United States Toxic Substances Control Act (TSCA) Chemical Substance Inventory (1985).

16. OTHER INFORMATION

REFERENCES:

1. McKee, R., W. Stubblefield, S. Lewis, R. Scala, G. Simon and L. DePass. Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids. Fund. and Appl. Toxicol. 7:228-235. 1986.

2. Feuston, M. H., Mackerer, C. R., C. A. Schreiner and C. E. Hamilton. Systemic Toxicity of Dermally Applied Crude Oils in Rats. J. Toxicol. Environ. Health. 51:387-399. 1997.

3. Burnham, K. and M. Bey. Effects of Crude Oil and Ultraviolet Radiation on Immunity Within Mouse Skin. J. Toxicol. Environ. Health. 34(1):83-93. 1991.

4. World Health Organization. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. Lyon. 1988.

5. Kerstetter, S. L. and K. R. Bodnar. Developmental Toxicity of Dermally Applied Crude Oils in Rats. Teratology. 45:500. 1992.

6. Frazier, M. E. and T. K. Andrews, Jr., Transformation of Syrian Hamster Embryo Cells by Synfuel Mixtures. J. Toxicol. Environ. Health. 11(4-6):591-606. 1983.

7. Vandermeulen, J. H. and R. W. Lee. Lack of Mutagenic Activity of Crude and Refined Oils in the Unicellular Alga Chlamydomonas Reinhardtii. Bull. Environ. Contam. Toxicol. 36:250-253.

8. Selby, C., J. Calkins and H. Enoch. Detection of Photomutagens in Natural and Synthetic Fuels. Mutation Research. 124(1):53-60. 1983.

9. Burnham, K. and M. Rahman. Effects of Petrochemicals and Ultraviolet Radiation on Epidermal IA. Expression in Vitro. J. Toxicol. Environ. Health. 35(3):175-185. 1992.

10. Gomer, C. J. and D. M. Smith. Acute Skin Phototoxicity in Hairless Mice Following Exposure to Crude Shale Oil or Natural Petroleum Oil. Toxicol. 18:75-85. 1980.

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Syncrude
Securing Canada's Energy Future

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT: **Syncrude Sweet Blend Crude Oil** **SAN 0930**

MANUFACTURER:

Syncrude Canada Ltd.
P.O. Bag 4009
Fort McMurray, AB
Canada T9H 3L1
Emergency Telephone No. (780) 790-5094

SYNONYMS: Synthetic Crude Oil; SSB
Syncrude sample Tag # 200000

PRODUCT USE: Refinery feedstock for petroleum and petrochemical refining.

PREPARED BY: Nathalie Bérubé
(780) 790-4544

DATE OF PREPARATION/REVISION: March 7, 2006

2. COMPOSITION, INFORMATION ON INGREDIENTS

CAS #: 8002-05-9

A low sulfur blend of treated naphtha, light gas oil, and heavy gas oil petroleum fractions derived from bitumen. It consists predominantly of paraffins, cyclic paraffins, and cyclic aromatic hydrocarbons having carbon numbers predominantly in the range of C3 to C50, boiling between -20 and 550 °C. It may also contain small amounts of benzene and oxygenated compounds.

Hazardous Ingredients	Composition	CAS #
Benzene	0.2 Wt.%	CAS # 71-43-2

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A yellow, translucent, slightly viscous liquid with a hydrocarbon odour. Extremely flammable. Crude oil can cause eye, skin, gastrointestinal, and respiratory tract irritation. May cause serious health effects if inhaled or swallowed. Aspirated crude oil is a threat to life.

ROUTE OF ENTRY: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

EFFECTS OF ACUTE EXPOSURE:

EYES: May cause irritation.

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SKIN: May cause irritation. May cause moderate inflammatory redness, fluid build-up, and slight burning on exposed skin. May damage the liver and kidneys.

INGESTION: May cause irritation and inflammation of the gastrointestinal tract. May cause vomiting, bloating, weight loss, mild mental depression, decreased plasma glucose level, nausea, diarrhea, and abdominal pain. May cause liver and kidney damage. May cause excitement of the central nervous system, as expressed by jerking eye movements, muscle tremors, and short sudden seizures. May affect blood clotting and cellular respiration. May affect reproduction, and cause developmental effects.

Ingestion of crude oil may result in aspiration into the lungs. Symptoms of aspiration may include coughing, choking, shortness of breath, increased respiration, chemical pneumonitis, and pulmonary edema. Liver and kidney damage can occur following aspiration.

INHALATION: Inhalation of crude oil may cause respiratory tract irritation. May cause central nervous system depression, chemical pneumonitis, respiratory arrest, euphoria, and cardiac dysrythmia. May damage the liver, kidneys, and lungs.

EFFECTS OF CHRONIC EXPOSURE:

EYES: Effects not reported.

SKIN: May cause irritation characterized by inflammation, dryness, pigmentation, and/or lesions of the hair follicles. May aggravate existing skin conditions. May affect the blood, liver, and kidneys. May cause changes to the skin.

INGESTION: Effects not reported.

INHALATION: May cause irritation.

4. FIRST AID MEASURES

INHALATION: Move victim to uncontaminated area. If breathing has stopped, trained personnel should begin artificial respiration, or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Apply oxygen if available. Obtain medical attention.

EYES: Immediately flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN: Remove contaminated clothing. Wash affected area with soap and water. If irritation persists, seek medical attention.

INGESTION: DO NOT INDUCE VOMITING BECAUSE OF DANGER OF ASPIRATING LIQUID INTO LUNGS. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

GENERAL: In all cases seek medical attention.

5. FIRE FIGHTING MEASURES

FLASH POINT (Tag Closed Cup): below -20 °C
FLAMMABLE LIMITS IN AIR: Not available
AUTO-IGNITION TEMPERATURE: 245 °C

FIRE & EXPLOSION HAZARDS:
Flammable near any source of ignition with vapour concentration within explosion limits.

EXTINGUISHING MEDIA:
Class B fire extinguishers: Carbon Dioxide, dry powder, foam, and polymer foam. Water fog can be used by trained fire prevention personnel.

FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Exposed firefighters must wear full bunker gear, including a NIOSH approved positive pressure self-contained breathing apparatus with full-face mask. Shut off sources of fuel and ignition. Stop flow of material, and contain spill. Cover with extinguishing media. Use water spray to cool fire-exposed containers, and as a protective screen. To avoid spreading fire, do not point solid water stream directly into burning material.

6. ACCIDENTAL RELEASE MEASURES

LEAK AND SPILL PROCEDURE:
Shut off all sources of ignition and evacuate area. Ventilate area of spill. Dike large spill with non-flammable material. Absorb on inert material and place in closed container for recycling or disposal. Personal Protective Equipment must be worn by clean-up crew.

7. HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
Avoid prolonged or repeated exposure to vapours. Avoid skin contact. Wash thoroughly after handling. Contact lens may absorb vapours and cause eye irritation.

STORAGE REQUIREMENTS:
Keep away from direct sunlight, heat, flame, or sources of spark. Do not store near oxidizing material. Provide adequate ventilation. Keep containers tightly closed and grounded.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
Ventilate confined space before entry. Provide local exhaust where appropriate to minimize fugitive vapours or mists. Provide adequate general ventilation to dilute vapour concentrations within buildings.

PERSONAL PROTECTIVE EQUIPMENT:

Gloves:	Acrylonitrile or neoprene
Respirator:	NIOSH approved air purifying organic vapour at low concentrations (< 1000 ppm)
Eye:	Monogoggles
Footwear:	Not required under normal conditions. Remove and change footwear if contaminated.
Clothing:	Coveralls/apron as required.

EXPOSURE LIMITS:
8-hour OEL= 300 ppm (total hydrocarbon)
8-hour OEL = 5 mg/m^3 (aerosol)
Benzene 8-hour OEL = 1 ppm
Benzene 15-minute OEL = 5 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow translucent, slightly viscous
ODOUR: Hydrocarbon odour
PHYSICAL STATE: Liquid
pH: Not applicable
VAPOUR PRESSURE: 4-5 psi (Reid Method)
VAPOUR DENSITY (Air = 1): 2.7
FREEZING POINT: -45 °C
BOILING RANGE: -20 to 550 °C
SPECIFIC GRAVITY: 0.87 at 20 °C
EVAPORATION RATE (n-Butyl Acetate = 1): 0.28
COEFFICIENT OF WATER/OIL DISTRIBUTION: Water insoluble, Oil soluble
ODOUR THRESHOLD: Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Avoid exposure to sources of ignition

MATERIALS TO AVOID: Strong oxidizing materials. This material might soften or dissolve some plastics.

HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, carbon monoxide, uncombusted hydrocarbons, soot.

11. TOXICOLOGICAL INFORMATION

LD50: >2 g/kg (dermal) - species not reported
>3.16 g/kg (dermal) - rabbits
>5 g/kg (oral) - mice, rats

LC50: 4 g/m3 (6 hr) - mice

ACUTE:
An acute oral, dermal, ocular and inhalation toxicity study was performed using synthetic crude oil from the Alberta oil sands. No animals (rats and mice) died following a single oral dose of 5 g/kg. No animals (rabbits) died following a single dermal dose of 3.16 g/kg. The rabbits did experience moderate skin irritation (Draize score of 3/8), desquamation, ocular discharge and decreased food consumption. Rabbits experienced slight eye irritation (Draize score of 4/110) with conjunctival redness. Five of 10 mice and no rats died following a 6-hour exposure to 4.0 g/m3. Additional effects following inhalation included extreme hair loss in mice, possible liver and kidney involvement, increased liver weight in mice and female rats and decreased lung weight in female rats. (Reference 1)

CHRONIC:
Observed skin effects among petroleum field workers and crude oil transport workers include dryness, pigmentation, hyperkeratosis, pigmented plane warts, eczematous reaction and follicular lesions.

Two crude oils were dermally applied to rats at doses of 30, 125 and 500 mg/kg (5 day/wk) for 13 weeks. At the 500 mg/kg dose level, observed effects included a reduced weight gain, depressed red blood cell counts, hemoglobin, hematocrit and platelet counts, increased relative and absolute liver weights, decreased absolute and relative thymus weight, changes in the relative kidney, spleen and adrenal weights and atrophy of the thymus. Hyperplasia and an associated dermal inflammatory cell infiltration at the site of application and hypertrophy and hyperplasia of the follicular epithelium in the thyroid gland were observed at all dose levels. (Reference 2)

SENSITIZATION TO PRODUCT:
An acute dermal toxicity study was performed to assess the effect of ultraviolet light on petroleum oil toxicity. Mice were painted with 50 L of oil 5 days per week for 2 weeks. The petroleum oil was found to be non-toxic to the skin of mice, however, the mice that were painted with the oil and then exposed to ultraviolet light for 2 hours experienced some skin damage (distinct erythema). (Reference 3)

CARCINOGENICITY:
Crude oil was applied to the skin of mice (3 times/wk, 6 months followed by 2 times/wk for life) for up to 13 months. Hyperkeratosis was observed at the site of treatment. Many cases of keratotic changes and epithelioma on the exposed skin of workers exposed to crude oil. (Reference 4)

An evaluation of the dermal carcinogenic potential of synthetic crude oil from the Athabasca oil sands was conducted. Mice were dermally applied crude oil three times per week (75 mL/wk) for life. Out of fifty animals 13 developed tumors with a mean latency of 113 weeks. This was significantly different from the controls. The authors concluded that synthetic crude oil from the Athabasca oil sands is a moderately active dermal carcinogen, however, results are consistent with conventional crude oil. (Reference 1)

REPRODUCTIVE TOXICITY:
A single dose (5 mL/kg bw) of crude oil to pregnant rats on gestation days 11, 15 or 17 resulted in induction in both placental and fetal hepatic enzyme systems. (Reference 4)

Oral administration to pregnant rats as a single dose (5 mL/kg bw on gestation days 3, 6, 11, 15 or 17), as a single variable dose (2-10 mL/kg bw on gestation day 6), or as daily doses (1 or 2 mL/kg bw on gestation days 6-17) resulted in significantly increased number of resorptions and decreased fetal weight and length. Daily doses of crude oil also caused a significant reductive in maternal body weight. (Reference 4)

TERATOGENICITY:
Crude oil was dermally applied to pregnant rats on days 0-19 of gestation. Parturition was delayed in the dams at 500 mg/kg. Fetal body weight was decreased at 500 mg/kg and the 4-day viability index was decreased at all dose levels (30, 125 and 500 mg/kg). Also observed were increased in utero death and reduced ossification. (Reference 5)

MUTAGENICITY:
Several studies have reported on the mutagenicity of crude oil to Salmonella typhimurium. Crude oil did not induce mutagenicity either in the presence or absence of an exogenous metabolic system, however, some neutral/aromatic fractions were mutagenic. (Reference 4)

A weak positive result was reported for two crude oil samples in the Syrian hamster embryo cell-transformation assay. (Reference 6)

No significant differences were noted in the number of spontaneous streptomycin-resistant mutants in Chlamydomonas reinhardtii. (Reference 7)

The photomutagenicity of crude oil was assessed using a modification of the Salmonella histidine reversion test. Crude oil was non-mutagenic without the added light and was non-mutagenic in the presence of visible light. (Reference 8)

SYNERGISTIC EFFECTS:
May act as a synergist to pesticides. The combination of crude oil and ultraviolet radiation may potentiate the suppressive effect on Langerhans cell density and contact hypersensitivity. (Reference 9)

Ultraviolet light may increase the severity of the effects to the skin. (Reference 10)

12. ECOLOGICAL INFORMATION

Not available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Recover for reuse and recycling on plant site. Small quantities off-site can be burned in a chemical incinerator equipped with afterburner and scrubber. Comply with relevant legislation.
This product is known to be a hazardous waste according to Canada and US RCRA regulations. Provincial jurisdictions use various hazardous waste control regulations and the Transportation of Dangerous Goods Act to define hazardous waste and appropriate packaging, reporting, storage, and transport. Contact federal, provincial/state, and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste.

14. TRANSPORT INFORMATION:

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

Hazard Class: 3 **Packing Group:** I

PRODUCT IDENTIFICATION NUMBER (PIN): UN1268

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.

15. REGULATORY INFORMATION

WHMIS CLASS: B-2, D-2B

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

All compounds in this product are listed in the Canada Domestic Substances List (DSL) and the United States Toxic Substances Control Act (TSCA) Chemical Substance Inventory (1985).

16. OTHER INFORMATION

REFERENCES:

1. McKee, R., W. Stubblefield, S. Lewis, R. Scala, G. Simon and L. DePass. Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids. Fund. and Appl. Toxicol. 7:228-235. 1986.

2. Feuston, M. H., Mackerer, C. R., C. A. Schreiner and C. E. Hamilton. Systemic Toxicity of Dermally Applied Crude Oils in Rats. J. Toxicol. Environ. Health. 51:387-399. 1997.

3. Burnham, K. and M. Bey. Effects of Crude Oil and Ultraviolet Radiation on Immunity Within Mouse Skin. J. Toxicol. Environ. Health. 34(1):83-93. 1991.

4. World Health Organization. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. Lyon. 1988.

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6. Frazier, M. E. and T. K. Andrews, Jr., Transformation of Syrian Hamster Embryo Cells by Synfuel Mixtures. J. Toxicol. Environ. Health. 11(4-6):591-606. 1983.

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Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Synthetic Crude Oil
Synonyms:	Not available.
Product Use:	Refinery feedstock.
Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	877-262-2111
Date of Preparation:	January 5, 2011

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
FLAMMABLE LIQUID AND VAPOR. IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE.

Colour: Straw coloured.
Physical State: Liquid.
Odour: Petroleum. Rotten eggs. May be odourless (due to high H2S concentrations present).

WHMIS	Personal Protection Equipment	TDG (Ground)

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact, skin contact, inhalation, and ingestion.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with

concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin, eyes, gastrointestinal tract, and respiratory system. Central nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %
Gas oils (petroleum), hydrodesulfurized	64742-79-6	60 - 100
Naphtha (petroleum), hydrotreated heavy	64742-48-9	10 - 30
Naphtha (petroleum), hydrotreated light	64742-49-0	3 - 7
Butane	106-97-8	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	0.001 - 0.01

Section 4: FIRST AID MEASURES

Eye Contact: Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.

Inhalation: Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction
Suitable Extinguishing Media: Dry chemical, foam, or carbon dioxide.
Unsuitable Extinguishing Media: Water may not be an effective medium to extinguish fire.

Products of Combustion: Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous

sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Protection of Firefighters: Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

Explosion Data
Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Other Information: Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:
Do not breathe vapours. Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment.

Storage:
Head spaces in storage containers may contain toxic hydrogen sulphide gas. Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Structural materials and lighting and ventilation systems should be corrosion resistant. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Ingredient		TWA	STEL	Ceiling	Notes
Gas oils (petroleum), hydrodesulfurized	ACGIH	5 mg/m³ *	10 mg/m³ *	Not available.	* Oil mist, mineral.

Gas oils (petroleum), hydrodesulfurized	OSHA	5 mg/m³ *	Not available.	Not available.	* Oil mist, mineral.
Naphtha (petroleum), hydrotreated heavy	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated heavy	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated light	ACGIH	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Naphtha (petroleum), hydrotreated light	OSHA	100 ppm (400 mg/m³) *	Not available.	Not available.	* For Naphtha.
Butane	ACGIH	1000 ppm	Not available.	Not available.	Not available.
Butane	OSHA	800 ppm (1900 mg/m³) *	Not available.	Not available.	* Vacated.
Hydrogen sulfide (H2S)	ACGIH	1 ppm	5 ppm	Not available.	Not available.
Hydrogen sulfide (H2S)	OSHA	Not available.	Not available.	20 ppm	50 ppm (10 mins. once only if no other meas. exp. occurs.)
Benzene	ACGIH	0.5 ppm	2.5 ppm	Not available.	Skin.
Benzene	OSHA	1 ppm	5 ppm	Not available.	Not available.
Polycyclic Aromatic Hydrocarbons	ACGIH	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Polycyclic Aromatic Hydrocarbons	OSHA	0.2 mg/m³ *	Not available.	Not available.	* For benzene-soluble fraction.
Benzene, dimethyl-	ACGIH	100 ppm	150 ppm	Not available.	Not available.
Benzene, dimethyl-	OSHA	100 ppm (435 mg/m³)	Not available.	Not available.	Not available.

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment

Eye/Face Protection: Wear chemical goggles.

Hand Protection: Wear impervious gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-

purifying respirators. Where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels a NIOSH-approved supplied air respirator or self-contained breathing apparatus (SCBA) is necessary.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear liquid.
Colour:	Straw coloured.
Odour:	Petroleum.
Odour Threshold:	0.00047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	20 °C (PMCC)
Evaporation Rate:	(Ether, anhydrous = 1)
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	15 to 35 kPa (20 °C)
Vapor Density:	Not available.
Specific Gravity:	0.86 (Water = 1)
Density:	Not available.
Solubility in Water:	Insoluble in cold water.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Sources of ignition.
Incompatible Materials:	Strong acids. Strong oxidizers. Chlorine.

Hazardous Decomposition Products: Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Possibility of Hazardous Reactions: Explosion hazard in contact with strong nitric acid.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Ingredient	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³, (rat)
Hydrogen sulfide (H2S)	7783-06-4	Not available.	Not available.	444 ppm, (rat)
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat)
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.
Benzene, dimethyl-	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat)

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Above 50 ppm Hydrogen sulphide, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: Irritating to respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. This product contains hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm. Memory loss, paralysis of facial muscles, and nerve tissue damage may occur after severe exposures near 500 ppm.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Respiratory system. Skin. Liver. Kidney. Blood. Central nervous system. Cardiovascular system.

Chronic Effects: Not hazardous by OSHA/WHMIS criteria. Prolonged or repeated contact may dry skin and cause irritation. Similar products have shown the potential to produce skin tumors in laboratory animals as indicated following direct skin application over the lifetime of the test animal.High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated or prolonged exposure to H2S at 50 ppm or greater include respiratory illnesses such as bronchitis and pulmonary edema. This product may contain small quantities of benzene. Epidemiological studies indicate that long term inhalation of benzene vapours can result in leukemia. This product contains small quantities of xylene. Xylene can damage bone marrow thus causing anemia, and can also damage the liver and kidneys, as well as the central and peripheral nervous systems. This product contains small quantities of polycylic aromatic hydrocarbons. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Benzene has been classified by the International Agency for Research on Cancer as carcinogenic to humans (IARC Group 1).

Component Carcinogenicity

Ingredient	ACGIH	IARC	OSHA	NTP	Prop 65
Gas oils (petroleum), hydrodesulfurized	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha (petroleum), hydrotreated heavy	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Naphtha (petroleum), hydrotreated light	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hydrogen sulfide (H2S)	Not listed.	Not listed.	Listed.	Not listed.	Not listed.
Benzene	A1	Group 1	Listed.	List 1	Listed.
Polycyclic Aromatic Hydrocarbons	A2	Group 2A	Listed.	List 2	Listed.
Benzene, dimethyl-	A4	Group 3	Listed.	Not listed.	Not listed.

Mutagenicity: Not hazardous by OSHA/WHMIS criteria.

Reproductive Effects: Not hazardous by OSHA/WHMIS criteria.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Not hazardous by OSHA/WHMIS criteria. Exposure to xylene has produced fetotoxic effects in animal studies.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION

CFR

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:

TDG

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, II

Class: 3

UN Number: 1267

Packing Group: II

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:

Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Not listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Not listed.

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Ingredient	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not listed.

Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	Listed.
Benzene	71-43-2	Listed.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not listed.
Benzene, dimethyl-	1330-20-7	Listed.

California

California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Ingredient	Type of Toxicity
Benzene	developmental, male
Benzene	cancer
Polycyclic Aromatic Hydrocarbons	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: January 4, 2014

Version: 1.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Husky Energy — Material Safety Data Sheet

WHMIS	Personal Protection	TDG Road/Rail

Section I. Product Identification and Uses

Common/Trade name	**Western Canadian Select (WCS)**		
Synonyms	Not available.	**CAS #**	8002-05-09
Chemical family	Blend of Heavy Petroleum Crude, Medium Sweet Crude and Synthetic Crude.	**DSL**	On the DSL list.
Supplier	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111	**Manufacturer**	Husky Oil Operations Limited PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7 403-298-6111
Material uses	Chemical feedstock		

Section 2. First Aid Measures

Eye contact	Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.
Skin contact	Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.
Inhalation	Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.
Ingestion	If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

Section 3. Hazardous Ingredients

		Exposure Limits						
Name	**CAS #**	**TWA (ppm)**	**TWA (Mg/M3)**	**STEL (ppm)**	**STEL (Mg/M3)**	**CEIL (ppm)**	**CEIL (Mg/M3)**	**% by Weight**
Crude Oil (Hydrocarbons C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulphide	7783-06-4	10	14	15	21	n/av	n/av	<0.5
Benzene	71-43-2	0.5	n/av	2.5	n/av			0.1-1
Toluene	108-88-3	20	n/av					1-5
Xylene	1330-20-7	100	n/av	150	n/av			1-30

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H2S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat= 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat= 4300 mg/Kg. LC50 Inhalation rat= 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat= 5000 mg/Kg. LC50 Inhalation rat= 8000 ppm for n4 hrs. LD50 Dermal rabbit= 14000 mg/Kg.

Continued on Next Page

Section 4. Physical Data

Physical state and appearance	Liquid. Black/Brown.
Odor	Petroleum Odour
pH (1% soln/water)	Not applicable.
Odor threshold	O.13 ppm H2S
Evaporation rate	Not available.
Freezing point	Not available.
Boiling point	10°C - 1000°C
Specific gravity	0.92 -0.94 (Water = 1)
Volatility	100 (%vol)
Vapor density	Not available.
Vapor pressure	Not available.
Water/oil dist. coeff.	Not available.
Solubility	Not available.
Molecular Weight	Not applicable.
Melting Point	Not available.
Density	Not available.

Section 5. Fire and Explosion Data

Auto-ignition temperature	Not available.
Flash points	CLOSED CUP: -40°C (-40°F)
Flammable limits	Not available.
Extinguishing Media	Use DRY chemicals, CO2, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Special fire fighting procedures	Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.
Flammability	Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.
	Remark No additional remark.
Risks of explosion	This material is sensitive to static discharge. This product is not sensitive to mechanical impact.
	Remark No additional remark.

Section 6. Reactivity Data

Stability	The product is stable.
Hazardous decomp. products	Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.
Reactivity	Incompatible material: Strong acids, strong oxidizers, chlorine. Hazardous polymerization: Will not occur.
	Remark No additional remark.

Continued on Next Page

Section 7. Toxicological Properties

Routes of entry	Ingestion. Inhalation. Eye contact. Skin contact.
TLV	TLV-TWA 100 PPM (525 mg/m3) for stoddard solvent from ACGIH. Hydrogen Sulfide: TWA: 10 ppm, STEL: 15 ppm, from ACGIH Benzene TWA:0.5 ppm, STEL: 2.5 ppm, from ACGIH, SKIN Toluene TWA: 20 ppm, from ACGIH Consult local authorities for acceptable exposure limits.
Toxicity to animals	**Hydrocarbons C5 and C6 Rich** LD50: Not available. LC50: Not available. **Hydrogen Sulphide (H2S)** **LC50 Inhalation Mouse = 673 ppm 1 hour** **LC50 Inhalation Rat = 444 ppm for 4 hours**
	Remark No additional remark.
Chronic effects	This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficent evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has produced fetotoxic effects in animal studies. This product contains small quantities of polycylic aromatic hydrocarbons. Prolonged contact with these compound has been associated with the induction of skin and lung tumours. This product may contain toluene which is known to cause visual impairment, narcosis, anxiety, muscle fatigue, insomnia, dermatitis, parathesis, liver and kidney damage and to affect reproduction.
	Remark No additional remark.
Acute effects	Sensitizing Capabiltiy: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.
Ingestion	Pulmonary aspiration hazard if swallowed and vomitting occurs.
Skin	Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.
Eyes	Eye contact with product or product vapours may result in eye irritation.
Inhalation	May cause headache, dizziness, loss of appetite and loss of consiousness. Product vapours are irritating to the respiratory tract.
	Remark This product contains small quantities of hydrogen sulphide (H2S) gas which may collect in confined spaces. Acute effects vary with concentration of H2S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.
Synergistic materials	Not available.

Section 8. Preventive Measures

Waste disposal	Dispose of in accordance with all federal, provincial and local regulations.
Storage	Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.
Ventilation	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
Spill and leak	Evacuate unecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

Continued on Next Page

Section 9. Classification/Regulatory Information

TDG road / rail

TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5 C (140.9 F). Closed cup test method.

PIN: 1267 - PETROLEUM CRUDE OIL

Remark
No additional remark.

WHMIS

WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).

Remark
No additional remark.

Other

This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
Refer to federal, provincial, and local legislation for further requirements.

Section 10. Protective Clothing

Eye

Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Skin

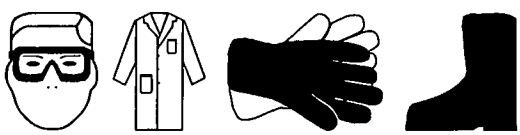
Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Respiratory

Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H2S may be present.

Other

As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.



Section 11. Preparation Information

References

-Provisional Domestic Substances List, Canadian Ennvironmental Protection Act, Volume 1-Registry Number Index, April 1990; Environment Canada. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. CCOHS (Chem advi)
CCOHS(Cheminfo) Doccumentation of the Threshold Limit Values and Biological Exposure Indices (ACGIH)
Pocket Guide to Chemical Hazards (NIOSH)
Transportation of Dangerous Goods Shedule II List II

MSDS Status

Acronyms: TLV = Threshold Limit Value N/AP = Not applicable N/AV = Not Available COC = Cleveland Open Cup PMCC = Pensky Martens Closed Cup

Validated by Husky Corporate Hygiene on 3/19/2009.	**Verified by Husky Corporate Hygiene.**
Supersedes: 11/28/2005	**Printed 3/9/2009.**

Continued on Next Page

Emergency Phone # 403-262-2111

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

Material Safety Data Sheet

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Western Heavy Blend**
Uses : Refinery Feedstock.

Manufacturer/Supplier : **Shell Trading Canada**
400 - 4th Avenue S.W.
Calgary-Alberta T2P 0J4
Canada
Telephone : (+1) 800-661-1600

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.
Synonyms : Crude Oil, Sour (>0.5% S)

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Asphalt	8052-42-4	40.00- 60.00 %
Petroleum, Crude Oil	8002-05-9	5.00- 20.00 %
Hydrocracked petroleum residues	64741-75-9	5.00- 20.00 %
Natural Gas Condensate (C2-C8)	68919-39-1	0.00- 10.00 %
Naphtha (petroleum), hydrotreated light	64742-49-0	0.00- 10.00 %
Natural Gas Condensate	64741-47-5	0.00- 10.00 %
Residues (petroleum), vacuum	64741-56-6	0.00- 5.00 %
Distillates (petroleum), hydrotreated middle	64742-46-7	0.00- 5.00 %
Naphtha (petroleum), hydrotreated heavy	64742-48-9	0.00- 5.00 %
Naphtha (petroleum), heavy hydrocracked	64741-78-2	0.00- 5.00 %
Clarified oils (petroleum), catalytic cracked	64741-62-4	0.00- 5.00 %
Naphtha (petroleum), heavy straight-run	64741-41-9	0.00- 5.00 %
Naphtha (petroleum), light straight-run	64741-46-4	0.00- 5.00 %
Distillates (petroleum), straight-run, middle	64741-44-2	0.00- 5.00 %
CONTAINS:		
Isopentane	78-78-4	
Pentane	109-66-0	
n-Hexane	110-54-3	
Heptane	142-82-5	
Octane	111-65-9	
Nonane	111-84-2	

Decane	124-18-5
Methylcyclopentane	96-37-7
Methyl cyclohexane	108-87-2
Asphalt, fumes	8052-42-4
Benzene	71-43-2
Toluene	108-88-3
Trimethylbenzene, all isomers	25551-13-7

Refer to Chapter 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2B Other Toxic Effects - Narcotic effects.
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Irritant (Skin and Eye)
Class D2A Other Toxic Effects - Embryotoxic/Fetotoxic
Class D2A Other Toxic Effects - Developmental Toxicity

Routes of Exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Health Hazards : Moderately irritating to eyes. Harmful: may cause lung damage if swallowed. Possibility of organ or organ system damage from prolonged exposure; see Chapter 11 for details. Target organ(s): Bone Marrow Thymus. Liver. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).

Signs and Symptoms : Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.

Safety Hazards : Extremely flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Flammable vapours may be present even at temperatures below the flash point. This material is a static accumulator. Even with proper grounding

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and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

Additional Information : This product is intended for use in closed systems only.

4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact : Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.

Ingestion : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.

Advice to Physician : Treat symptomatically.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point : -35 °C / -31 °F

Upper / lower Flammability or Explosion limits : Data not available

Auto ignition temperature : > 220 °C / 428 °F

Hazardous Combustion Products and Specific Hazards : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible.

Suitable Extinguishing Media : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable Extinguishing Media : Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to

be avoided as water destroys the foam.

Protective Equipment for Firefighters : Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

Additional Advice : Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures : May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

Clean Up Methods : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

Additional Advice : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine

appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier. Avoid contact with skin, eyes and clothing.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on

road tanker vehicles) before opening hatches or manholes.
Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use.
Do not use compressed air for filling, discharging or handling.
Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

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Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Toluene	ACGIH	TWA	20 ppm		
Isopentane	ACGIH	TWA	600 ppm		
Pentane	ACGIH	TWA	600 ppm		
Heptane	ACGIH	TWA	400 ppm		
	ACGIH	STEL	500 ppm		
	ACGIH	TWA	400 ppm		
	ACGIH	STEL	500 ppm		
Octane	ACGIH	TWA	300 ppm		
Xylene	ACGIH	TWA	100 ppm		
	ACGIH	STEL	150 ppm		
Cyclohexane	ACGIH	TWA	100 ppm		
Methyl cyclohexane	ACGIH	TWA	400 ppm		

Asphalt, fumes	ACGIH	TWA(Inhalable fraction.)		0.5 mg/m3	as benzene solubles
Trimethylbenzene, all isomers	ACGIH	TWA	25 ppm		

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard.

Biological Exposure Index (BEI) - See reference for full details

Material	Determinant	Sampling Time	BEI	Reference
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)
Toluene	toluene in Urine	Sampling time: End of shift.	0.03 mg/l	ACGIH BEL (2011)
	toluene in Blood	Sampling time: Prior to last shift of work week.	0.02 mg/l	ACGIH BEL (2011)

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	o-Cresol, with hydrolysis in Creatinine in urine	Sampling time: End of shift.	0.3 mg/g	ACGIH BEL (2011)
Xylene	Methylhippuric acids in Creatinine in urine	Sampling time: End of shift.	1.5 g/g	ACGIH BEL (02 2012)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Select a filter suitable for acid gases and vapours meeting EN14387.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: Longer term protection: Nitrile rubber. Incidental contact/Splash protection: PVC. Natural rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where

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		suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing).
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Information on accidental release measures are to be found in section 6.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Yellow to brown. Viscous liquid.
Odour	:	Strong hydrocarbon.
Odour threshold	:	Data not available
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	34.1 °C / 93.4 °F
Freezing Point	:	< -65 °C / -85 °F
Pour point		-30 °C / -22 °F
Vapour pressure	:	Typical 54 kPa
Specific gravity	:	Data not available
Density	:	Typical 928 kg/m3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	Data not available
Kinematic viscosity	:	101 mm2/s at 30 °C / 86 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
Evaporation rate (nBuAc=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	No hazardous reaction is expected when handled and stored according to provisions.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Polymerisation	:	No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact	:	Data not available
Sensitivity to Static Discharge	:	Yes

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rat.
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit.
Acute Inhalation Toxicity	:	Low toxicity by inhalation. LC50 >5 mg/l (Petroleum, Crude Oil) High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin Irritation	:	Irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
Eye Irritation	:	Expected to be irritating to eyes.
Respiratory Irritation	:	Based on human experience, breathing of vapours or mists may cause a temporary burning sensation to nose, throat and lungs.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	May cause damage to organs or organ systems through prolonged or repeated exposure. Bone Marrow Thymus. Liver.
Repeated Dose Toxicity	:	Kidney: caused kidney effects in male rats which are not considered relevant to humans Blood-forming organs: repeated exposure affects the bone marrow. (Benzene)
Mutagenicity	:	May cause heritable genetic damage. (Benzene) Mutagenicity

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studies on gasoline and gasoline blending streams have shown predominantly negative results.

Carcinogenicity : Known human carcinogen. (Benzene) May cause leukaemia (AML - acute myelogenous leukemia). (Benzene) Inhalation exposure to mice causes liver tumours, which are not considered relevant to humans.

Material	:	Carcinogenicity Classification
Asphalt	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Asphalt	:	IARC: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Asphalt	:	GHS / CLP: No carcinogenicity classification
Petroleum, Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Petroleum, Crude Oil	:	GHS / CLP: No carcinogenicity classification
Hydrocracked petroleum residues	:	GHS / CLP: No carcinogenicity classification
Natural Gas Condensate (C2-C8)	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), hydrotreated light	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Naphtha (petroleum), hydrotreated light	:	IARC 2B: Possibly carcinogenic to humans.
Naphtha (petroleum), hydrotreated light	:	GHS / CLP: No carcinogenicity classification
Natural Gas Condensate	:	GHS / CLP: No carcinogenicity classification
Residues (petroleum), vacuum	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Residues (petroleum), vacuum	:	IARC 2B: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Residues (petroleum), vacuum	:	GHS / CLP: No carcinogenicity classification
Distillates (petroleum), hydrotreated middle	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Distillates (petroleum), hydrotreated middle	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Distillates (petroleum), hydrotreated middle	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), hydrotreated heavy	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), heavy hydrocracked	:	GHS / CLP: No carcinogenicity classification
Clarified oils (petroleum),	:	IARC 2B: Possibly carcinogenic to humans.

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catalytic cracked		
Clarified oils (petroleum), catalytic cracked	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), heavy straight-run	:	GHS / CLP: No carcinogenicity classification
Naphtha (petroleum), light straight-run	:	GHS / CLP: No carcinogenicity classification
Distillates (petroleum), straight-run, middle	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Distillates (petroleum), straight-run, middle	:	GHS / CLP: No carcinogenicity classification
Isopentane	:	GHS / CLP: No carcinogenicity classification
Pentane	:	GHS / CLP: No carcinogenicity classification
n-Hexane	:	GHS / CLP: No carcinogenicity classification
Heptane	:	GHS / CLP: No carcinogenicity classification
Octane	:	GHS / CLP: No carcinogenicity classification
Nonane	:	GHS / CLP: No carcinogenicity classification
Decane	:	GHS / CLP: No carcinogenicity classification
Methylcyclopentane	:	GHS / CLP: No carcinogenicity classification
Methyl cyclohexane	:	GHS / CLP: No carcinogenicity classification
Toluene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Toluene	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Toluene	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	OSHA: Cancer hazard.
Benzene	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Asphalt, fumes	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Asphalt, fumes	:	IARC 2B: Occupational exposures to hard bitumens and their emissions during mastic asphalt work are 'possibly carcinogenic to humans' (IARC Group 2B)., Occupational exposures to straight-run bitumens and their fume condensates during road paving are 'possibly carcinogenic to humans' (IARC Group 2B).
Asphalt, fumes	:	GHS / CLP: No carcinogenicity classification
Trimethylbenzene, all isomers	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : May impair fertility at doses which produce other toxic effects. (n-hexane)

Additional Information : May cause MDS (Myelodysplastic Syndrome).
Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest.

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Toxicity : Expected to be toxic:LL/EL/IL50 > 1 <= 10 mg/l(to aquatic organisms)LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Fish : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Aquatic crustacea : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Algae/aquatic plants : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Microorganisms : Expected to be harmful: LL/EL/IL50 >10 <= 100 mg/l

Chronic Toxicity

Fish : NOEC/NOEL expected to be > 1.0 - <= 10 mg/l

Aquatic crustacea : NOEC/NOEL expected to be > 1.0 - <= 10 mg/l

Mobility : If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater. Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. Floats on water and forms a slick.

Persistence/degradability : Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulation : Contains constituents with the potential to bioaccumulate.

Other Adverse Effects : Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Container Disposal : Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or

waste disposal regulations.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be in compliance.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II
Additional Information	MARPOL Annex 1 rules apply for bulk shipments by sea.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2B Other Toxic Effects - Narcotic effects.
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Irritant (Skin and Eye)
Class D2A Other Toxic Effects - Embryotoxic/Fetotoxic
Class D2A Other Toxic Effects - Developmental Toxicity

Inventory Status

EINECS	:	All components listed or polymer exempt.
DSL	:	All components listed.
TSCA	:	All components listed.

16. OTHER INFORMATION

SDS Version Number : 1.1

SDS Effective Date : 11-08-2012

SDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

Material Safety Data Sheet

SDS Regulation	:	The content and format of this (M)SDS is in accordance with the Controlled Product Regulations.
SDS Prepared By	:	Shell Product Stewardship; 1-800-661-1600
SDS Distribution	:	The information in this document should be made available to all who may handle the product.
Disclaimer	:	The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

APPENDIX H

BASICS OF OIL SPILL RESPONSE

H.1 Dikes, Berms and Dams

H.2 Deflection Boom

H.3 Containment Boom

H.4 Diversion Boom

H.5 Shoreline Recovery

H.6 Ice Operations

Figure H.1 Culvert Blocking

Figure H.2 Deflective Booming Technique(Single Boom Method)

Figure H.3 Deflective Booming Technique(Trolley Method)

Figure H.4 Deflective Booming Technique(Cascade Method)

Figure H.5 Containment Booming (Catenary Method)

Figure H.6 Open Chevron Boom Technique

Figure H.7 Closed Chevron Boom Technique

Figure H.8 Ice Slotting Technique

Figure H.9 Deflective Board Recovery Strategy

Figure H.10 Close up view of Deflective Board

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H.1 DIKES, BERMS AND DAMS

Dikes, berms, and dams are land-based tactics, with the objective of containing spilled oil and limiting spreading of oil slicks, thus minimizing impacts to the environment. Dikes, berms and dams are embankment structures built-up from the existing terrain, placed to contain and accumulate oil for recovery. These barriers can serve to:

- Contain and stabilize a contaminated area.
- Contain or divert oil on water or oil that has potential to migrate.
- Create cells for recovery.
- Use natural depressions to act as containment areas for recovery.

The tactic may be deployed in association with a recovery tactic, such as Shoreline Recovery or On-land Recovery. Dikes, berms, and dams are most effective when placed before oil arrives. Dikes, berms, and dams can also be used to exclude oil from a sensitive area, which is covered in the Beach Berms and Exclusion Dams tactic. The tactic can also be used in conjunction with an excavation tactic to enhance containment volumes (see Pits, Trenches, and Slots).

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Plan a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy response resources.
4. Construct the containment structure and ensure it does not leak.
5. Consider the need to remove any water-bottom that may collect beneath the oil inside the structure.
6. Monitor the containment structure on an appropriate basis.
7. If oil collects in the structure, utilize an appropriate recovery system for removal.

Tactic Description

This tactic involves building an embankment perpendicular to the flow of the oil slick or around a contaminated area. Dike, berm, and dam structures can be constructed with a wide variety of materials including: soil, gravel, snow, sand bags, oil boom, timbers and logs. Selection of the construction material depends on the operating environment, location, available materials, and whether the structure is to be temporary or permanent. The containment area should be lined with an impermeable membrane, such as plastic sheeting, to keep oil and oily water from leaking or migrating into the soil. The structure may include a method to regulate flow, such as a weir or spill way. Dikes, berms, and dams can be built by manual labor or with earth-moving equipment depending on the location and available resources.

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Deployment Configurations

Berms

A containment berm can be constructed of available materials such as earth, gravel, or snow. Use earth-moving equipment or manual labor to construct the berm. Form the materials into a horseshoe shape ahead of the flow of oil. Use plastic sheeting to line the walls of a soil berm to prevent oil penetration. Sandbags filled with sand or other heavy material also make excellent containment barriers.

Dams

An underflow dam can be used when there is too much water flow to allow for a complete blockage of a drainage channel. The dam is built of earth, gravel, or other barriers such as sandbags or plywood sheets. Wherever possible, line the upstream side of the dam with plastic sheeting to prevent erosion and penetration of oil into the dam material.

Underflow dams use inclined culverts or pipes to move water downstream while leaving the spill contained behind the dam. The capacity of the pipe(s) should exceed the stream flow rate. It may be necessary to use pumps to remove water behind a dike. Valves or culvert plugs can also be used to control flow rate.

Pipes must be placed on the upstream side of the dam, with the elevated end on the downstream side. Make sure that the upstream end of the pipe is submerged and below the oil/water interface. The height of the elevated downstream end of the pipe will determine the water level behind the dam.

Existing Roads

Roadways that are built up above the terrain can be used as dikes. However, road construction usually allows for natural drainage through culverts or bridges. These drainage structures must be controlled to turn the road into a barrier.

Culvert Blocking

A culvert can be blocked using sheet metal, plywood barriers, or inflatable culvert plugs. Use a full block only when the culvert will be blocked for the entire cleanup operation, if the oil floating on the water will not contaminate additional soil or tundra, and if blocking the water flow will not threaten the road. Otherwise, an adjustable weir or culvert plug should be used.

Plywood and/or sandbags can also be used as culvert blocks, but are more labor-intensive and pose a higher potential for injury. A wood block may require a headwall with kickers oriented to support the boards or plywood. Place the blocking materials over the upstream end of the culvert. Plastic sheeting over the outside of the block will prevent oil penetration.

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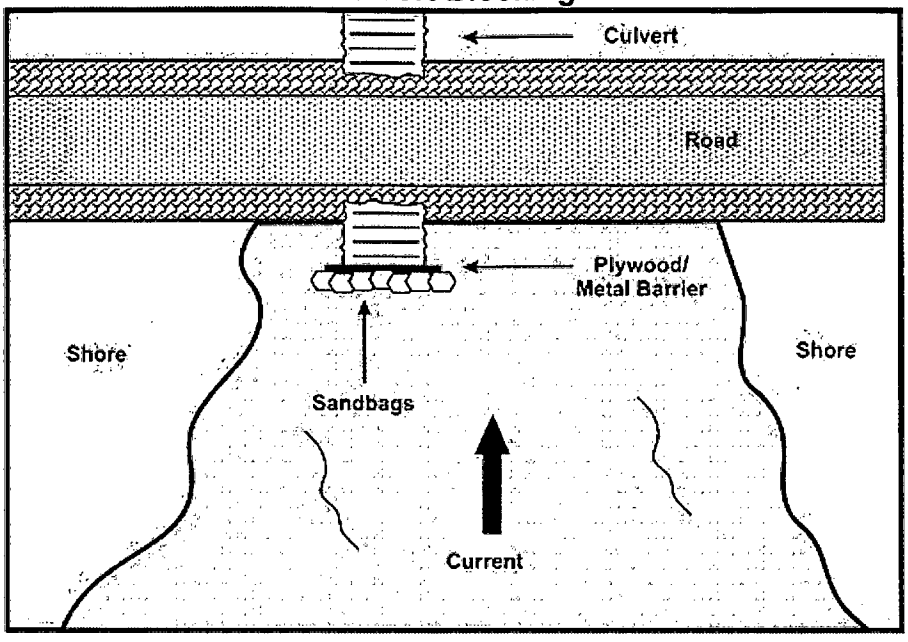
FIGURE H.1

Culvert Blocking



Earth Moving Equipment

A bulldozer, road grader, or front-end loader drives around the spill with its blade angled towards the spill, pushing earth or snow into a berm. Once the perimeter has been covered with an initial berm, shore-up areas as necessary.

Snow

Because of the absorbent quality of snow, it makes an excellent berm for both containment and recovery. A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow. A snow berm is built around the areas of heaviest oiling to contain oil or diesel spilled to tundra and/or ice in winter.

Mesh Fence

Plastic mesh fencing may be used to quickly construct an underflow dam system. The mesh fencing is placed across the drainage and held in place with stakes. Absorbent boom, oil boom, plywood, or even dry dead grass can be placed on the upstream side of the fencing. Running water will find its way under the barrier fence, but oil floating on top of the water will be trapped. The advantages of this system are that it is lightweight and mobile.

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H.2 DEFLECTION BOOM

Objective & Strategy

The objective is to direct spilled oil away from a location to be protected or simply to change the course of the slick. "Deflection" is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom and then releasing it into the current again with a new trajectory. The angle is chosen to prevent oil from entraining beneath the boom skirt. Boom may be held in place by anchors, vessels, or a boom control device.

Deflection Boom may be used to temporarily avoid impacts to a sensitive area, but there is no recovery associated with the tactic, thus no oil is removed from the environment.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Identify, prioritize, and select sensitive areas to be protected from impact.
3. Select a deployment configuration that best supports the operating environment and available resources.
4. Mobilize to the location and deploy the tactic.
5. Place boom using secured anchor systems, mooring points, vessels, boom control devices, etc.
6. Monitor and adjust the boom on an appropriate basis.

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Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Anchor Systems

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating equipment.

Deployment Configurations

Single Boom

Boom is deployed from a site at an optimum angle to the current and anchored to deflect the oil away from a location. Figures H.2 and H.3 illustrate two single boom deflection techniques.

FIGURE H.2

Deflective Booming Technique (Single Boom Method)

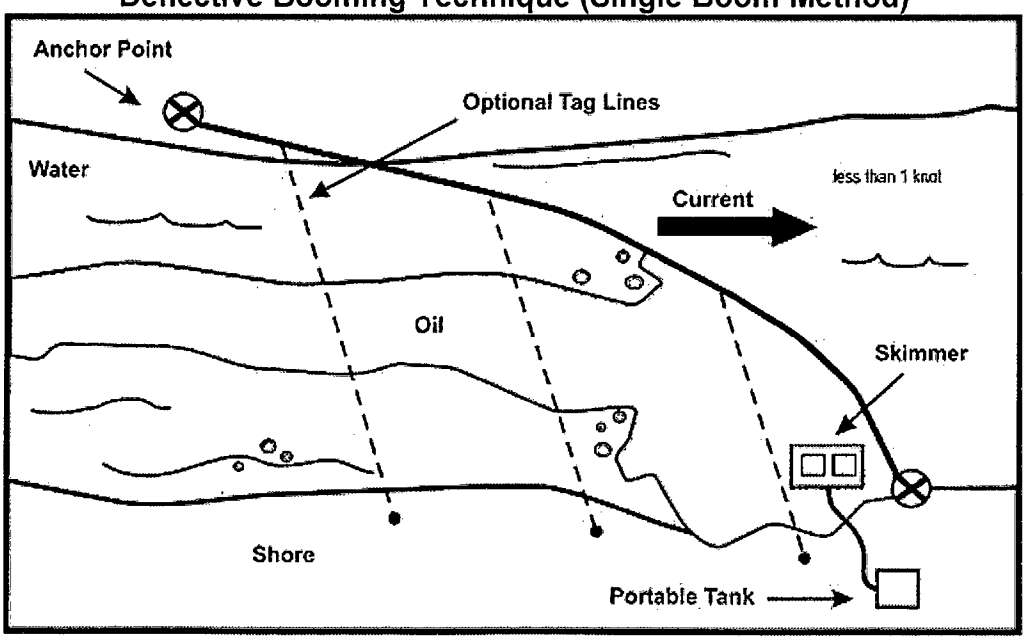

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FIGURE H.3

Deflective Booming Technique (Trolley Method)

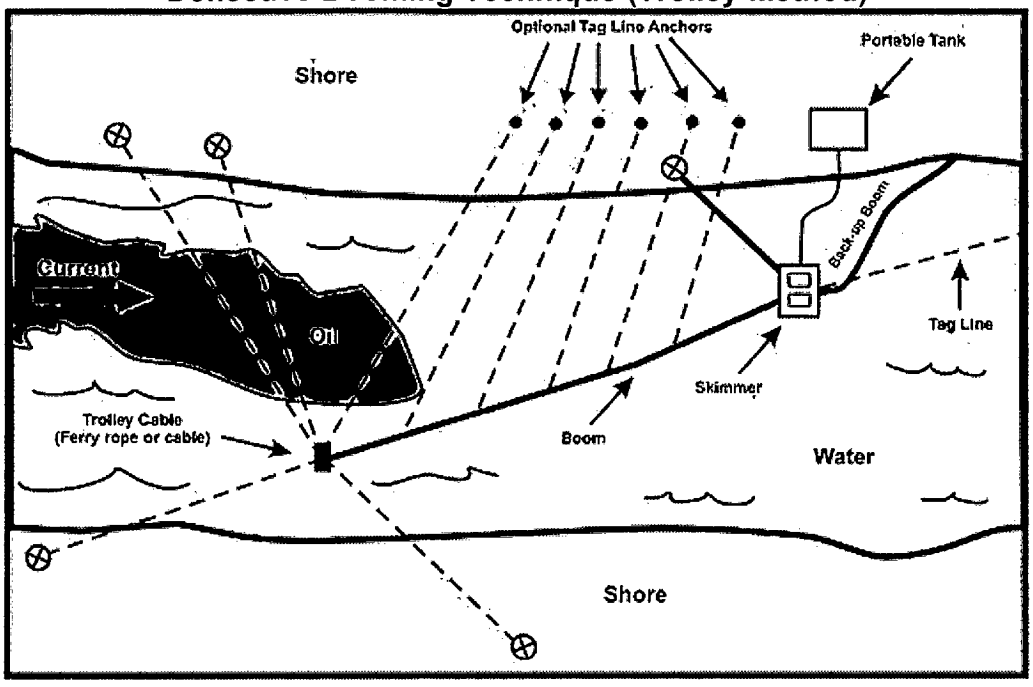

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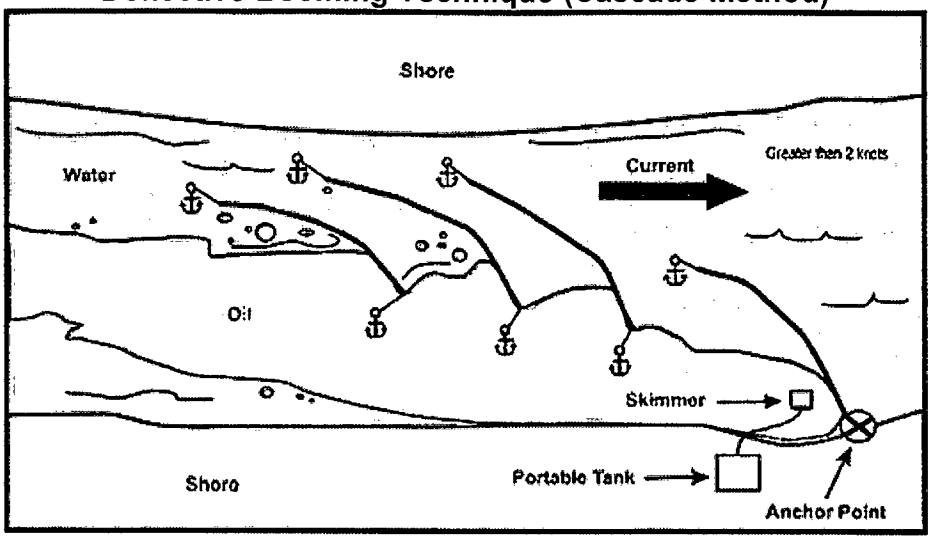
FIGURE H.4

Deflective Booming Technique (Cascade Method)



Cascade

Several booms are deployed in a cascade configuration when a single boom cannot be used because of fast current or because it is necessary to leave openings in the boom for vessel traffic, etc. This configuration can be used in strong currents where it may be impossible to effectively deploy one continuous section of boom. Shorter sections of boom used in a cascade deployment are easier to handle in faster water, thereby increasing efficiency. Additional equipment may be required to set and maintain this system as compared to the single boom configuration.

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H.3 CONTAINMENT BOOM

Objective & Strategy

Containment booming is a fixed-boom tactic. The objective is to corral spilled oil on the water, usually near the source, thus minimizing spreading and impacts to the environment. It is usually deployed with Shoreline Recovery.

This tactic can be deployed for oil spill migrating downstream or downhill to water or through water.

The general strategy is to:

1. Identify the location and trajectory of the spill or potential spill.
2. Select a deployment configuration that best supports the operating environment and available resources.
3. Mobilize to the location and deploy the tactic.
4. Place boom, using secure anchor system or mooring points.
5. Monitor the boom on an appropriate basis.
6. If oil collects in the boom, utilize an appropriate recovery tactic to remove it.

Tactic Description

Containment boom systems are comprised of the appropriate oil boom for containment and concentration, and anchoring systems to hold the boom in place.

Containment boom systems are not recommended for the fast water environment because of the high probability of fixed-boom failure and the difficulty of anchoring in this environment.

Containment boom systems are not recommended for the broken ice environment, because of the high probability of fixed-boom failure and loss due to ice encounters.

Anchoring systems are often deployed first and then the boom is set from one anchor to the adjacent anchor. Boom can be placed from shoreline to shoreline.

A second layer of containment boom, outside the primary boom, has two advantages:

1. It breaks the sea chop and reduces its impact on the primary boom,
2. It may capture oil that has escaped if the primary boom fails.

Figure H.5 illustrates a simple containment booming technique.

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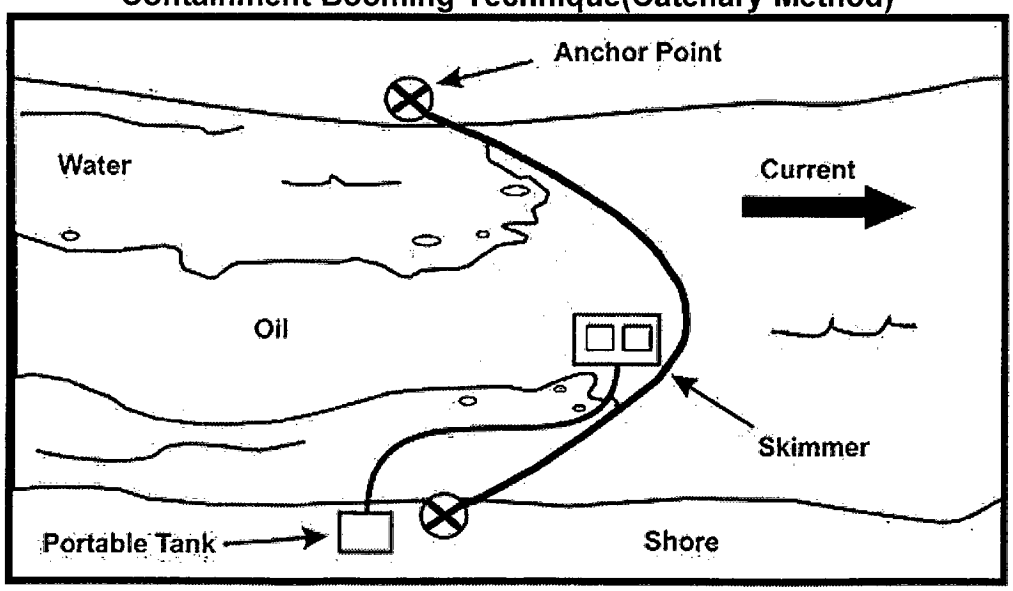
Deployment Considerations

- It is often advisable to "line" the containment boom with sorbent materials (passive recovery) to recover the sheen and reduce decontamination costs.
- If the oil slick is moving, due to wind or current, consider containment at the source and ahead of the leading edge.
- If spill is moving in excess of 1 knot, consider the Diversion Boom Tactic.
- Anchor systems must be selected based on the maximum stress that might be expected to occur on the boom array, considering stronger currents and winds than when the anchor is set.
- Site conditions will influence deployment configuration options.
- Combinations of Containment Boom and Diversion Boom tactics are often used together to optimize success.

FIGURE H.5

Containment Booming Technique(Catenary Method)



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H.4 DIVERSION BOOM

Objective & Strategy

The objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. For the purposes of maintaining consistent and clear terms, diversion is always associated with oil recovery, in contrast with the term deflection, which is used to describe the tactic where oil is redirected away from an area but not recovered.

Tactic Description

The Diversion Boom tactic is for water-born spills where there is some current, usually from 0.5 to 3.0 knots. The boom is placed at an optimum angle to the oil trajectory, using the movement of the current to carry oil along the boom to a recovery location. The angle is chosen to prevent oil from entraining beneath the boom skirt. Oil can be diverted to a shoreline or away from a shoreline or shoal waters. This tactic is always associated with a Shoreline Recovery. Figures H.6 and H.7 illustrate two diversionary booming techniques. These techniques are the Open Checvron and the Closed Chevron technique respectively.

FIGURE H.6

Open Chevron Booming Technique

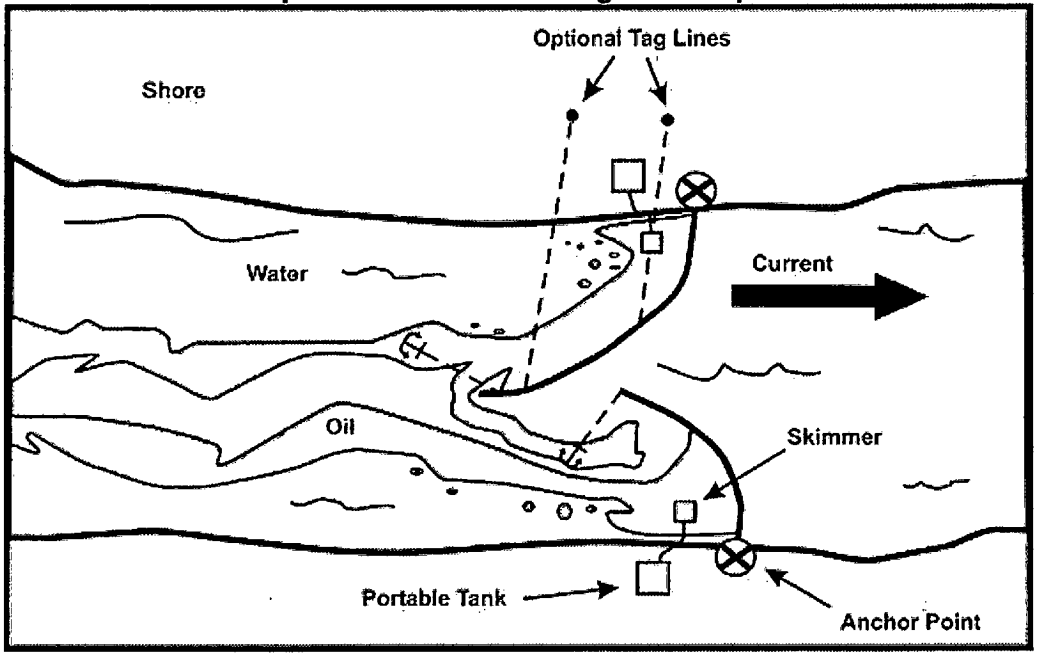

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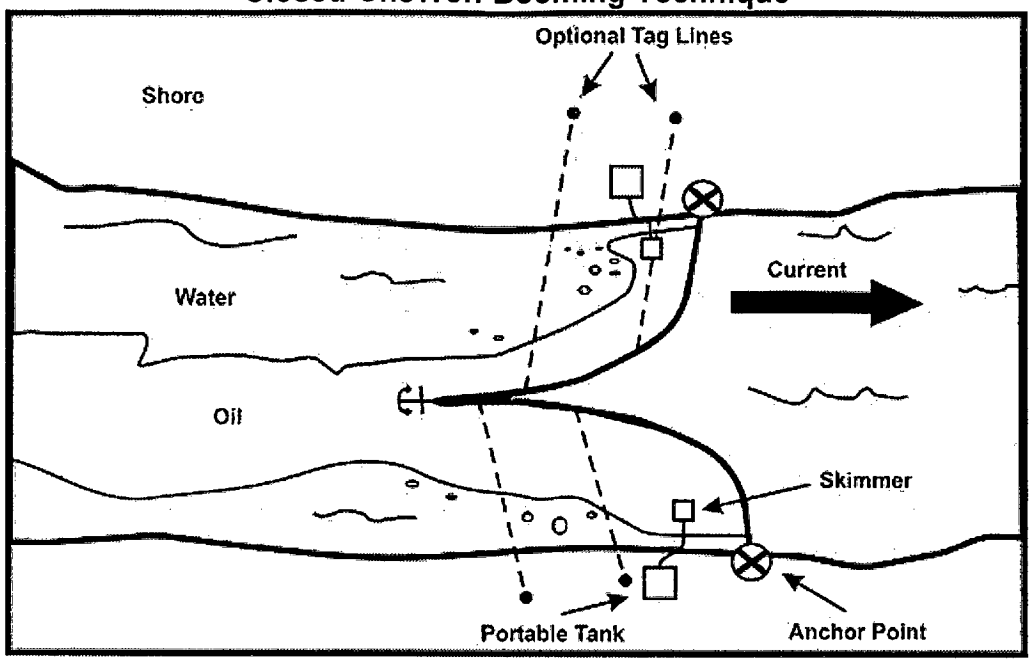
FIGURE H.7

Closed Chevron Booming Technique



Anchor Systems

Boom is secured in place using standard anchoring systems. Anchor sizes vary depending on the boom type and the operating environment.

Boom Angle

Select the appropriate boom angle to keep oil from entraining under the boom. Note that the angle relative to the current decreases rapidly as the current increases. Where currents exceed 3 knots the boom must be almost parallel to the current to prevent entrainment. In currents exceeding 3 knots, a cascade of boom arrays may be used; the first boom array will slow the velocity of the slick allowing subsequent arrays to deflect the oil.

Single Boom

A basic diversion technique is to divert oil from a current to a recovery site along a shoreline. The recovery site is chosen where there is minimal current and a suitable recovery system can be deployed. The boom is then anchored at the site and deployed at an optimum angle to the current and secured/anchored to divert the oil to the shoreline for recovery.

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H.5 SHORELINE RECOVERY

Objective & Strategy

The objective is to remove spilled oil that has been diverted to a designated recovery site accessible from the shore.

Shoreline Recovery is usually deployed as part of another tactic, such as Diversion Boom strategy. When deployed in conjunction with another tactic, fewer personnel may be required.

The general strategy is to:

1. Identify the primary recovery site.
2. Assess site conditions and access routes.
3. Determine the appropriate recovery and storage systems based on oil type, access, and deployment restrictions.
4. Mobilize and deploy equipment to recover and temporarily store the oil from the recovery site.
5. Take precautions to minimize contamination of the shoreline at the collection site.
6. Man and monitor the system as appropriate.
7. Store and transfer recovered oil and oily water according to an approved waste management plan.

Tactic Description

Shoreline recovery systems can be deployed from land access routes (beaches, all-terrain vehicles), or water access. Access to the recovery site and the oil type will influence/dictate the options of equipment to be used.

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Skimming Systems

Shoreline recovery requires at least one portable skimming system to remove spilled oil. The typical portable skimming system includes:

- Skimmer with pump and power pack
- Hose (suction and discharge with fittings)
- Oil transfer and decanting pump(s)
- Repair kit (tools and extra parts)

There are many models of skimmers to choose from, but they all fall into three types:

- **Weir skimmers** draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. Weir skimmers can recover oil at high rates, but they can alsó recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant it back into the environment. Otherwise, the recovered water takes available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity.
- **Oleophilic skimmers** pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a storage device. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface. Oleophilic skimmers are a good choice where liquid storage capacity is limited.
- **Suction skimmers** use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best at sites with road access.

Primary Oil Storage Devices

Primary oil storage devices for shoreline recovery can be portable tanks, bladders, or truck-mounted tanks on the shoreline. If access is not restricted, larger systems can be used and deployed by heavy lifting equipment. If the site is accessible by road, vacuum trucks may be used for oil recovery, storage, and transport.

Recovery Location

Selection of a shoreline recovery location is critical to the success of this tactic. A recovery site should be in calm water with minimal currents. The site must have enough level ground to set up and operate a power pack and portable tanks. Sites with road access are preferred, but if not available, the site must have some other suitable access. Shelter, food and water for the response crew must also be considered in selecting a site.

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H.6 ICE OPERATIONS

Objective & Strategy

Much like that of diversion booming, the objective is to redirect the spilled oil from one location or direction of travel to a specific site for recovery. With a layer of ice preventing the use of booming equipment, other response strategies must be employed.

Tactic Description

Ice Slotting

Ice slotting (Figure H.8) may be used in cases where the ice is thick enough to support the response equipment and personnel. Consideration for the weakening and cracking of the ice must be taken when conducting ice slotting operations.

Slotting Angle

The slot should be angled at approximately 30 degrees to the river's edge. The slotting needs to be wide enough to place a skimming system into the water to recover the oil. The lead end of the slot should have a slight curve which parallels the river current to allow the current to push the oil towards the recovery area.

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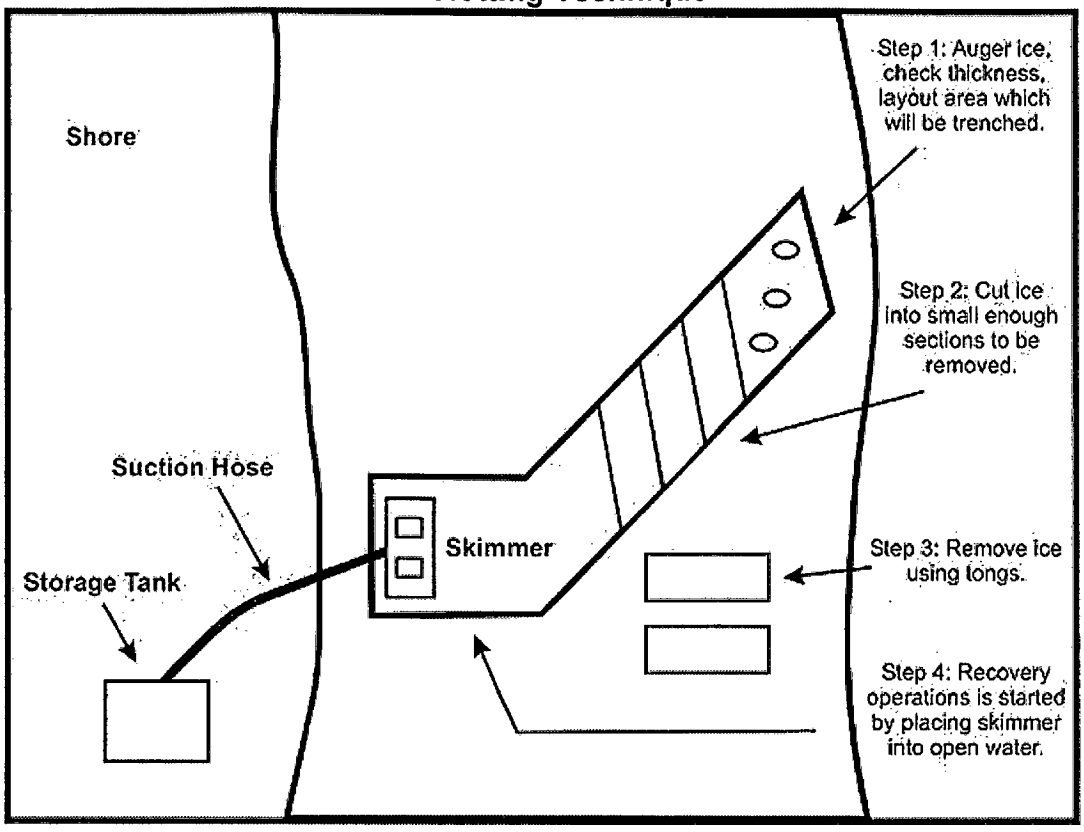
FIGURE H.8

Ice Slotting Technique



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Deflection Boards

In place of using booming equipment it may be possible to use flat boards, such as plywood, to divert the oil under the ice into a recovery area, which has been cut out. To use this form of diversion, the depth of the water under the ice and the speed of the current ice must be considered. The angle in which the boards are placed is derived much like that of deflection booming. In any current above 3 knots, a series of cascading boards should be considered. Also, the depth of the water must be considered. The stronger the current the deeper the boards must be placed to prevent entrainment. If the water is not deep enough to place the boards to prevent entrainment, ice slotting methods may be required. Figure H.9 illustrates the overall method of using deflective boards. Figure H.10 illustrates a close up of the deflective board response method.

FIGURE H.9

Deflective Boards Recovery Srategy

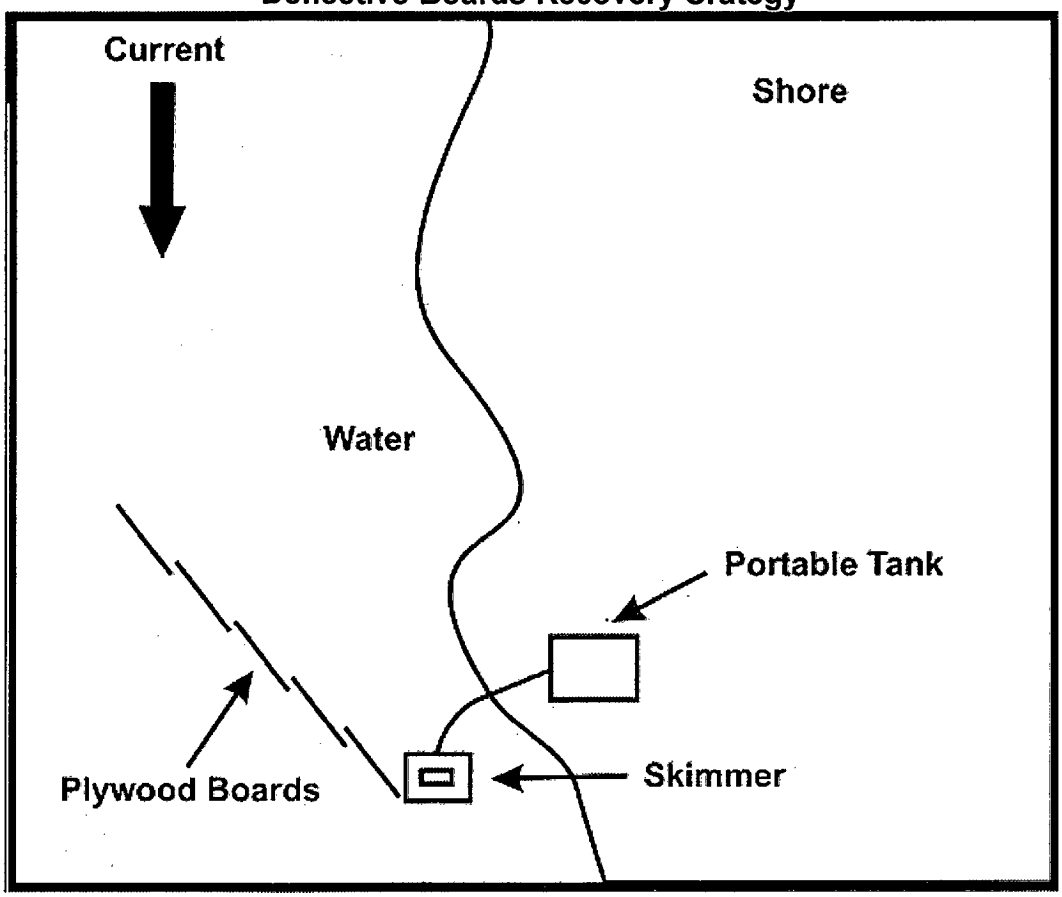

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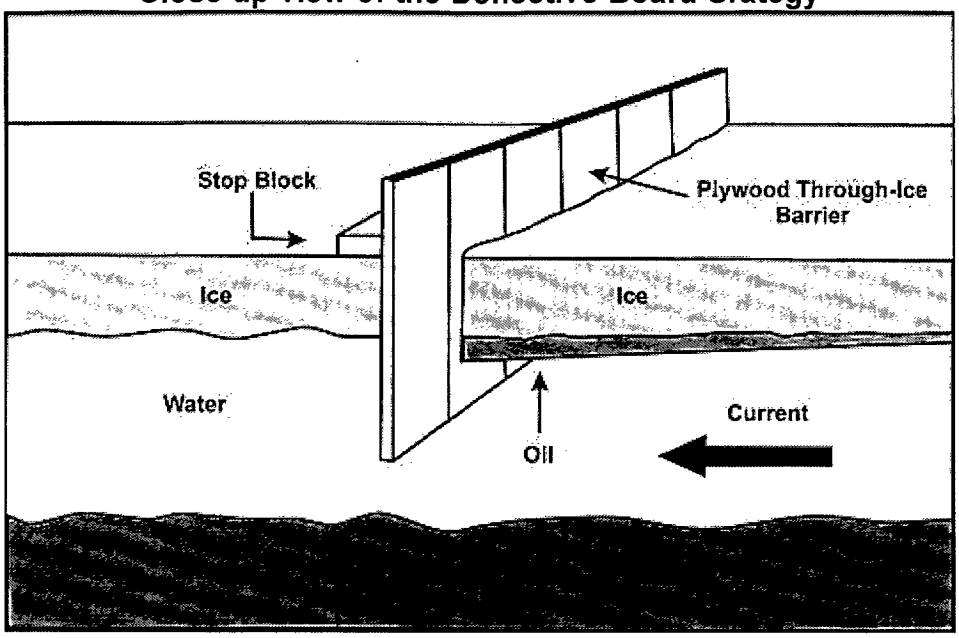
FIGURE H.10

Close up view of the Deflective Board Srategy



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APPENDIX I

MEDIA RELATIONS

I.1 Introduction

I.2 Dealing with Agencies, the Media and the Public

I.3 The Public Wants to Know

I.4 Target Audiences

I.5 Media Statements

I.6 Holding Statements

I.7 Media Advisories

I.8 Press Releases

I.9 New Confrences

I.10 Media Center

I.11 Post Incident Public Affairs

Figure I.1 Media Holding Statement

Figure I.2 Procedures and Considerations

Figure I.3 Layout for Press Conference

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I.1 INTRODUCTION

Goals:

- Provide a coordinated communications response to ensure appropriate information is disseminated in an accurate and timely manner
- Communicate concisely the nature of the emergency, the steps being taken to address it and the effectiveness of those measures
- Control the communications environment as much as possible in an effort to protect the reputation of the Company

I.2 DEALING WITH AGENCIES, THE MEDIA AND THE PUBLIC

Only official Company spokespersons are authorized to release incident information. Receptionists and others may receive calls or be required to take messages. They should take the following information from each caller and pass the details to the Public Information Officer as soon as possible:

- Name
- Media outlet-publication, TV/radio station and market they are serving
- Time of call
- Nature of request
- Phone and fax number(s)
- E-mail address

Deadline

The Company's goal is to prioritize and return media calls as soon as possible knowing that a reporter working on a breaking news story will attempt to fill the information void. The Company will want to be the ones to fill that void. It may not be possible to return all phone calls. Reporters might also be directed to other sources such as our website or instructed to call back at a specific time.

Objectives During Emergencies

- Provide as much relevant information as possible about how the Company is responding to the incident to build and maintain stakeholder and media trust.
- Present an accurate, compassionate and up-to-date account of the crisis.
- Balance the resolution of the technical emergency while managing human issues.

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- Maintain an accurate record of what is happening and actions being taken to respond to the crisis.
- Present a positive and accurate perception of the Company.
- Identify factual and interpretative errors and develop a strategy to respond.
- Bring positive developments to the forefront quickly.
- Prepare spokespersons to deliver the message.
- Communicate the policies, attitudes and actions of the Company to convey that the organization has a plan in place to deal with the crisis.
- Maintain credibility in the communication process by ensuring consistency in the message and the information being disseminated.

I.3 THE PUBLIC WANTS TO KNOW

- Does the Company care?
- Does the Company have a plan in place?
- Is Company's priority to keep people and the environment safe?
- Is the Company doing everything possible to address the situation?

It is the job of the Public Information Officer or Company spokesperson to convey to the audiences and to assist Executive Management to convey that the answer to all these questions is a resounding **"Absolutely."**

I.4 TARGET AUDIENCES

Each emergency is unique and requires careful judgment to determine which audiences to target and which audiences have priority. Given the media's pervasive and instant capability to relay information and impact public opinion, it is clearly the key audience for Company's communications strategy and actions.

The following list indicates the audiences who should be considered when developing the key messages that will be communicated by the media.

Internal

- Employees and Employees' families
- Affiliated Companies/Businesses

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External (Local, Regional, National, and International)

- Media
- Environmental Community
- Impacted Communities/General Public
- Contractors
- Site Investigators
- Industry Associations
- Elected Officials
- Vendors
- Shareholders
- Securities Exchanges
- Analysts
- Neighboring Businesses
- Regulators
- Governmental Entities
- General Public
- Bankers

When responding, always prepare for the worst possible scenario. It is important to recognize that no two incidents will be the same. The Company must remain flexible and adapt a response to meet the unique characteristics of the current situation.

I.5 MEDIA STATEMENTS

Three types of media statements for communicating information can be generated:

1. Holding Statement
2. Media Advisory
3. Press Release

I.6 HOLDING STATEMENTS

A holding statement should be prepared **immediately** to reduce media frustration and quickly establish a channel of communication. Immediate action will help to fill the information void with accurate details. The holding statement is the response to any inquiries made to the Company prior to a press release being issued. The holding statement should contain the following:

- Nature of incident;
- Time and date of incident;

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- Location of incident;
- Impact of the incident (e.g., any people involved? Injuries? Damage?); and
- Report fatalities only if cleared by the Public Information Officer and Legal and only after the family has been notified.
- It is OK to say "no information is available" on any given topic if the information is not yet known
- Status of emergency crews – en route or on the scene
- "The Company's trained emergency response teams are supporting rescue units. The Company's teams are trained to deal with incidents of this nature."
- "It is just too early to tell what caused this incident. There will be a thorough investigation."
- When to expect an update

Not Release

- Fatalities unless cleared by the Public Information Officer and Legal Officer
- Names of injured or deceased
- Nature of injuries
- Any Company communication or Company record
- Any opinion as to the cause of the incident
- Hazardous Materials involved

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Holding Statement Template

DATE:(YY/MM/DD) _____ TIME: _____ ☐ AM

☐ PM

MY NAME IS: _____ MY JOB TITLE IS: _____

_____

This is the information I can give you so far:

At *(time)* _____ ☐ AM ☐ PM, on _____

(date), a(n) (fire, explosion, gas release, spill – specify) occurred at (Company's name) _____'s _____ location, located _____ _____ kilometers *(east/west/north/south)* _____ of *(nearest town or city)* _____.

Presently, *(number of personnel)* _____ Company employees or Contract personnel, are (O.K., not injured, are being treated for injuries, etc. – specify).

_____

_____.

Note: The names and condition of the injured can only be released after they have been released by the proper authorities.

The *(plant / pipeline / office, etc. – specify)* _____

_____

_____ has been shut down and isolated.

Company staff have activated the Emergency Response Plan and are directing emergency response procedures to protect the Public, our employees and the environment.

The cause of the (fire, explosion, gas release, spill, etc. – specify) _____is not yet known and no estimate of damage is available. Further information will be released as it becomes available.

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I.7 MEDIA ADVISORIES

A media advisory should be issued immediately after the holding statement has been finalized. Essentially, the holding statement is the media advisory; the only difference is that the media advisory is issued externally. The Public Information Officer has overall responsibility for ensuring this advisory is issued externally.

I.8 PRESS RELEASES

Press releases should be prepared for distribution by the Public Information Officer as soon possible, preferably within an hour of the incident. Subsequent news releases should be issued as new information becomes available.

They should include the following details:

- Time, date and location of the release;
- Spokesperson name and contact number;
- Summary of holding statement information;
- Current status of the incident;
- Status of the investigation;
- Concern for public health and safety, safety of responders and environmental impact;
- Involvement of authorities and outside responders;
- Time of next update or news conference, if warranted; and
- Refer to media specific web site, if available.

Consider using other tools for the media when appropriate:

- Fact Sheets;
- Backgrounders; and
- Visuals (e.g., maps, etc.).

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I.9 NEWS CONFERENCES

A number of factors will determine the need for a news conference, including:

- The level of media interest the story has generated;
- The need to make technical experts available to journalists to explain complex details such as nature of a substance released, environmental impact, public health threats, etc.;
- A significant change in the status of the situation; or
- The investigation is complete and the results are ready for release.

Strategy

- If possible, hold press conferences at a location removed from Company property.
- Give media some type of guideline for the timing (i.e., there will NOT be a briefing before a given time).
- Determine who will open the news conference and what the ground rules will be (e.g., time limits, etc.).
- Determine who will make statements and whether there will be a question period.
- It is appropriate to outline the ground rules for those attending the press conference before the conference formally begins.
- Prepare opening statement and review potential questions with key spokesperson. Any new information released during the press conference should be cleared with the Public Information Officer.

Note: Media should never be left unattended on Company property. If necessary, arrange for media escorts. Also, arrange for any Security personnel or law enforcement as deemed necessary.

News Conference Checklist

- ■ Check with Public Information Officer (and spokesperson) to select the best time for the conference. (Arrange for Technical Advisor to be present.) Keep in mind demands of the news cycle. Late morning and early afternoon are typically best for electronic media. Late afternoon will better serve the print media and might facilitate a "live shot" by electronic media.
- ■ Stage the conference at a local hotel or hall. Keep in mind accommodations for cameras, reporters, technical staff, parking for live or satellite trucks and cable run for television crews.
- ■ Distribute media advisory of time and location, including directions and parking information.

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- Compile list of media who have indicated they will attend. If possible, determine if there is a particular area of interest.
- Invite outside officials, as appropriate.
- Compile background information that may serve as a resource for reporters.

I.10 MEDIA CENTER

The need to establish a media center will be determined by the Public Information Officer. The level of media interest in the story will be a key factor in determining if a media center is needed.

If a media center is established appropriate news organizations will be notified by way of fax and e-mail distribution. Access to the media center should be confined only to credentialed "working press." Arrange for Security personnel or law enforcement as deemed necessary.

Media Center Checklist

- Work Tables and Chairs;
- External telephone lines (might not be possible if center is located in the field);
- Radio;
- Television/VCR;
- Podium with microphone and audio distribution (mult box);
- Extension cords;
- Blank audio and videotapes;
- Copier/Fax machine;
- Laptop computer and printer;
- If the center is in the field, you might need a generator to provide power;
- Car battery adapter for PC;
- Cell phone car adapter; and
- Power generator (if remote location).

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Supplies Checklist

- The Company letterhead
- Pens and pencils
- Background material
- Past press releases
- Fact sheets
- Maps
- Refreshments

I.11 POST INCIDENT PUBLIC AFFAIRS

Once the incident is concluded, the Public Information Officer should prepare one final press release, possibly in the form of a chronology, to describe the incident and the subsequent response. The media may also be looking for any follow-up information as to the cause of the incident, people involved, long term effects on the company, costs associated with the incident, etc. These requests will have to be considered on a case-by-case basis. All releases should be reviewed by the Legal Officer and approved by the Incident Commander (or a higher authority) prior to being released.

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FIGURE I.1

MEDIA HOLDING STATEMENT

The following statement is an example of how to address reporters when you need more time to gather facts before speaking to them.

Open:

Hi_____. I'm _____, and I am the spokesperson for _____ _____.

I am in the process of gathering more facts for you regarding _____ _____.

I know you want accurate information, so I will need_____(how much time) to get these facts confirmed.

Basic Facts: (If confirmed)

I can tell you...Who: **(Background -- optional at this point)**

When:

Where:

What:

Priority:
"A preliminary investigation into the _____has already begun. That is all the information I have for you at this time.

Holding Statement:

We could meet back here (or via phone) at _____ o'clock.

Meantime, let me get your business card, cell phone, etc...

Questions & Offers: (Optional)

What is your deadline?

I can give you our web address for more information on our Company.

I can provide our public affairs contact and number (or provide your business card):

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FIGURE I.2

PROCEDURES AND CONSIDERATIONS	
Identify Your Audience • Employees • Clients • Local Media • National / International Media • Special Interest Groups • Stakeholders • Agencies / Public Officials • Industry Associations • Suppliers • Competitors	**Identify Key Message(s)** • People / Safety • Environment • Property • Potential Impacts of Incident • Basis for Company's Position / Action(s) • Business Continuity
Prepare Official Company Statement • Facility / Personnel Fact Sheet(s) • Issues Applicable to Identified Audience • No Speculation of Any Kind • Confidentiality Issues • Express Care and Concern • Do Not Accept Liability or Offer Compensation • Include Photos / Video • Must be Reviewed and Approved by Incident Commander and Legal Officer	**Identify Communications Methods** • Media Advisory • Toll-free Telephone • Web-Site • Press Release • Telephone Interviews • Personal Interviews • Press Briefings (Alone or Jointly?) • Holding Statement
Determine Support Requirements • Personnel • Equipment • Physical Space • Photos, Videos, Charts, Graphs, Maps	**Determine Frequency of Communications** • Times per Shift • Daily • Corporate IC's Discretion • Maintain Awareness of Audience Deadlines / Schedules • Obtain Corporate IC's Approval
Identify Spokesperson(s) if Applicable • Ensure Understanding of Incident • Ensure Familiarity With Expected Audience • Ensure Understanding of Confidentiality / Privacy Issues • Brief on Anticipated Questions and Answers • Ensure Equal Treatment of All Audience Members • Establish Conference Duration • Do Not Underestimate the Impact of Television Reports • Coordinate Responses if Joint Conference • Be Positive • Be Supportive of Agencies, Investigators, and Responders	**Monitor Audience Reaction to and Perception of Message** • Hostile Press • Special Interest Groups • Public Outrage or Increased Demands • Attempts to Place Blame • Distribution of Disinformation
Revise/Update Message • Answer Earlier Questions • Provide Additional Facts • Address Previous and New Concerns • Adjust Position as suitable or Necessary but Do Not Appear to "Flip-Flop" or Waiver • Maintain Awareness of Audience Deadlines / Schedules • Must be Reviewed and Approved by Incident Commander and Legal Officer	

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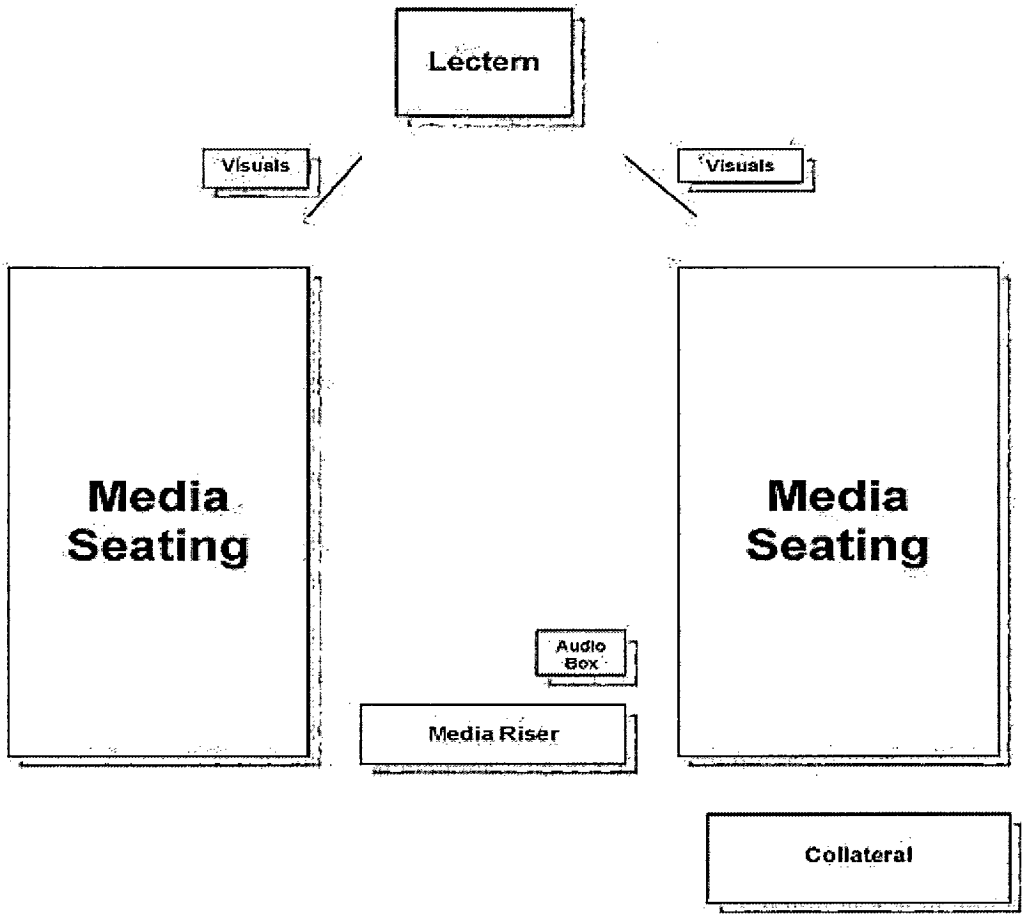
FIGURE I.3

LAYOUT FOR PRESS CONFERENCE



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REGULATORY CROSS REFERENCE

DOT/PHMSA 49 CFR Part 194 Cross Reference
Onshore Pipeline Regulation, 1999 SOR/99-294
Annex A to Can/CSA-Z-731-03
Texas Discharge Prevention and Response Plans, 31 TAC Section 19.13
South Dakota Legislature - South Dakota Codified Laws 34A-12-9, 34A-18-2, 34A-18-9

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DOT/PHMSA 49 CFR PART 194		
§ 194.105	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	... determine the worst case discharge ... provide methodology, including calculations, used to arrive at the volume.	App B
(b)	The worst case discharge is the largest volume, in barrels, of the following:	-----
(b)(1)	... maximum release time in hours, plus the maximum shutdown response time in hours, multiplied by the maximum flow rate expressed in barrels per hour, plus the largest line drainage volume after shutdown of the line section(s) ...; or	App B
(b)(2)	The largest foreseeable discharge for the line section(s) within a response zone, expressed in barrels, based on the maximum historic discharge, if one exists, adjusted for any subsequent corrective or preventative action taken; or	App B
(b)(3)	If the response zone contains one or more breakout tanks, the capacity of the single largest tank or battery of tanks within a single secondary containment system, adjusted for the capacity or size of the secondary containment system, expressed in barrels.	App B
(b)(4)	Operators may claim prevention credits for breakout tank secondary containment and other specific spill prevention measures as follows:...	App B
§ 194.107	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each response plan must plan for resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge.	App A
(b)	An operator must certify in the plan ... reviewed NCP and each applicable ACP...	Foreword
(b)(1)	As a minimum to be consistent with the NCP as a facility response plan must:	-----
(b)(1)(i)	Demonstrate an operator's clear understanding of the function of the Federal response structure...	§ 4.0
(b)(1)(ii)	Establish provisions to ensure the protection of safety at the response site; and	§ 4.0 (Command), § 5.0
(b)(1)(iii)	Identify the procedures to obtain any required Federal and State permissions for using alternative response strategies such as in-situ burning and dispersants...	§ 6.7, App. E
(b)(2)	As a minimum, to be consistent with the applicable ACP the plan must:	-----
(b)(2)(i)	Address the removal of a worst case discharge and the mitigation or prevention of a substantial threat of a worst case discharge;	§ 3, App B
(b)(2)(ii)	Identify environmentally and economically sensitive areas;	§ 6.0
(b)(2)(iii)	Describe the responsibilities of the operator and of Federal, State and local agencies in removing a discharge and in mitigating or preventing a substantial threat of a discharge; and	§4.0
(b)(2)(iv)	Establish the procedures for obtaining an expedited decision on use of dispersants or other chemicals.	§ 6.8
(c)	Each response plan must include:	-----
(c)(1)	A core plan consisting of ...	-----
(c)(1)(i)	An information summary as required in § 194.113,	Fig 1.1
(c)(1)(ii)	Immediate notification procedures,	§ 2.0
(c)(1)(iii)	Spill detection and mitigation procedures,	§ 3.0
(c)(1)(iv)	The name, address, and telephone number of the oil spill response organization, if appropriate,	Fig 2.5, App A
(c)(1)(v)	Response activities and response resources,	§ 3.0, App A

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DOT/PHMSA 49 CFR PART 194		
§ 194.107	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(c)(1)(vi)	Names and telephone numbers of Federal, State, and local agencies which the operator expects to have pollution control responsibilities or support,	Fig 2.5
(c)(1)(vii)	Training procedures,	App D
(c)(1)(viii)	Equipment testing,	App D.2
(c)(1)(ix)	Drill program - an operator will satisfy the requirement for a drill program by following the National Preparedness for Response Exercise Program (PREP) guidelines. An operator choosing not to follow PREP guidelines must have a drill program that is equivalent to PREP. The operator must describe the drill program in the response plan and PHMSA will determine if the program is equivalent to PREP.	App D.2
(c)(1)(x)	Plan review and update procedures;	§ 1.4
(c)(2)	An appendix for each response zone that includes the information required in paragraph (c)(1)(i)-(ix) of this section and the worst case discharge calculations that are specific to that response zone. An operator submitting a response plan for a single response zone does not need to have a core plan and a response zone appendix. The operator of a single response zone onshore pipeline shall have a single summary in the plan that contains the required information in § 194.113.7; and.	Annexes
(c)(3)	A description of the operator's response management system including the functional areas of finance, logistics, operations, planning, and command. The plan must demonstrate that the operator's response management system uses common terminology and has a manageable span of control, a clearly defined chain of command, and sufficient trained personnel to fill each position.	§ 4.0
§ 194.111	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall maintain relevant portions of its response plan at the operator's headquarters and at other locations from which response activities may be conducted, for example, in field offices, supervisor's vehicles, or spill response trailers.	Foreword Distribution List
(b)	Each operator shall provide a copy of its response plan to each qualified individual	Foreword Distribution List
§ 194.113	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	The information summary for the core plan, required by § 194.107, must include:	-----
(a)(1)	The name and address of the operator.	Fig 1.1
(a)(2)	For each response zone which contains one or more line sections that meet the criteria for determining significant and substantial harm as described in § 194.103, a listing and description of the response zones, including county(s) and state(s).	Fig 1.1, Response Zone Annexes
(b)	The information summary for the response zone appendix, required in § 194.107, must include:	-----
(b)(1)	The information summary for the core plan.	Fig 1.1
(b)(2)	The names or titles and 24-hour telephone numbers of the qualified individual(s) and at least one alternate qualified individual(s);	Fig 1.1, Fig 2.2
(b)(3)	The description of the response zone, including county(s) and state(s), for those zones in which a worst case discharge could cause substantial harm to the environment.	Fig 1.1, Response Zone Annexes
(b)(4)	A list of line sections for each pipeline contained in the response zone, identified by milepost or survey station number, or other operator designation.	Fig 1.1
(b)(5)	The basis for the operator's determination of significant and substantial harm.	Foreword
(b)(6)	The type of oil and volume of the worst case discharge.	App B

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DOT/PHMSA 49 CFR PART 194		
§ 194.115	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall identify and ensure, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge.	App A
(b)	An operator shall identify in the response plan the response resources which are available to respond within the time specified, after discovery of a worst case discharge, or to mitigate the substantial threat of such a discharge.	App A
§ 194.117	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall conduct training to ensure that:	-----
(a)(1)	All personnel know --	-----
(a)(1)(i)	Their responsibilities under the response plan	
(a)(1)(ii)	The name and address of, and the procedure for contacting, the operator on a 24-hour basis	§ 4.0
(a)(1)(iii)	The name of, and procedures for contacting, the qualified individual on a 24-hour basis	§ 2.0, Fig 2.2
(a)(2)	Reporting personnel know --	-----
(a)(2)(i)	The content of the information summary of the response plan.	Fig 1.1
(a)(2)(ii)	The toll-free telephone number of the National Response Center	Fig 2.5
(a)(2)(iii)	The notification process	§ 2.0, Fig 2.5
(a)(3)	Personnel engaged in response activities know --	-----
(a)(3)(I)	The characteristics and hazards of the oil discharged	Fig 3.2, App G
(a)(3)(ii)	The conditions that are likely to worsen emergencies, including the consequences of facility malfunctions or failures, and the appropriate corrective actions.	§ 3.0
(a)(3)(iii)	The steps necessary to control any accidental discharge of oil and to minimize the potential for fire, explosion, toxicity, or environmental damage	§ 3.0
(a)(3)(iv)	The proper firefighting procedures and use of equipment, fire suits, and breathing apparatus	§ 3.0
(b)	Each operator shall maintain a training record for each individual that has been trained as required by this section. Theses records must be maintained in the following manner as long as the individual is assigned duties under the response plan	App D.1
(b)(1)	Records for operator personnel must be maintained at the operator's headquarters	App D.1
(b)(2)	Records for personnel engaged in response, other than operator personnel, shall be maintained as determined by the operator.	App D.1
(b)(3)	Nothing in this section relieves an operator from the responsibility to ensure that all response personnel are trained to meet the OSHA standards for emergency response operations in 29 CFR 1910.120 ...	App D.1
§ 194.119	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each owner shall submit two copies...	Distribution
(b)	...PHMSA will notify the operator of any alleged deficiencies...	-----
(c)	The operator...may petition PHMSA for reconsideration within 30 days...	-----
(d)	...PHMSA will approve the Response Plan...	-----
(e)	...The operator may submit a certification to PHMSA...that the operator has obtained, through contract or other approved means, the necessary private personnel and equipment to record, to the maximum extent practicable, to a worst case discharge...	Foreword (Operator's Statement)
(f)	...PHMSA may require an operator to provide a copy of the response plan to the OSC...	-----

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DOT/PHMSA 49 CFR PART 194		
§ 194.121	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(a)	Each operator shall update its response plan to address new or different operating conditions or information. In addition, each operator shall review its response plan in full at least every 5 years from the date of the last submission or the last approval as follows:	§ 1.4
(a)(1)	For substantial harm plans, an operator shall resubmit every 5 years from the last approval date.	§ 1.4
(a)(2)	For significant and substantial harm plans, an operator shall resubmit every 5 years form the last approval date.	§ 1.4
(b)	If a new or different operating condition or information would substantially affect the implementation of a response plan, the operator must immediately modify its response plan to address such a change...	§ 1.4
(b)(1)	An extension of the existing pipeline or construction of a new pipeline in a response zone not covered by the previously approved plan;	§ 1.4
(b)(2)	Relocation or replacement of the pipeline in a way that substantially affects the information included in the response plan, such as a change to the worst case discharge volume;	§ 1.4
(b)(3)	The type of oil transported, if the type affects the required response resources, such as a change from crude oil to gasoline;	§ 1.4
(b)(4)	The name of the spill removal organization;	§ 1.4
(b)(5)	Emergency response procedures;	§ 1.4
(b)(6)	The qualified individual;	§ 1.4
(b)(7)	A change in the NCP or an ACP that has significant impact on the equipment appropriate for response activities; and	§ 1.4
(b)(8)	Any other information relating to circumstances that may affect full implementation of the plan.	§ 1.4
(c)	If PHMSA determines that a change to a response plan does not meet the requirements of this part, PHMSA will notify the operator of any alleged deficiencies, and provide operator...opportunity to correct deficiencies.	-----
(d)	An operator who disagrees with a determination that proposed revisions to a plan are deficient may petition PHMSA for reconsideration, within 30 days from the date of receipt of PHMSA's notice...	-----

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SOR/99-294		
S 32-34	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
-----	Directions for Use of Manual;	§ 1.0
-----	Emergency Preparedness and Response Policy;	§ 3.0
-----	Description of Initial Responses to Incident Calls;	§ 3.1
-----	Management of Threat Information;	§ 3.1
-----	Definitions and Levels of Emergencies;	§ 3.1
-----	Corporate and Operational Chains of Command;	§ 4.0
-----	Internal and External Contact Lists;	Fig. 2.2, 2.5
-----	External Communication Information (e.g. media outlets);	App. I
-----	Description of General and Site Specific Emergency Response Procedures;	§ 3.0
-----	Roles and Responsibilities (e.g. checklist of duties);	§ 4.0
-----	Site-Specific Emergency Information (e.g. control points);	Fig. 6.2
-----	Lists of Persons in Emergency Planning Zones (or on separate file);	Fig. 2.2
-----	Environmental or Other Areas Requiring Special Consideration or Protection;	§ 6.0
-----	Detailed Product Information (e.g. MSDS);	App. G
-----	Description and Location of Response Equipment;	App. A
-----	Internal and External Reporting Requirements;	§ 2.0
-----	Area Maps;	Fig. 1.2
-----	Training Requirements;	App. D
-----	Role of Government Departments;	§ 4.6
-----	Manual Updating Procedure and Schedule;	§ 1.4
-----	Forms and Records; and	App. F
-----	Manual Distribution List.	Foreword

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ANNEX A TO CAN/CSA-Z731-03		
SAMPLE TABLE OF CONTENTS FOR AN EMERGENCY PREPAREDNESS MANUAL		
REFERENCE		LOCATION IN PLAN
1	Administration	-----
1.1	Emergency Preparedness Policy	Sec. 1.1
1.2	Purpose of This Manual	Sec. 1.2
1.3	Distribution of This Manual	Foreword, Sec. 1.3
1.4	Definitions	Glossary of Terms/Acronyms
2	Organization of Emergency Areas	Annexes
3	Roles ad Responsibilities	Sec. 4.0
4	Communications	App. A.6
5	Emergency Response	-----
5.1	Emergencies Caused by Human Activity	Fig. 3.1
5.2	Natural Disasters	Fig. 3.1
6	Emergency Resources	-----
6.1	Contact List	Fig 2.2, 2.5
6.2	Personnel/Equipment	App. A
7	Training	-----
7.1	Employees	App. D.1
7.2	Contractors	App. D.1
7.3	Training Drills	App. D.2
8	Checklists	App. F
8.1	Role Checklists	App. F
8.2	Equipment Checklists	App. F

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(c)	Required elements of discharge prevention and response plans for all facility classifications.	-----
(1)	The owner and operator of the facility;	Fig 1.1
(2)	The person or persons in charge of this facility...	Fig 1.1
(3)	The name and address (both physical and mailing) of the facility;	Fig 1.1
(4)	A description of the facility, including:	-----
(A)	The location of the facility by latitude and longitude;	Fig 1.1
(B)	The facility's primary activity;	Fig 1.1
(C)	The types of oil handled, whether material safety data sheets (MSDS) have been prepared for them, and the location where the MSDS are maintained;	App. G
(D)	The storage capacity of each tank used for storing oil;	N/A
(E)	The diameter of all lines through which oil is transferred;	Fig 1.1
(F)	The average daily throughput of oil at the facility; and	Fig 1.1
(G)	The dimensions and capacity in barrels of the largest oil-handling vessel which docks at the facility	N/A
(5)	For a facility which normally does not have personnel on-site...	N/A
(6)	A general description of measures taken by the facility to prevent unauthorized discharges of oil;	3.0
(7)	A plan to conduct an annual oil spill drill that entails notifying the GLO and National Response Center and keeping a log...	App D
(8)	If oil is transferred at the facility, emergency transfer procedures to be implemented if an actual or threatened unauthorized discharge of oil occurs at the facility;	App H
(9)	Strategic plans to contain and clean up unauthorized discharges of oil from the facility;	3.0
(10)	A statement that all facility personnel who might be involved in an oil spill response have been informed that detergents or other surfactants are prohibited from being used on an oil spill in the water, and that dispersants can only be used with the approval of the Regional Response Team...	6.7
(11)	A description of any secondary containment or diversionary structures or equipment at the facility to prevent discharged oil from reaching coastal waters...	App C
(e)	Additional requirements for facilities classified as large	-----
(1)	Maps showing vehicular access to the facility, pipelines to and from the facility, and nearby residential or other populous areas;	Fig. 6.2

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13 (Cont'd)*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(2)	A site plan of the facility showing:	-----
(A)	The location of all structures in which oil is stored;	Fig. 6.2
(B)	The location of all areas where oil is transferred at the facility; and	Fig 1.1, Fig. 6.2
(C)	Drainage and diversion systems at the facility...	N/A
(3)	A plan to conduct an annual oil spill drill that includes the following elements:	-----
(A)	Notifying the GLO and National Response Center;	2.0
(B)	Notifying any third parties, such as discharge cleanup organizations	2.0
(C)	If the facility has spill response equipment stored on-site, deployment of a representative portion of the equipment which would be used to respond	App D
(D)	A log documenting when the annual drill was conducted and the facility personnel who participated in it;	App F
(4)	A detailed description of the facility's discharge prevention and response capability, including:	-----
(A)	Leak detection and safety systems to prevent accidental discharges	App C
(B)	Schedules, methods, and procedures for testing, maintaining, and inspecting storage tanks, pipelines, and other equipment used for handling oil;	App C
(C)	Schedules, methods, and procedures for conducting accidental discharge response drills;	App D
(D)	Whether the facility's oil spill response capability will primarily be based on contracts or agreements with third parties or on the facility's own personnel and equipment;	App A
(E)	Planned response actions, the chain of command, lines of communication, and procedures for notifying the GLO, emergency response and public safety entities;	3.0, 4.0
(F)	Oil spill response equipment and supplies located at the facility;	App A
(G)	If the facility owns and maintains oil spill response equipment, the schedules, methods, and procedures for maintaining the equipment;	App D
(H)	If the operator has entered into any oil spill response or cleanup contracts or basic ordering agreements with a discharge cleanup organization, copies of the contracts or agreements or a narrative description of their terms;	App A

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TEXAS DISCHARGE PREVENTION AND RESPONSE PLANS *31 TAC Section 19.13 (Cont'd)*		
19.13	**BRIEF DESCRIPTION**	**LOCATION IN PLAN**
(I)	The worst case unauthorized discharge of oil reasonably likely to occur at the facility and the rationale used to determine the worst case unauthorized discharge;	App B
(J)	A description and map of environmentally sensitive areas that would be impacted by the worst case unauthorized discharge;	6.0
(K)	A description of response strategies that would be implemented to contain and clean up worst case unauthorized discharge;	6.0
(L)	Information on the facility's program for training facility personnel;	App D
(M)	Information on facility personnel who have been specifically designated to respond to an oil spill, including any training they have received and where the training records are maintained;	Fig 2.1, App D
(N)	Plans for transferring oil during an emergency; plans for recovering, storing, separating, transporting, and disposing of oily waste materials generated during an oil spill response; and	App B
(O)	Plans for providing emergency medical treatment, site safety, and security during an oil spill	3.0

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DAKOTA LEGISLATURE - SOUTH DAKOTA CODIFIED LAWS *34A-12-9, 34A-18-2, and 34A-18-9*		
	BRIEF DESCRIPTION	**LOCATION IN PLAN**
34A-12-9	Report of discharge--Rules for reporting. Any person who has caused a discharge of a regulated substance shall immediately report the discharge to the department. The department may promulgate rules pursuant to chapter 1-26 to provide for the procedures to be followed in reporting a discharge.	2.0, Fig. 2.3
34A-18-2	Oil spill response plan required. Each crude oil pipeline operator which is issued a permit from the South Dakota Public Utilities Commission under the Energy Conversion and Transmission Facilities Act shall prepare an oil spill response plan. An oi lspill response plan must plan for resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge. Each response plan must include, but not be limited to:	-----
(1)	Immediate notification procedures;	2.0
(2)	Spill detection and mitigation procedures;	3.0, App. C
(3)	The name, address, and telephone number of the oil spill response organization, if appropriate;	2.0
(4)	Response activities and response resources;	App. A
(5)	Names and telephones of federal, state, and local agencies which the operator expects to have pollution control responsibilities or support;	2.0
(6)	Training procedures;	App. D
(7)	Equipment testing;	App. D.2
(8)	Drill types, schedules, and procedures; and	App. D
(9)	Plan review and update procedures.	1.4
	No oil spill response plan is effective until it is approved by the department.	-----
34A-18-9	Reports regarding spill. Each crude oil pipeline operator that experiences a spill shall file a written report with the department, within thirty days of discovery of the spill, if the spill: • Is of five gallons or more; or • Causes an explosion or fire; or • Causes the injury or death of any person.	2.0

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GLOSSARY OF TERMS AND ACRONYMS

Glossary

Acronyms

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GLOSSARY OF TERMS

This glossary contains definitions of terms that will be used frequently during the course of response operations.

Activate: The process of mobilizing personnel and/or equipment within the response organization to engage in response operations.

Activator: An individual in the response organization whose responsibilities include notifying other individuals or groups within the organization to mobilize personnel and/or equipment.

Adverse Weather: The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operating environment. Factors to consider include significant wave height, ice, temperature, weather - related visibility, and currents within the Captain of the Port (COTP) zone in which the systems or equipment are intended to function.

Agency Representative: Individual assigned to an incident from an agency who has been delegated full authority to make decisions on all matters affecting that agency's participation in response operations.

Area Committee: As defined by Sections 311(a)(18) and (j)(4) of CWA, as amended by OPA, means the entity appointed by the President consisting of members from Federal, State, and local agencies with responsibilities that include preparing an Area Contingency Plan for the area designated by the President. The Area Committee may include ex-officio (i.e., non-voting) members (e.g., industry and local interest groups).

Area Contingency Plan: As defined by Sections 311(a)(19) and (j)(4) of CWA, as amended by OPA, means the plan prepared by an Area Committee, that in conjunction with the NCP, shall aliress the removal of a discharge including a worst-case discharge and the mitigation or prevention of a substantial threat of such a discharge from a vessel, offshore facility, or onshore facility operating in or near an area designated by the President.

Average Most Probable Discharge: A discharge of the lesser of 50 barrels or 1% of the volume of the worst case discharge.

Barrel (bbl): Measure of space occupied by 42 U.S. gallons at 60 degrees Fahrenheit.

Bioremediation Agents: Means microbiological cultures, enzyme aliitives, or nutrient aliitives that are deliberately introduced into an oil discharge and that will significantly increase the rate of biodegradation to mitigate the effects of the discharge.

Boom: A piece of equipment or a strategy used to either contain free floating oil to a confined area or protect an uncontaminated area from intrusion by oil.

Booming Strategies: Strategic techniques which identify the location and quantity of boom required to protect certain areas. These techniques are generated by identifying a potential spill source and assuming certain conditions which would affect spill movement on water.

Bulk: Material that is stored or transported in a loose, unpackaged liquid, powder, or granular form capable of being conveyed by a pipe, bucket, chute, or belt system.

Chemical Agents: Means those elements, compounds, or mixtures that coagulate, disperse, dissolve, emulsify, foam, neutralize, precipitate, reduce, solubilize, oxidize, concentrate, congeal, entrap, fix, make the pollutant mass more rigid or viscous, or otherwise facilitate the mitigation of deleterious effects or the removal of the oil pollutant from the water. Chemical agents include biological aliitives, dispersants, sinking agents, miscellaneous oil spill control agents, and burning agents, but do not include solvents.

Clean-up Contractor: Persons contracted to undertake a response action to clean up a spill.

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Cleanup: For the purposes of this document, cleanup refers to the removal and/or treatment of oil, hazardous substances, and/or the waste or contaminated materials generated by the incident. Cleanup includes restoration of the site and its natural resources.

Coastal Waters: For the purpose of classifying the size of discharges, means the waters of the coastal zone except for the Great Lakes and specified ports and harbors on inland rivers.

Coastal Zone: As defined for the purpose of the NCP, means all United States waters subject to the tide, United States waters of the Great Lakes, specified ports and harbors on inland rivers, waters of the contiguous zone, other waters of the high seas subject to the NCP, and the land surface or land substrata, ground waters, and ambient air proximal to those waters. The term coastal zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Coast Guard District Response Ground (DRG): As provided for by CWA sections 311(a)(20) and (j)(3), means the entity established by the Secretary of the department in which the USCG is operating within each USCG district and shall consist of: the combined USCG personnel and equipment, including firefighting equipment, of each port within the district; aliitional prepositioned response equipment; and a district response advisory team.

Command: The act of controlling manpower and equipment resources by virtue of explicit or delegated authority.

Command Post: A site located at a safe distance form the spill site where response decisions are made, equipment and manpower deployed, and communications hanuled. The Incident Commander and the On-Scene Coordinators may direct the on-scene response from this location.

Communications Equipment: Equipment that will be utilized during response operations to maintain communication between the Company employees, contractors, Federal/State/Local agencies. (Radio/ telephone equipment and links)

Containment Boom: A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.

Contingency Plan: A document used by (1) federal, state, and local agencies to guide their planning and response procedures regarding spills of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies occurring upon their vessels or at their facilities.

Contract or Other Approved Means: For OPA 90, a written contract with a response contractor; certification by the facility owner or operator that personnel and equipment are owned, operated, or under the direct control of the facility, and available within the stipulated times; active membership in a local or regional oil spill removal organization; and/or the facility?s own equipment.

Critical Areas to Monitor: Areas which if impacted by spilled oil may result in threats to public safety or health.

Cultural Resources: Current, historic, prehistoric and archaeological resources which include deposits, structures, ruins, sites, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to the historical or prehistorical culture of people in the state as well as to the natural history of the state.

Damage Assessment: The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.

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Decontamination: The removal of hazardous substances from personnel and their equipment necessary to prevent adverse health effects.

Discharge: Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Dispersants: Means those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.

Diversion Boom: A floatation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert the product towards a pick up point, or away from certain areas.

Drinking Water Supply: As defined by Section 101(7) of CERCLA, means any raw or finished water source that is or may be used by a public water system (as defined in the Safe Drinking Water Act) or as drinking water by one or more individuals.

EM: Emergency Management. Serves as the focal point for senior management support of an incident.

Economically Sensitive Areas: Those areas of explicit economic importance to the public that due to their proximity to potential spill sources may require special protection and include, but are not limited to: potable and industrial water intakes; locks and dams; and public and private marinas.

Emergency Management: The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Emergency Service: Those activities provided by state and local government to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.

Environmentally Sensitive Areas: Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird rookeries, endangered or threatened species (flora and fauna) habitat, wilulife preserves or conservation areas, parks, beaches, dunes, or other areas protected or managed for its natural resource value.

Facility: Either an onshore facility or an offshore facility and includes, but is not limited to structures, equipment, and appurtenances thereto, used or capable of being used to transfer oil to or from a vessel or a public vessel. A facility includes federal, state, municipal, and private facilities.

Facility Operator: The person who owns, operates, or is responsible for the operation of the facility.

Federal Fund: The spill liability trust fund established under OPA.

Federal Regional ResponseTeam: The federal response organization (consisting of representatives from selected federal and state agencies) which acts as a regional body responsible for planning and preparedness before an oil spill occurs and providing advice to the FOSC in the event of a major or substantial spill.

Federal Response Plan (FRP): Means the agreement signed by 25 federal departments and agencies in April 1987 and developed under the authorities of the Earthquake Hazards Reduction Act of 1977 and the Disaster Relief Act of 1974, as amended by the Stafford Disaster Relief Act of 1988.

First Responders, First Response Agency: A public health or safety agency (e.g., fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.

Hanule: To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.

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Harmful Quantity Of Oil: The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or sheen upon or discoloration of the surface of the water or a shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.

Hazardous Material: Any nonradioactive solid, liquid, or gaseous substance which, when uncontrolled, may be harmful to humans, animals, or the environment. Including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants.

Hazardous Substance: Any substance designed as such by the Administrator of the EPA pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act; regulated pursuant to Section 311 of the Federal Water Pollution Control Act, or discharged by the SERC.

Hazardous Waste: Any solid waste identified or listed as a hazardous waste by the Administrator of the EPA pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C., Section 6901,et seq as amended. The EPA Administrator has identified the characteristics of hazardous wastes and listed certain wastes as hazardous in Title 40 of the Code of Federal Regulations, Part 261, Subparts C and D respectively.

HAZMAT: Hazardous materials or hazardous substances, exposure to which may result in adverse effects on health or safety of employees.

HAZWOPER: Hazardous Waste Operations and Emergency Response Regulations published by OSHA to cover worker safety and health aspects of response operations.

Heat Stress: Dangerous physical condition caused by over exposure to extremely high temperatures.

Hypothermia: Dangerous physical condition caused by over exposure to freezing temperatures.

Incident: Any event that results in a spill or release of oil or hazardous materials. Action by emergency service personnel may be required to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Briefing Meeting: Held to develop a comprehensive, accurate, and up-to-date understanding of the incident, nature of status of control operations, and nature and status of response operations; ensure the adequacy of control and response operations; begin to organize control and response operations; and prepare for interactions with outside world.

Incident Command Post (ICP): That location at which all primary command functions are executed.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, with responsibility for the management of assigned resources at an incident.

Incident Commander (IC): The one individual in charge at any given time of an incident. The Incident Commander will be responsible for establishing a unified command with all on-scene coordinators.

Indian Tribe: As defined in OPA section 1001, means any Indian tribe, band, nation, or other organized group or community, but not including any Alaska Native regional or village corporation, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and has governmental authority over lands belonging to or controlled by the Tribe.

Initial Cleanup: Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of cleanup increases significantly without timely remedial action. All sites must be evaluated to determine whether initial cleanup is total cleanup, however, this will not be possible in all cases due to site conditions (i.e., a site where overland transport or flooding may occur).

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Initial Notification: The process of notifying necessary the Company personnel and Federal/ State/Local agencies that a spill has occurred, including all pertinent available information surrounding the incident.

Initial Response Actions: The immediate actions that are to be taken by the spill observer after detection of a spill.

Inland Area: The area shoreward of the boundary lines defined in 46 CFR part 7, except that in the Gulf of Mexico, it means the area shoreward of the lines of demarcation (COLREG lines) as defined in §80.740 through 80.850 of this chapter. The inland area does not include the Great Lakes.

Inland Waters: State waters not considered coastal waters; lakes, rivers, ponds, streams, underground water, et. al.

Inland Zone: Means the environment inland of the coastal zone excluding the Great Lakes, and specified ports and harbors on inland rivers. The term inland zone delineates an area of federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in federal regional contingency plans.

Interim Storage Site: A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.

Lead Agency: The government agency that assumes the lead for directing response activities.

Lead Federal Agency: The agency which coordinates the federal response to incident on navigable waters. The lead federal agencies are:

- **U.S. Coast Guard:** Oil and chemically hazardous materials incidents on navigable waters.
- **Environmental Protection Agency:** Oil and chemically hazardous materials incidents on inland waters.

Lead State Agency: The agency which coordinates state support to federal and/or local governments or assumes the lead in the absence of federal response.

Loading: Transfer from Facility to vehicle.

Local Emergency Planning Committee (LEPC): A group of local representatives appointed by the State Emergency Response Commission (SERC) to prepare a comprehensive emergency plan for the local emergency planning district, as required by the Emergency Planning and Community Right-to-know Act (EPCRA).

Local Response Team: Designated Facility individuals who will fulfill the roles determined in the oil spill response plan in the event of an oil or hazardous substance spill. They will supervise and control all response and clean-up operations.

Lower Explosive Limit: Air measurement utilized to determine the lowest concentration of vapors that support combustion. This measurement must be made prior to entry into a spill area or a confined space.

Marinas: Small harbors with docks, services, etc. for pleasure craft.

Medium Discharge: Means a discharge greater than 2,100 gallons (50 Bbls) and less than or equal to 36,000 gallons (85+ Bbls) or 10% of the capacity of the largest tank, whichever is less and not to exceed the WCD.

National Contingency Plan: The plan prepared under the Federal Water Pollution Control Act (33 United State Code §1321 et seq) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 United State Code § 9601 et seq), as revised from time to time.

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National Pollution Funds Center (NPFC): Means the entity established by the Secretary of Transportation whose function is the administration of the Oil Spill Liability Trust Fund (OSLTF). Among the NPFC's duties are: providing appropriate access to the OSLTF for federal agencies and states for removal actions and for federal trustees to initiate the assessment of natural resource damages; providing appropriate access to the OSLTF for claims; and coordinating cost recovery efforts.

National Response System (NRS): Is the mechanism for coordinating response actions by all levels of government in support of the OSC. The NRS is composed of the NRT, RRTs, OSC, Area Committees, and Special Teams and related support entities.

National Strike Force (NSF): Is a special team established by the USCG, including the three USCG Strike Teams, the Public Information Assist Team (PIAT), and the National Strike Force Coordination Center. The NSF is available to assist OSCs in their preparedness and response duties.

National Strike Force Coordination Center (NSFCC): Authorized as the National Response Unit by CWA section 311(a)(23) and (j)(2), means the entity established by the Secretary of the department in which the USCG is operating at Elizabeth City, North Carolina, with responsibilities that include administration of the USCG Strike Teams, maintenance of response equipment inventories and logistic networks, and conducting a national exercise program.

Natural Resource: Land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the state, federal government, private parties, or a municipality.

Navigable Waters: As defined by 40 CFR 110.1 means the waters of the United States, including the territorial seas. The term includes:

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

Interstate waters, including interstate wetlands;

All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, and wetlands, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

- that are or could be used by interstate or foreign travelers for recreational or other purposes;
- from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; and
- that are used or could be used for industrial purposes by industries in interstate commerce.

All impoundments of waters otherwise defined as navigable waters under this section;

Tributaries of waters identified in paragraphs (a) through (d) of this definition, including adjacent wetlands; and

Wetlands adjacent to waters identified in paragraphs (a) through (e) of this definition: Provided, that waste treatment systems (other than cooling ponds meeting the criteria of this paragraph) are not waters of the United States.

Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act jurisdiction remains with EPA.

Nearshore Area: For OPA 90, the area extending seaward 12 miles from the boundary lines defined in 46 CFR Part 7, except in the Gulf of Mexico. In the Gulf of Mexico, it means the area extending seaward 12 miles from the line of demarcation defined in §80.740 - 80.850 of title 33 of the CFR.

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Non-persistent or Group I Oil: A petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions:

1. At lease 50% of which by volume, distill at a temperature of 340 degrees C (645 degrees F);
2. At least 95% of which volume, distill at a temperature of 370 degrees C (700 degrees F).

Ocean: The open ocean, offshore area, and nearshore area as defined in this subpart.

Offshore area: The area up to 38 nautical miles seaward of the outer boundary of the nearshore area.

Oil or Oils: Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil, diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Oil does not include any substance listed in Table 302.4 of 40 CFR Part 302 adopted August 14, 1989, under Section 101(14) of the federal comprehensive environmental response, compensation, and liability act of 1980, as amended by P. L. 99-499.

Oil Spill Liability Trust Fund: Means the fund established under section 9509 of the Internal Revenue Code of 1986 (26 U.S.C. 9509).

Oily Waste: Product contaminated waste resulting from a spill or spill response operations.

On-Scene Coordinator (OSC): Means the federal official predesignated by the EPA or the USCG to coordinate and direct response under subpart D.

On-site: Means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a response action.

Open Ocean: means the area from 38 nautical miles seaward of the outer boundary of the nearshore area, to the seaward boundary of the exclusive economic zone.

Owner or Operator: Any person, individual, partnership, corporation, association, governmental unit, or public or private organization of any character.

Persistent Oil: A petroleum-based oil that does not meet the distillation criteria for a non-persistent oil. For the purposes of this Appendix, persistent oils are further classified based on specific gravity as follows:

1. Group II specific gravity less than .85
2. Group III specific gravity between .85 and less than .95
3. Group IV specific gravity .95 and including 1.0
4. Group V specific gravity greater than 1.0

Plan Holder: The plan holder is the industry transportation related facility for which a response plan is required by federal regulation to be submitted by a vessel or facility's owner or operator.

Post Emergency Response: The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and cleanup of the sites has begun.

Post Emergency: The phase of response operations conducted after the immediate threat of the release has been stabilized, and cleanup operations have begun.

Primary Response Contractors or Contractors: An individual, company, or cooperative that has contracted directly with the plan holder to provide equipment and/or personnel for the containment or cleanup of spilled oil.

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Qualified Individual (QI): That person or entity who has authority to activate a spill cleanup contractors, act as liaison with the "On-Scene Coordinator" and obligate funds required to effectuate response activities.

Recreation Areas: Publicly accessible locations where social/sporting events take place.

Regional Response Team (RRT): The Federal response organization (consisting of representatives from selected Federal and State agencies) which acts as a regional body responsible for overall planning and preparedness for oil and hazardous materials releases and for providing advice to the OSC in the event of a major or substantial spill.

Remove or Removal: As defined by section 311(a)(8) of the CWA, refers to containment and removal of oil or hazardous substances from the water and shorelines or the taking of such other actions as may be necessary to minimize or mitigate damage to the public health or welfare (including, but not limited to, fish, shellfish, wildlife, public and private property, and shorelines and beaches) or to the environment. For the purpose of the NCP, the term also includes monitoring of action to remove discharge.

Response Activities: The containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, or the taking of other actions as necessary to minimize or mitigate damage to public health or welfare, or the environment.

Response Contractors: Persons/companies contracted to undertake a response action to contain and/or clean up a spill.

Response Guidelines: Guidelines for initial response that are based on the type of product involved in the spill, these guidelines are utilized to determine clean-up methods and equipment.

Response Plan: A practical manual used by industry for responding to a spill. Its features include: (1) identifying the notifications sequence, responsibilities, response techniques, etc. in a easy to use format; (2) using decision trees, flowcharts, and checklists to insure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from data required by regulatory agencies to prevent confusion during a spill incident.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Responsible Party: Any person, owner/operator, or facility that has control over an oil or hazardous substance immediately before entry of the oil or hazardous substance into the atmosphere or in or upon the water, surface, or subsurface land of the state.

Response Priorities: Mechanism used to maximize the effective use of manpower and equipment resources based upon their availability during an operational period.

Response Resources: All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.

Restoration: The actions involved in returning a site to its former condition.

Rivers and Canals: A body of water confined within the inland area that has a project depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.

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Securing the Source: Steps that must be taken to stop discharge of oil at the source of the spill.

Sinking Agents: Means those aliitives applied to oil discharges to sink floating pollutants below the water surface.

Site Characterization: An evaluation of a cleanup site to determine the appropriate safety and health procedures needed to protect employees from identified hazards.

Site Conditions: Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.

Site Safety and Health Plan: A site specific plan developed at the time of an incident that addresses:

- Safety and health hazard analysis for each operation.
- Personal protective equipment to be used.
- Training requirements for site workers.
- Medical surveillance requirements.
- Air monitoring requirements.
- Site control measures.
- Decontamination procedures.
- Emergency response procedures.
- Confined space entry procedures.

Site Security and Control: Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.

Skimmers: Mechanical devices used to skim the surface of the water and recover floating oil. Skimmers fall into four basic categories (suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices) which vary in efficiency depending on the type of oil and size of spill.

Snare Boom: Oil will adhere to the material of which this boom is made of and thus collect it.

Sorbents: Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.

Spill: An unauthorized discharge of oil or hazardous substance into the waters of the state.

Spill Observer: The first Facility individual who discovers a spill. This individual must function as the first responder and person-in-charge until relieved by an authorized supervisor.

Spill of National Significance (SONS): Means a spill which due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of federal, state, local, and responsible party resources to contain and cleanup the discharge.

Spill Management Team: The personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Spill Response: All actions taken in responding to spills of oil and hazardous materials, e.g.: receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.

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Spill Response Personnel: Federal, state, local agency, and industry personnel responsible for participating in or otherwise involved in spill response. All spill response personnel will be pre-approved on a list maintained in each region.

Staging Areas: Designated areas near the spill site accessible for gathering and deploying equipment and/or personnel.

State Emergency Response Commission (SERC): A group of officials appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Re-authorization Act of 1986 (SARA). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local Emergency Response Plans.

Surface Collecting Agents: Means those chemical agents that form a surface film to control the layer thickness of oil.

Surface Washing Agent: Is any product that removes oil from solid surfaces, such as beaches and rocks, through a detergency mechanism and does not involve dispersing or solubilizing the oil into the water column.

Tanker: A self-propelled tank vessel constructed or adapted primarily to carry or hazardous material in bulk in the cargo spaces.

Tidal Current Tables: Tables which contain the predicted times and heights of the high and low waters for each day of the year for designated areas.

Trajectory Analysis: Estimates made concerning spill size, location, and movement through aerial surveillance or computer models.

Transfer: Any movement of oil to, from, or within a vessel by means of pumping, gravitation, or displacement.

Trustee: Means an official of a federal natural resources management agency designated in subpart G of the NCP or a designated state official or Indian tribe or, in the case of discharges covered by the OPA, a foreign government official, who may pursue claims for damages under section 1006 of the OPA.

Underwriter: An insurer, a surety company, a guarantor, or any other person, other than an owner or operator of a vessel or facility, that undertakes to pay all or part of the liability of an owner or operator.

Unified Command: The method by which local, state, and federal agencies and the responsible party will work with the Incident Commander to:

- Determine their roles and responsibilities for a given incident.
- Determine their overall objectives for management of an incident.
- Select a strategy to achieve agreed-upon objectives.
- Deploy resources to achieve agreed-upon objectives.

Unified or Coordinated Command Meeting: Held to obtain agreement on strategic objectives and response priorities; review tactical strategies; engage in joint planning, integrate response operations; maximize use of resources; and minimize resolve conflicts.

Volunteers: An individual who donates their services or time without receiving monetary compensation.

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Waste: Oil or contaminated soil, debris, and other substances removed from coastal waters and adjacent waters, shorelines, estuaries, tidal flats, beaches, or marshes in response to an unauthorized discharge. Waste means any solid, liquid, or other material intended to be disposed of or discarded and generated as a result of an unauthorized discharge of oil. Waste does not include substances intended to be recycled if they are in fact recycled within 90 days of their generation or if they are brought to a recycling facility within that time.

Waters of the United States: See **Navigable Waters** in this Glossary.

Wetlands: Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include playa lakes, swamps, marshes, bogs, and similar areas such as sloughs, prairie potholes, wet meadows, prairie river overflows, mudflats, and natural ponds (40 CFR 112.2(y)).

Wildlife Rescue: Efforts made in conjunction with Federal and State agencies to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill.

Worst Case Discharge: The largest foreseeable discharge under adverse weather conditions. For facilities located above the high water line of coastal waters, a worst case discharge includes those weather conditions most likely to cause oil discharged from the facility to enter coastal waters.

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ACRONYMS

AMIO	Alien Migration Interdiction Operation
AQI	Alternate Qualified Individual
AM	Ante Meridiem
ACP	Area Contingency Plan
Avg.	Average
bbls	Barrels
bbl/hr	Barrel per Hour
Br	Branch
BLM	Bureau of Land Management
COTP	Captain of the Port
Ctr.	Center
CAS Number	Chemical Abstracts Service
CST	Civil Support Team
CG	Coast Guard
CFR	Code of Federal Regulations
Cont'd	Continued
CERT	Corporate Emergency Response Team
CMT	Crisis Management Team
DOA	Dead on Arrival
Dept.	Department
DOD	Department of Defense
DENR	Department of Environment and Natural Resources
DHS	Department of Homeland Security
DOI	Department of Interior
DNR	Department of Natural Resources
DOT	Department of Transportation
D.C.	District of Columbia
Div.	Division
DOCL	Documentation Unit Leader
EMS	Emergency Management System
EM	Emergency Manager
EMS	Emergency Medical Service
EOC	Emergency Operations Center
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESA	Endangered Species Act
EET	Environmental Emergency Team
EPA	Environmental Protection Agency
EDRC	Estimated Daily Recovery Capability
EPA	Environmental Protection Agency
ETA	Estimated Time of Arrival
etc.	Et Cetera
exempli gratia e.g.	For Example
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FOSC	Federal On-Scene Coordinator
Ft.	Feet
Ft./Sec.	Feet/Second
FIR	Field Investigation Report
FR	Fire Retardant
FWD	Forward
Freq.	Frequency
GRP	Group
Gru Sups.	Group Supervisors
HAZMAT	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard

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HVAC	Heating, Ventilating, and Air Conditioning
HEPA OVV	High Efficiency Particle Air Device
HF ERW	High Frequency Electric-Resistance Weld
HLS	Homeland Security
Hrs.	Hours
ID NO.	Identification Number
IL	Illinois
IDNR	Illinois Department of Natural Resources
IAW	In Accordance With
IAP	Incident Action Plan
ICP	Incident Command Post
ICS	Incident Command System
IC	Incident Commander
IMH	Incident Management Handbook
IMS	Incident Management System
Info.	Information
IRT	Initial Response Team
KS	Kansas
KM	Kilometer
KP	Kilometer Point
LE	Law Enforcement
LDS	Leak Detection System
LO	Liaison Officer
LPG	Liquefied Petroleum Gas
LEPC	Local Emergency Planning Committee
LRT	Local Response Team
LSC	Logistics Section Chief
LF ERW	Low Frequency Electric-Resistance Weld
LEL	Lower Explosive Limit
MO	Missouri
MSDS	Material Safety Data Sheets
MEDEVAC'D	Medical Evacuation
NCP	National Contingency Plan
NE	Nebraska
NEECP (CA)	National Environmental Emergencies Contingency Plan
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NOAA	National Oceanographic Atmospheric Administration
NCP (U.S.)	National Oil and Hazardous Substances Contingency Plan
NPFC	National Pollution Fund Center
NRC	National Response Center
NRS	National Response System
NSF	National Strike Force
NSFCC	National Strike Force Coordination Center
NRDAR	Natural Resource Damage Assessment and Restoration
NEB	National Energy Board
N	No
ND	North Dakota
NW	North West
N/A	Not Available
OSHA	Occupational Safety & Health Administration
OPA	Oil Pollution Act of 1990
OSRO	Oil Spill Removal Organization
OSRP	Oil Spill Response Plan
OSRV	Oil Spill Response Vessel
OSC	On-Scene Commander
OSC	On-Scene Coordinate
OSC	Operation Section Chief

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O&M	Operations and Maintenance
OP	Operational Period
Op.	Operations
OPS	Operations
O&M	Operations and Maintenance
OCC	Operations Coordination Center
OV	Organic Vapor
PPM	Parts Per Million
PFD	Personal Floatation Device
PPE	Personal Protection Equipment
PHMSA	Pipeline and Hazardous Materials Safety Administration
PSC	Planning Section Chief
POC	Point of Contact
PVC	Polyvinyl Chloride
P.M.	Post Meridiem
PREP	Preparedness for Response Exercise Program
Prot.	Protection
PWSD	Public Water Supply District
QI	Qualified Individual
REET	Regional Environmental Emergency Team
RPT	Regional Preparedness Team
RRT	Regional Response Team
Req.	Required
RCRA	Resource Conservation and Recovery Act
RESL	Resource Leader
RP	Responsible Party
RPIC	Responsible Party Incident Commander
Rev.	Revision
ROW	Right-of-Way
RWD	Rural Water District
SAR	Search and Rescue
SART	Search and Rescue Transporter
Sec.	Second
SI	Security Incident
SO	Security Officer
SCBA	Self Contained Breathing Apparatus
SSPs	Site Safety Plans
SITL	Situation Unit Leader
SD	South Dakota
Spec.	Special
SONS	Spill of National Significance
SPCC	Spill Prevention, Control, and Countermeasure
SORS	Spilled oil Recovery System
Sq. Ft.	Square Foot
STAM	Staging Area Manager
SERC	State Emergency Response Center
SERC	State Emergency Response Commission
SOSC	State On-Scene Coordinator
SOR	Statutory Orders and Regulations
SUPSALV	US Navy Supervisor Salvage & Diving
SCADA	Supervisory Control and Data Acquisition
TOC	Table of Contents
TSD	Temporary Storage and Disposal
TSC	Temporary Storage Capacity
id est, I.E.	That is
TBA	To be Assigned
TSB	Transportation Safety Board
UC	Unified Command

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UN Number	United Nations
US	United States
USCG	United States Coast Guard
Vsl.	Vessel
VOSS	Vessel of Opportunity Skimmer System
VP	Vice President
VOC	Volatile Organic Compound
Vol.	Volume
W	West
WCD	Worst Case Discharge
Y	Yes

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RESPONSE ZONE INFORMATION

Hardisty Pump Station/ Regina Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Alberta, Saskatchewan
Areas/Counties Traversed:	Eastern Alberta, Western Saskatchewan

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 39,723 Bbls

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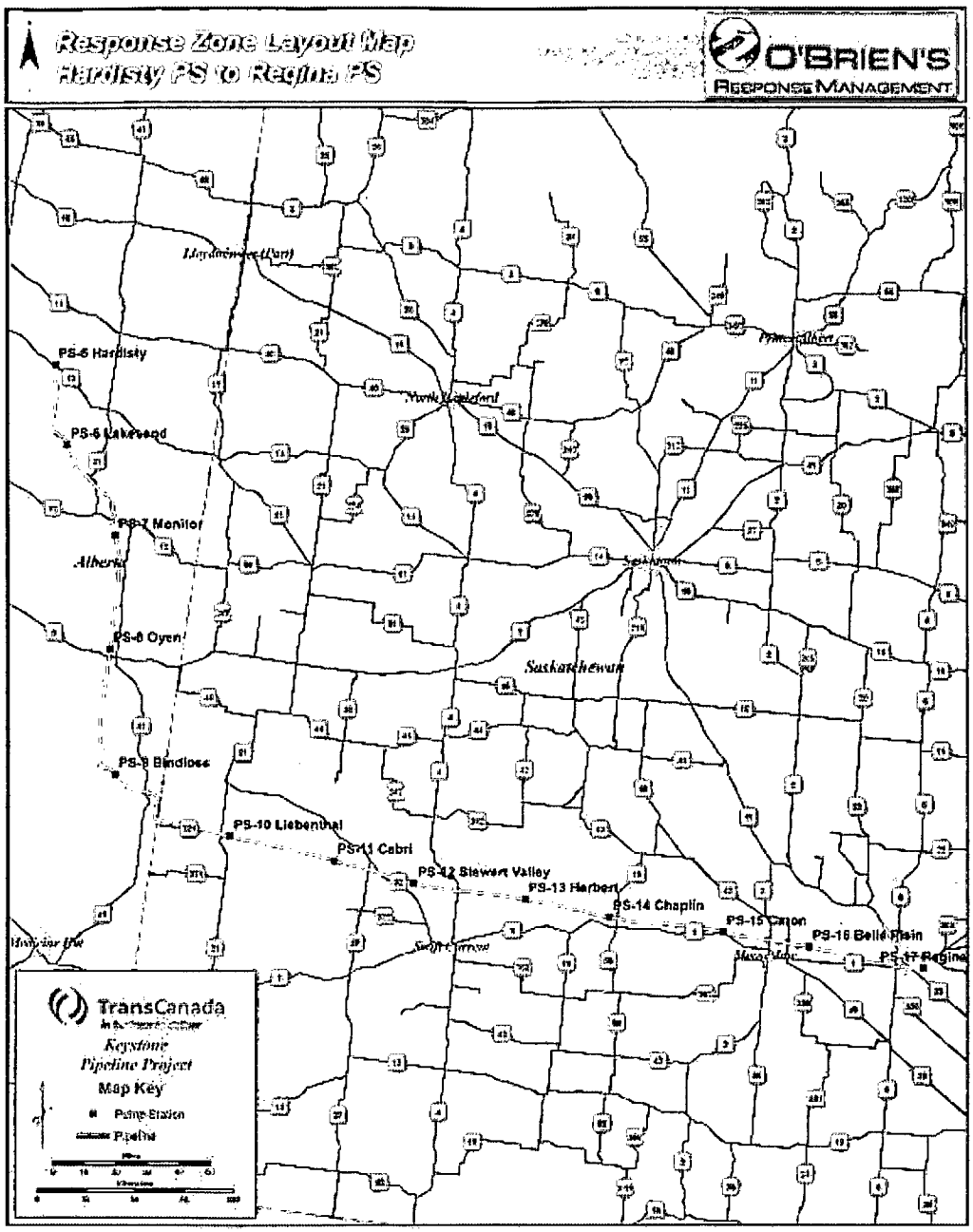

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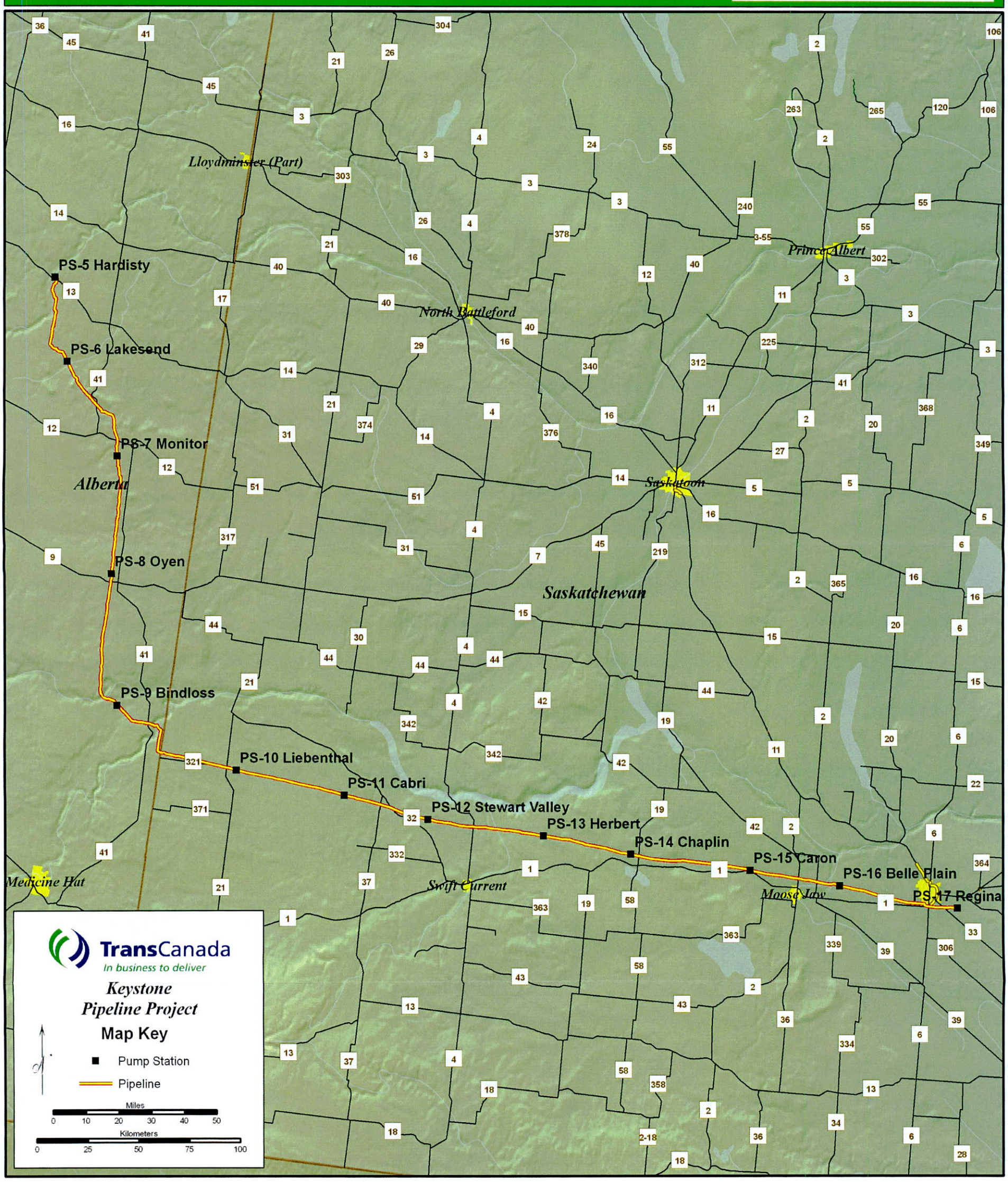
Response Zone Layout Map
Hardisty PS to Regina PS

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Hardisty Area Manger	Incident Commander	Bryan Templeton	(780) 888-2668 (Office) (780) 842-4023 (Home) (403) 928-1852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
Palliser Area Manager	Incident Commander, Planning Section Chief	Rob Ferguson	(403) 529-4318 (Office) (403) 548-6077 (Home) (204) 233-7109 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)
Heartland Area Manager	Incident Commander	Stephen Bachorcik	(306) 773-7501 (Office) (306) 750-2103 (Cell)

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Area: Hardisty Pump Station / Regina Pump Station Qualified Individuals			
NAME	OFFICE	HOME	CELL
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Bryan Templeton	(780) 888-2668	(780) 842-4023	(403) 928-1852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416
Rob Ferguson	(403) 529-4318	(403) 548-6077	(204) 233-7109

Pipeline Specifications			
Location	Type of Oil	State	County
Cabri PS / Herbert PS	Crude Oil	Saskatchewan	Western Saskatchewan
Herbert PS / Caron PS	Crude Oil	Saskatchewan	Western Saskatchewan
Hardisty PS / Lakesend PS	Crude Oil	Alberta	Eastern Alberta
Lakesend PS / Monitor PS	Crude Oil	Alberta	Eastern Alberta
Monitor PS / Oyen PS	Crude Oil	Alberta	Eastern Alberta
Oyen PS / Bindloss PS	Crude Oil	Alberta	Eastern Alberta
Blindloss PS / Cabri PS	Crude Oil	Alberta	Eastern Alberta
Hardisty Interconnection Facility	Crude Oil	Alberta	Eastern Alberta
Caron PS / Regina PS	Crude Oil	Saskatchewan	Western Saskatchewan

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
34' Equipment Response Trailer	HSE Integrated, Brooks Ab	See Inventory - Appendix A
20' Boom trailer	HSE Integrated, Brooks Ab	See Inventory - Appendix A
OSRV boat	HSE Integrated, Brooks Ab	See Inventory - Appendix A
Safety Boat - HSE	HSE Integrated, Brooks Ab	See Inventory - Appendix A
20' Equpment Trailer	TC, Hardisty, Ab	See Inventory - Appendix A
Work Boat	TC, Hardisty, Ab	See Inventory - Appendix A
Safety Boat - TC	TC, Hardisty, Ab	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Alberta

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Alberta		
Abbey Fire Department	Abbey, Alberta	(306) 689-2933
Acadia Valley Fire Department	Acadia Valley, Alberta	(403) 972-3808
Bindloss Fire Department	Bindloss, Alberta	(403) 379-2278
Bow Island Fire Department	Bow Island, Alberta	(403) 545-2424
Cereal Fire Department	Cereal, Alberta	(403) 326-2195
CFB Suffield Military Police Detachment	Ralston, Alberta	(403) 544-4303 /4506
Elkwater Fire Department	Elkwater, Alberta	(403) 893-2005
Empress Ambulance Services (Alberta Medivac)	Oyen, Alberta	(403) 664-2456
Empress Fire Department	Empress, Alberta	(403) 565-3746
Etzikom Fire Department	Bow Island, Alberta	(403) 545-2424
Hilda Fire Department	Hilda, Alberta	(403) 838-2510
Irvine Fire Department	Irvine, Alberta	(403) 529-8285
Jenner Fire Department	Jenner, Alberta	(403) 898-2204
Medicine Hat Police Service	Medicine Hat, Alberta	(403) 529-8400
Medicine Hat Disaster Services	Medicine Hat, Alberta	(403) 529-8450
Medicine Hat Fire Department	Medicine Hat, Alberta	(403) 529-8282
Oyen Fire Department	Oyen, Alberta	911
Oyen RCMP Detachment	Oyen, Alberta	(403) 664-3505 /3883
Palliser Regional EMS - Medicine Hat	Medicine Hat, Alberta	(403) 529-8800
Ralston Fire Department	Ralston, Alberta	(403) 544-4448

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Redcliff Disaster Services	Redcliff, Alberta	(403) 548-3618
Redcliff Fire Department	Redcliff, Alberta	(403) 548-3425
Schuler Fire Department	Schuler, Alberta	(403) 526-2888
Seven Persons Fire Department	Seven Persons, Alberta	(403) 832-3750
Special Areas No. 3 Fire Department (Youngstown)	Youngstown, Alberta	(403) 779-3733
Walsh Fire Department	Walsh, Alberta	(403) 937-3936

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EXTERNAL NOTIFICATION REFERENCES

Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Western Saskatchewan		
Burstall Ambulance Services	Burstall, Saskatchewan	(306) 679-2271
Burstall EMO Services	Burstall, Saskatchewan	(306) 679-2000
Burstall Fire Department	Burstall, Saskatchewan	(306) 679-2108 /2215
Cabri Ambulance Services	Cabri, Saskatchewan	(306) 587-2547
Cabri Fire Department	Cabri, Saskatchewan	(306) 587-2500
Cabri RCMP Detachment	Cabri, Saskatchewan	(306) 587-6400
Caronport Fire Department	Caronport, Saskatchewan	(306) 756-3253
Central Butte Ambulance Services	Central Butte, Saskatchewan	(306) 694-2111 /4610
Chaplin Fire Department	Chaplin, Saskatchewan	(306) 395-2561 /2598
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
Climax Fire Department	Climax, Saskatchewan	(306) 293-2131
Eastend Fire Department	Eastend, Saskatchewan	(306) 295-3634
Fox Valley Fire Department	Fox Valley, Saskatchewan	(306) 666-2151
Frontier Ambulance Services	Frontier, Saskatchewan	(306) 296-4554
Frontier Fire Department	Frontier, Saskatchewan	(306) 296-4554 /4778
Gull Lake Ambulance Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake EMO Services	Gull Lake, Saskatchewan	(306) 672-4704
Gull Lake Fire Department	Gull Lake, Saskatchewan	(306) 672-4273
Herbert Fire Department	Herbert, Saskatchewan	(306) 784-2400
Kipling Fire Department	Kipling, Saskatchewan	(306) 736-8461

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Leader Ambulance Services	Leader, Saskatchewan	(306) 628-3828
Leader EMO Services	Leader, Saskatchewan	(306) 628-3868
Leader Fire Department	Leader, Saskatchewan	(306) 628-3868
Leader RCMP Detachment	Leader, Saskatchewan	(306) 628-4600
Maple Creek Ambulance	Maple Creek, Saskatchewan	(306) 662-2611
Maple Creek EMO Services	Maple Creek, Saskatchewan	(306) 662-2244
Maple Creek RCMP Detachment	Maple Creek, Saskatchewan	(306) 662-5550
Moose Jaw Ambulance Services	Moose Jaw, Saskatchewan	(306) 694-2151
Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 693-9700
Moose Jaw Fire Department	Moose Jaw, Saskatchewan	(306) 692-2792
Moose Jaw RCMP Detachment	Moose Jaw, Saskatchewan	(306) 691-4670
Morse Fire Department	Morse, Saskatchewan	(306) 629-3282
Morse RCMP Detachment	Morse, Saskatchewan	(306) 629-4100
Pense Fire Department	Pense, Saskatchewan	(306) 345-2302
Piapot Fire Department	Piapot, Saskatchewan	(306) 558-2022 /2011
RCMP - Gull Lake Community Detachment	Swift Current, Saskatchewan	(306) 672-3140
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829 /7830
Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560
Richmound Ambulance Services	Leader, Saskatchewan	(306) 679-7182
RM of Moose Jaw EMO Services	Moose Jaw, Saskatchewan	(306) 692-3446
RM of Wheatland EMO Services	Mortlach, Saskatchewan	(306) 355-2233
Rural Municipality of Riverside No.168 Fire Depart	Pennant, Saskatchewan	(306) 626-3255
Sceptre Fire Department	Sceptre, Saskatchewan	(306) 623-4244

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Shaunavon Ambulance Services	Shaunavon, Saskatchewan	(306) 297-2644
Shaunavon EMO Services	Shaunavon, Saskatchewan	(306) 297-9381
Shaunavon Fire Department	Shaunavon, Saskatchewan	(306) 297-4131
Shaunavon RCMP Detachment	Shaunavon, Saskatchewan	(306) 297-5555
Stewart Valley Fire Department	Stewart Valley, Saskatchewan	(306) 778-2105 /2152
Swift Current Ambulance Services	Swift Current, Saskatchewan	(306) 773-2666
Swift Current Fire Department	Swift Current, Saskatchewan	(306) 778-2760
Swift Current RCMP Detachment	Swift Current, Saskatchewan	(306) 778-5550
Val Marie Ambulance Services	Val Marie, Saskatchewan	(306) 298-4911
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012 /2022

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RESPONSE ZONE INFORMATION

Regina Pump Station / Haskett Pump Station

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Saskatchewan, Manitoba
Areas/Counties Traversed:	Eastern Saskatchewan, Southwestern Manitoba

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 47,782 Bbls

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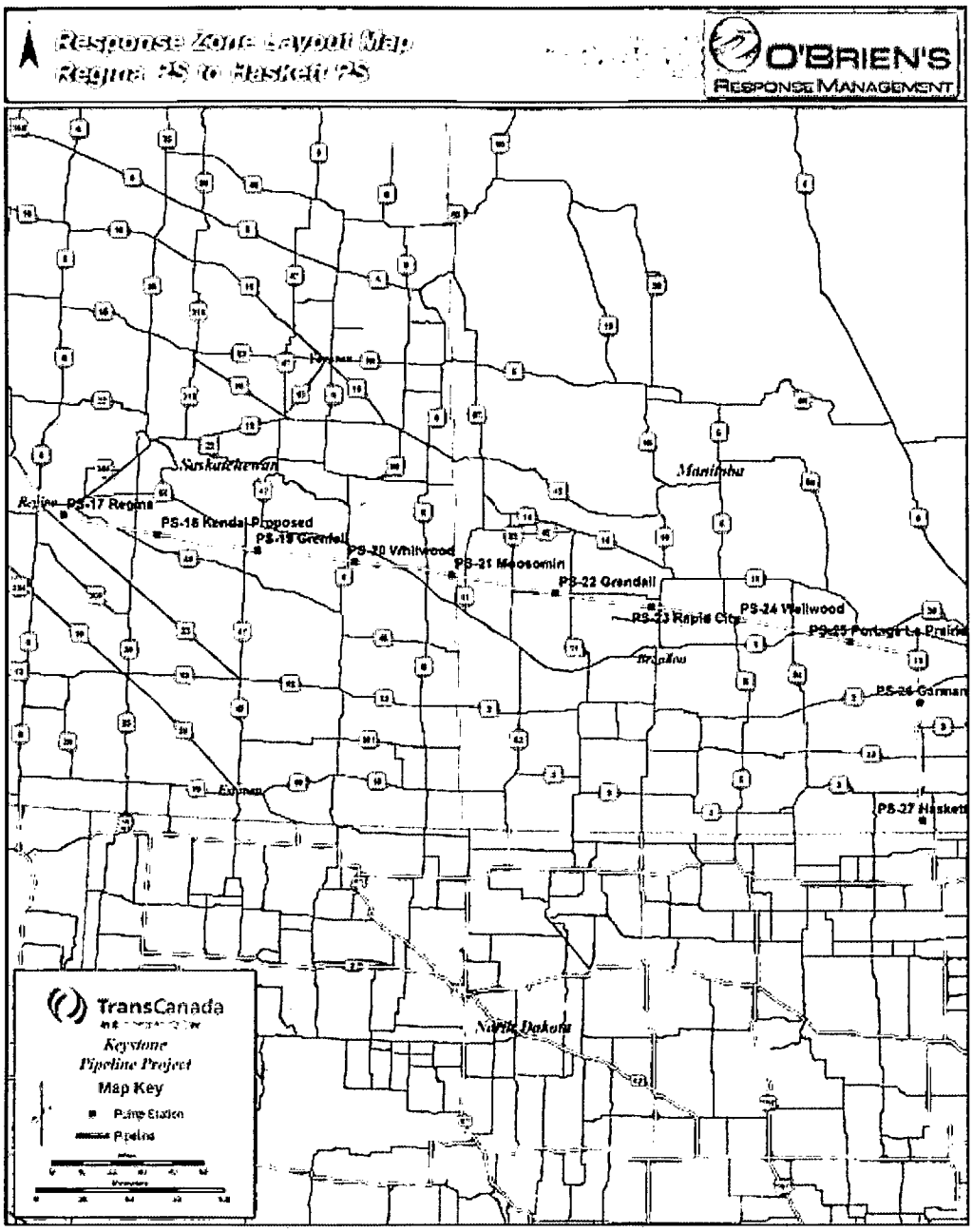

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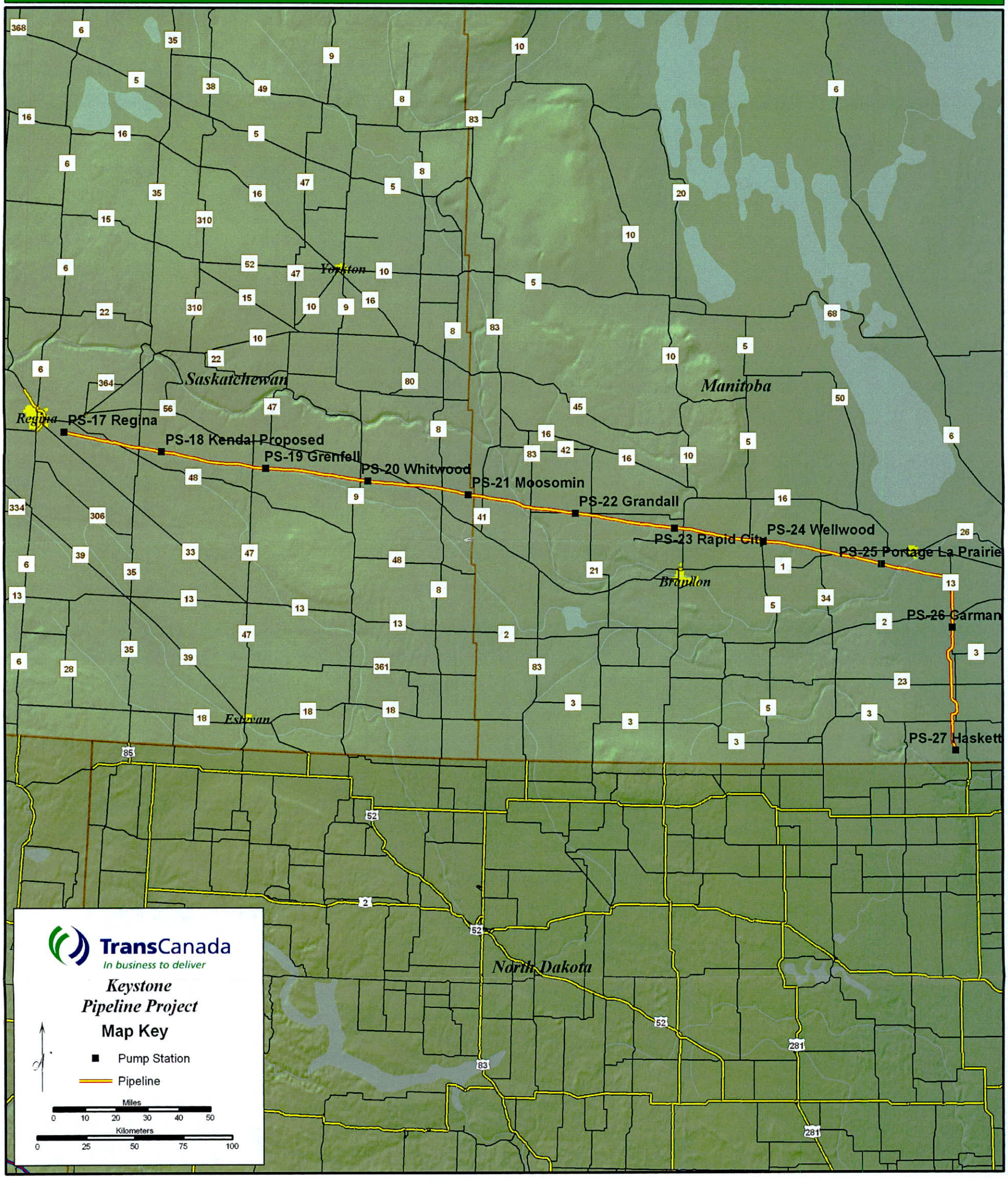
Response Zone Layout Map
Regina PS to Haskett PS

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Director		Michael Liao	(204) 957-6832 (Office) (204) 260-9364 (Cell)
Agassiz Area Manger	Incident Commander, Operations Section Chief	Barry Adamson	(204) 957-6840 (Office) (204) 878-4473 (Home) (204) 471-7918 (Cell)
Qu'Appelle Area Manager	Incident Commander	Deanna Doig	(306) 347-4307 (Office) (306) 781-2964 (Home) (306) 533-4852 (Cell)
Incident Response Specialist	Incident Commander, Operations Section Chief, Environmental Unit Leader	Gary Trask	(204) 957-6837 (Office) (204) 736-4730 (Home) (204) 619-2416 (Cell)
RAR Manager	Incident Commander	Patrick Kelly	(204) 957-6813 (Office) (204) 330-5139 (Home) (204) 918-2984 (Cell)
Incident Response Specialist	Incident Commander	Ken Jones	(780) 962-7331 (Office) (587) 337-8713 (Cell)

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Area: Regina Pump Station / Haskett Pump Station Qualified Individuals			
NAME	OFFICE	HOME	CELL
Barry Adamson	(204) 957-6840	(204) 878-4473	(204) 471-7918
Deanna Doig	(306) 347-4307	(306) 781-2964	(306) 533-4852
Gary Trask	(204) 957-6837	(204) 736-4730	(204) 619-2416

Pipeline Specifications			
Location	Type of Oil	State	County
Regina PS / Kendal PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Kendal PS / Grenfell PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Grenfell PS / Moosomin PS	Crude Oil	Saskatchewan	Eastern Saskatchewan
Moosomin PS / Rapid City PS	Crude Oil	Manitoba	Southwestern Manitoba
Rapid PS / Portage La Prairie PS	Crude Oil	Manitoba	Southwestern Manitoba
Portage La Prairie PS / Carman PS	Crude Oil	Manitoba	Southwestern Manitoba
Carman PS / Haskett PS	Crude Oil	Manitoba	Southwestern Manitoba

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Safety Boat - TC	TC, Caron Sk	See Inventory - Appendix A
34' Equipment Response Trailer	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
20' Boom trailer	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
OSRV boat	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
Safety Boat - Winnipeg	Euroway Industries, Winnipeg, Mb	See Inventory - Appendix A
20' Equpment Trailer	TC, Caron Sk	See Inventory - Appendix A
Work Boat	TC, Caron Sk	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Saskatchewan

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Eastern Saskatchewan		
Balgonie Fire Department	Balgonie, Saskatchewan	(306) 771-2206
Broadview Fire Department	Broadview, Saskatchewan	(306) 696-2533
Broadview RCMP Detachment	Broadview, Saskatchewan	(306) 696-5200
Carry The Kettle Fire Department	Sintaluta, Saskatchewan	(306) 727-2135
City of Regina - Emergency Planning	Regina, Saskatchewan	(306) 777-7886
Glenavon Fire Department	Glenavon, Saskatchewan	(306) 429-2220
Grenfell Ambulance Services	Grenfell, Saskatchewan	(306) 697-2707
Grenfell Fire Department	Grenfell, Saskatchewan	(306) 697-2217
Indian Head Fire Department	Indian Head, Saskatchewan	(306) 695-3887
Indian Head RCMP Detachment	Indian Head, Saskatchewan	(306) 695-5200
Kipling Ambulance Service	Kipling, Saskatchewan	(306) 736-2553
Kipling RCMP Detachment	Kipling, Saskatchewan	(306) 736-6400
Montmartre Fire Department	Montmartre, Saskatchewan	(306) 424-2040
Montmartre RCMP Detachment	Montmartre, Saskatchewan	(306) 424-6400
Moosomin Ambulance Services	Moosomin, Saskatchewan	(306) 435-2962
Moosomin Fire Department	Moosomin, Saskatchewan	(306) 435-2105
Moosomin RCMP Detachment	Moosomin, Saskatchewan	(306) 435-3361
Regina City Police Department	Regina, Saskatchewan	(306) 777-6500
Regina EMS - Ambulance	Regina, Saskatchewan	(306) 766-7007
Regina Fire Department	Regina, Saskatchewan	(306) 777-7829 /7830

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Regina RCMP Detachment	Regina, Saskatchewan	(306) 780-5560
Val Marie Fire Department	Val Marie, Saskatchewan	(306) 298-2012 /2022
White City Fire Department	White City, Saskatchewan	(306) 781-2303
Whitewood Fire Department	Whitewood, Saskatchewan	(306) 735-2331
Wolseley Fire Department	Wolseley, Saskatchewan	(306) 698-2288

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EXTERNAL NOTIFICATION REFERENCES

Manitoba

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Southwestern Manitoba		
Austin Fire Department	Austin, Manitoba	(204) 637-2169
Brandon Ambulance	Brandon, Manitoba	(204) 729-2400 /2406
Brandon Fire Department	Brandon, Manitoba	(204) 729-2400 /2406
Brandon RCMP Detachment	Brandon, Manitoba	(204) 726-7500 /7522
Carberry - Assiniboine EMS	Carberry, Manitoba	(204) 834-3548
Carberry Ambulance Services	Carberry, Manitoba	(204) 834-3548
Carberry Fire Department	Carberry, Manitoba	(204) 834-2212
Carberry RCMP Detachment	Carberry, Manitoba	(204) 834-2905
Cartier Ambulance	Elie, Manitoba	(204) 353-4161
Cartier Fire Department	Elie, Manitoba	(204) 353-2214 /2424
City of Brandon Emergency Management Services	Brandon, Manitoba	(204) 729-2239
Dominion City Fire Department	Dominion City, Manitoba	(204) 427-2628
Emerson Ambulance Department	Emerson, Manitoba	(204) 373-2002
Emerson Fire Department	Emerson, Manitoba	(204) 373-2335 /2414
Emerson RCMP	Emerson, Manitoba	(204) 373-2505
Falcon / Whiteshell Fire Department	Falcon Lake, Manitoba	(204) 349-8772
Gladstone RCMP Detachment	Gladstone, Manitoba	(204) 385-3035
Hadashville Ambulance Services	Hadashville, Manitoba	(204) 426-5328
Hamiota - Ambulance EMS	Hamiota, Manitoba	(204) 764-4207
Hamiota Fire Department	Hamiota, Manitoba	(204) 764-3050 /3055

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Hamiota RCMP Detachment	Hamiota, Manitoba	(204) 759-2704 /2732
Headingley Fire Department	Headingley, Manitoba	(204) 837-5766
Headingley RCMP Detachment	Headingley, Manitoba	(204) 888-0358
Headingley Traffic Services	Winnipeg, Manitoba	(204) 984-6911
Ile des Chenes Ambulance Services	St. Pierre-Jolys, Manitoba	(204) 433-3330
MacDonald Ambulance Services	Oak Bluff, Manitoba	(204) 837-3332
MacGregor Ambulance Services	MacGregor, Manitoba	(204) 685-2161
MacGregor Fire Department	MacGregor, Manitoba	(204) 685-2161
MacGregor RCMP	Portage la Prairie, Manitoba	(204) 857-4445
McAuley Fire Department	McAuley, Manitoba	(204) 722-2211
Miniota Fire Department	Miniota, Manitoba	(204) 567-3683 /3813
Minnedosa Ambulance Services	Minnedosa, Manitoba	(204) 867-5555
Minnedosa EMO Services	Minnedosa, Manitoba	(204) 867-5273
Minnedosa Fire Department	Minnedosa, Manitoba	(204) 867-2727
Minnedosa RCMP Detachment	Minnedosa, Manitoba	(204) 867-2916
Morris RCMP Detachment	Morris, Manitoba	(204) 746-2323
Neepawa Ambulance Services	Neepawa, Manitoba	(204) 476-7840
Neepawa Fire Department	Neepawa, Manitoba	(204) 476-7654
Neepawa RCMP Detachment	Neepawa, Manitoba	(204) 476-7340
North Eastman Health Association Inc	Pinawa, Manitoba	(204) 753-2015
Oak Bank RCMP Detachment	Oak Bank, Manitoba	(204) 444-3847
Oak River Fire Department	Oak River, Manitoba	(204) 566-2126
Portage la Prairie Ambulance Central Region Health	Portage la Prairie, Manitoba	(204) 857-5444
Portage la Prairie Fire Department	Portage la Prairie, Manitoba	(204) 239-5154
Portage la Prairie RCMP Detachment	Portage la Prairie, Manitoba	(204) 857-8767 /4445

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Rapid City EMO	Rapid City, Manitoba	(204) 826-2679
Rapid City Fire Department	Rapid City, Manitoba	(204) 826-2652 /2679
Richer Fire Department	Richer, Manitoba	(204) 422-5929
Ritchot Fire Department	Ile Des Chenes, Manitoba	(204) 981-6782
Rivers Ambulance Services	Rivers, Manitoba	(204) 328-6201
Rivers Fire Department	Rivers, Manitoba	(204) 328-7437 /7930
Rivers Police Services	Rivers, Manitoba	(204) 328-7430
RM of Reynolds Fire Department	Hadashville, Manitoba	(204) 426-2265 /2266
RM of Tache Fire Department	Lorette, Manitoba	(204) 878-9977
Sanford Fire Department	Sanford, Manitoba	(204) 736-2255
Shoal Lake RCMP Detachment	Shoal Lake, Manitoba	(204) 759-2390
Souris RCMP Detachment	Souris, Manitoba	(204) 483-2854
South Eastman Health/EMS	Ste. Anne, Manitoba	(204) 935-2730
St. Malo Fire Department	St. Malo, Manitoba	(204) 347-5246 /
St. Pierre-Jolys Ambulance Service	St. Pierre-Jolys, Manitoba	(204) 433-7701
St. Pierre-Jolys Fire Department	St. Pierre-Jolys, Manitoba	(204) 433-7117
St. Pierre-Jolys RCMP Detachment	St. Pierre-Jolys, Manitoba	(204) 433-7908
Ste. Anne Fire Department	Ste. Anne, Manitoba	(204) 422-9110
Ste. Anne Police Service	Ste. Anne, Manitoba	(204) 422-8209
Steinbach Ambulance Services	Steinbach, Manitoba	(204) 346-6411
Steinbach Fire Department	Steinbach, Manitoba	(204) 326-1109 /9877
Steinbach RCMP Detachment	Steinbach, Manitoba	(204) 326-1234 /4452
Virden & Wallace Fire Department	Virden, Manitoba	(204) 748-1304
Virden Ambulance Services	Virden, Manitoba	(204) 748-4332
Virden RCMP Detachment	Virden, Manitoba	(204) 748-2046

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Whitemouth Ambulance Services	Whitemouth, Manitoba	(204) 348-7700
Whitemouth Fire Department	Whitemouth, Manitoba	(204) 348-7911
Winnipeg Fire Paramedic Service	Winnipeg, Manitoba	(204) 986-6380
Winnipeg Police Service	Winnipeg, Manitoba	(204) 986-6222
Winnipeg RCMP Detachment	Winnipeg, Manitoba	(204) 983-5420

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RESPONSE ZONE INFORMATION

North Dakota, South Dakota, Nebraska

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	North Dakota, South Dakota, Nebraska
Areas/Counties Traversed:	Barnes, Beadle, Butler, Cavalier, Cedar, Clark, Colfax, Day, Gage, Hanson, Hutchinson, Jefferson, Kingsbury, Marshall, McCook, Miner, Nelson, Pembina, Platte, Ransom, Saline, Sargent, Seward, Stanton, Steele, Walsh, Wayne, Yankton

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 33,058 Bbls

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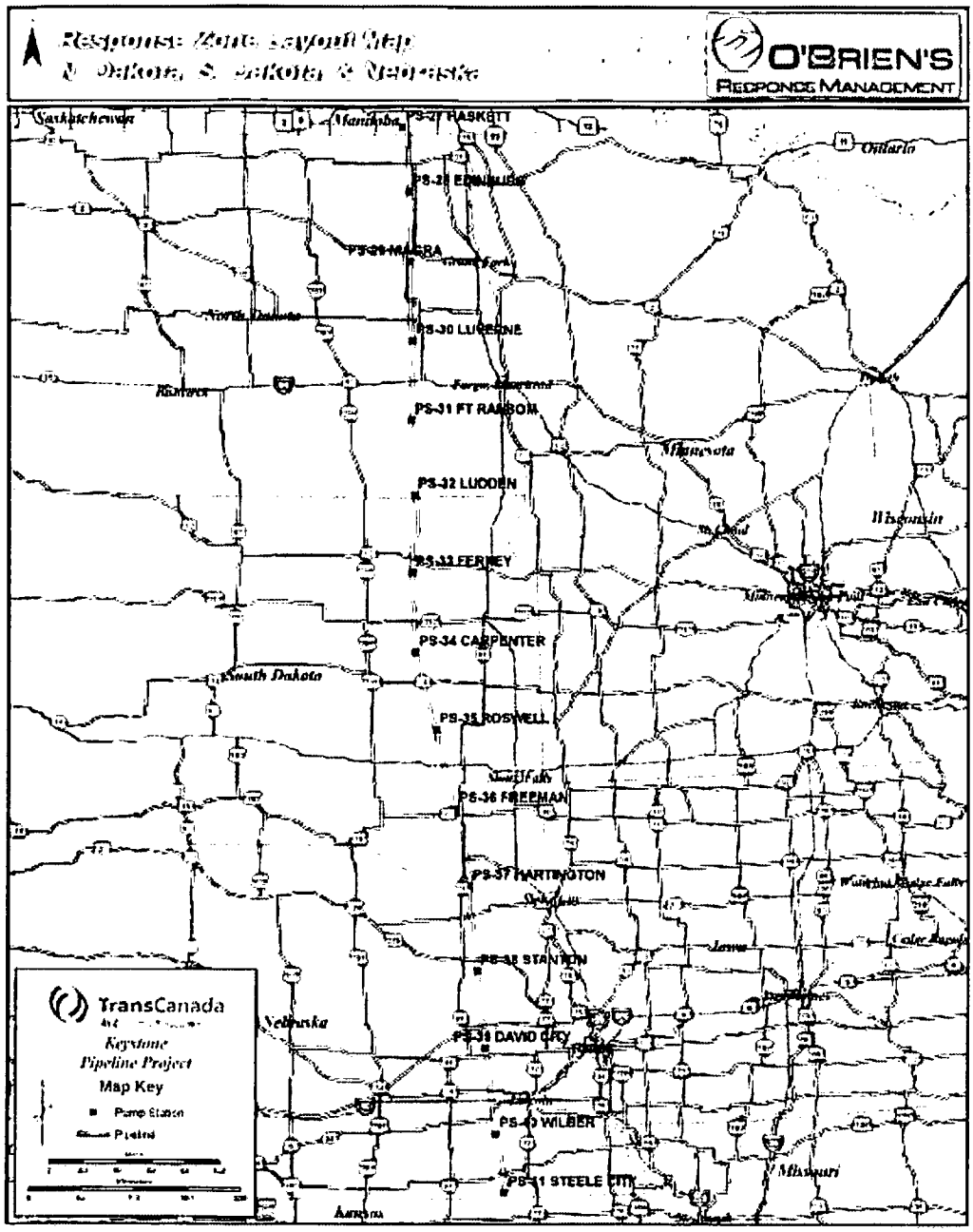

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Response Zone Layout Map
N. Dakota, S. Dakota, & Nebraska

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
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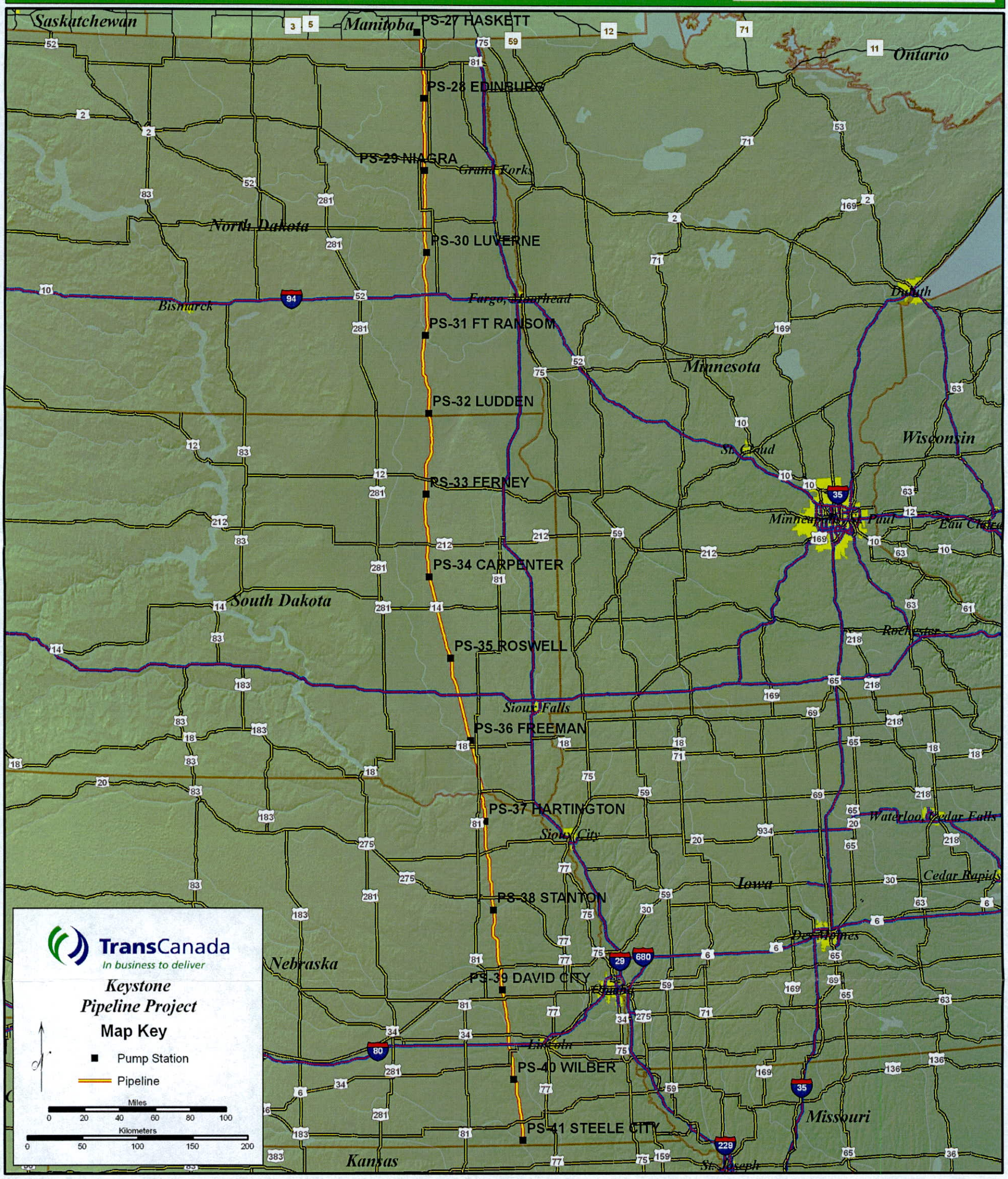
O'BRIEN'S RESPONSE MANAGEMENT



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RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
West River Area Manager	Incident Commander	Virgil Pfenning	(402) 492-7469 (Office) (402) 889-7383 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: North Dakota, South Dakota, Nebraska Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Virgil Pfenning	(402) 492-7469		(402) 889-7383
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Steele City / State Line	Crude Oil	Nebraska	Jefferson, Gage
Carpenter PS / Roswell PS	Crude Oil	South Dakota	Clark, Beadle, Kingsbury, Miner
Roswell PS / Freeman PS	Crude Oil	South Dakota	Miner, Hanson, McCook, Hutchinson
Freeman PS / Hartington PS	Crude Oil	Nebraska , South Dakota	Hutchinson, Yankton, Cedar
Hartington PS / Stanton PS	Crude Oil	Nebraska	Cedar, Wayne, Stanton
US-CAN Border / Edinburg PS	Crude Oil	North Dakota	Cavalier, Pembina, Walsh
Edinburg PS / Niagara PS	Crude Oil	North Dakota	Walsh, Nelson
Niagara PS / Luverne PS	Crude Oil	North Dakota	Nelson, Steele
Luverne PS / Fort Ransom PS	Crude Oil	North Dakota	Steele, Barnes, Ransom
Fort Ransom PS / Ludden PS	Crude Oil	North Dakota	Ransom, Sargent
Ludden PS / Ferney PS	Crude Oil	North Dakota , South Dakota	Sargent, Marshall, Day
Stanton PS / David City PS	Crude Oil	Nebraska	Stanton, Platte, Colfax, Butler
David City PS / Wilber PS	Crude Oil	Nebraska	Butler, Seward, Saline
Wilber PS/Steele City PS	Crude Oil	Nebraska	Saline, Jefferson
Ferney PS / Carpenter PS	Crude Oil	South Dakota	Day, Clark

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Valley City 20' Enclosed Trailer	Valley City, ND	See Inventory - Appendix A
Valley City 20' Work Boat	Valley City, ND	See Inventory - Appendix A
Valley City Zodiac Inflatable Boat	Valley City, ND	See Inventory - Appendix A
Yankton OSRV	Yankton, SD	See Inventory - Appendix A
Yankton 34' Response Trailer	Yankton, SD	See Inventory - Appendix A
Yankton 20' Work Boat	Yankton,SD	See Inventory - Appendix A
Yankton 20' Boom Trailer	Yankton, SD	See Inventory - Appendix A
Fairbury 20' Enclosed Trailer	Fairbury, NE	See Inventory - Appendix A
Fairbury 20' Work Boat	Fairbury, NE	See Inventory - Appendix A
Fairbury Zodiac Inflatable Boat	Fairbury, NE	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Nebraska

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Cedar		
Cedar County	Hartington, Nebraska	(402) 254-7411
Cedar County Sheriff & Emergency Mgmt.	Hartington, Nebraska	(402) 254-6884
City of Hartington	Hartington, Nebraska	(402) 254-6353
Local Public Safety Answering Point (PSAP)	Hartington, Nebraska	(402) 254-6451
Wayne		
City of Wayne	Wayne, Nebraska	(402) 375-1733
City of Wayne Electric Distribution Department	Wayne, Nebraska	(402) 375-2896
City of Wayne Fire Department	Wayne, Nebraska	(402) 375-1122
City of Wayne Police Department	Wayne, Nebraska	(402) 375-2626
City of Wayne Public Works Department	Wayne, Nebraska	(402) 375-1300
City of Wayne Water Department	Wayne, Nebraska	(402) 375-5250
Local Public Safety Answering Point	Wayne, Nebraska	(402) 375-2626
Wayne County (LEPC)	Wayne, Nebraska	(402) 833-5190
Stanton		
City of Stanton	Stanton, Nebraska	(402) 439-2119
Local Public Safety Answering Point	Stanton, Nebraska	(402) 439-2212
Stanton County LEPC	Stanton, Nebraska	(402) 439-2631
Stanton County Sheriff	Stanton, Nebraska	(402) 439-2212
Village of Pilger	Stanton, Nebraska	(402) 396-3563
Platte		
City of Columbus	Columbus, Nebraska	(402) 562-4224
Local Public Safety Answering Point	Columbus, Nebraska	(402) 564-3229

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Platte County LEPC	Columbus, Nebraska	(402) 564-1206
Platte County Sheriff	Columbus, Nebraska	(402) 564-3229
Colfax		
City of Schuyler Schools	Schuyler, Nebraska	(402) 352-3527
Colfax County	Schuyler, Nebraska	(402) 352-8502
Colfax County LEPC	Schuyler, Nebraska	(402) 352-8522
Colfax County Sheriff	Schuyler, Nebraska	(402) 352-8526
Local Public Safety Answering Point	Schuyler, Nebraska	(402) 352-8527
Village of Leigh	Leigh, Nebraska	(402) 487-3303
Village of Richland	Richland, Nebraska	(402) 564-0609
Butler		
Butler County First Responder / Sheriff	David City, Nebraska	(402) 367-7400
David City Electric & Light Department	David City, Nebraska	(402) 367-3197
David City Park & Auditorium Department	David City, Nebraska	(402) 367-3914
David City Police Department	David City, Nebraska	(402) 367-3133
David City Power Plant	David City, Nebraska	(402) 367-3138
David City Water & Sewer Department	David City, Nebraska	(402) 367-3132
Local Public Safety Answering Point	David City, Nebraska	(402) 367-7400
Butler County LEPC	David City, Nebraska	(402) 367-3125
Seward		
City of Milford	Milford, Nebraska	(402) 761-3247
City of Seward	Seward, Nebraska	(402) 643-2928
City of Seward Electric Department	Seward, Nebraska	(402) 643-3151
City of Seward Fire Department	Seward, Nebraska	(402) 643-6088
City of Seward Police Department	Seward, Nebraska	(402) 643-2759
City of Seward Sheriff	Seward, Nebraska	(402) 643-2359

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City of Seward Water Department	Seward, Nebraska	(402) 643-3433
Local Public Safety Answering Point	Seward, Nebraska	(402) 643-3002
Seward County	Seward, Nebraska	(402) 643-6262
Seward County LEPC	Seward, Nebraska	(402) 643-4722
Village of Bee	Bee, Nebraska	(402) 643-6247
Village of Goehner	Goehner, Nebraska	(402) 534-4311
Village of Staplehurst	Staplehurst, Nebraska	(402) 535-2507
Jefferson		
City of Fairbury	Fairbury, Nebraska	(402) 729-2476
Jefferson Co. Emergency Management Agency/Planning	Fairbury, Nebraska	(402) 729-3602
Local Public Safety Answering Point	Fairbury, Nebraska	(402) 729-3624
Village of Diller	Diller, Nebraska	(402) 793-5991
Village of Plymouth	Plymouth Village, Nebraska	(402) 656-3132
Saline		
City of Wilber	Wilber, Nebraska	(402) 821-2320
City of Wilber Fire Department	Wilber, Nebraska	(402) 821-2647
City of Wilber Police Department	Wilber, Nebraska	(402) 821-2201
Crete Public Safety Answering Point	Crete, Nebraska	(402) 826-4311
Local Public Safety Answering Point	Wilber, Nebraska	(402) 821-2111
Saline County	Wilber, Nebraska	(402) 826-2363
Saline County LEPC	Wilber, Nebraska	(402) 821-3010
Saline County Sheriff	Wilber, Nebraska	(402) 821-2111
Village of Dorchester	Dorchester, Nebraska	(402) 946-3201
Village of Swanton	Swanton, Nebraska	(402) 448-2285
Gage		
Gage County LEPC	Beatrice, Nebraska	(402) 223-1305

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Gage County Sheriff / First Responder	Beatrice, Nebraska	(402) 223-1382
Local Public Safety Answering Point	Beatrice, Nebraska	(402) 223-4080

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EXTERNAL NOTIFICATION REFERENCES

North Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Cavalier		
Cavalier County	Langdon, North Dakota	(701) 256-2229
Cavalier County Fire Department	Langdon, North Dakota	(701) 256-3911
Cavalier County Water Resource	Langdon, North Dakota	(701) 256-2220
Fremont Township	Walhalla, North Dakota	(701) 549-2748
Local Public Safety Answering Point	Langdon, North Dakota	(701) 256-2555
Pembina		
City of Cavalier	Cavalier, North Dakota	(701) 265-8800
City of Walhalla	Walhalla, North Dakota	(701) 549-3176
Drayton, North Dakota	Drayton, North Dakota	(701) 265-4231
Local Public Safety Answering Point	Cavalier, North Dakota	(701) 265-4122
Local Public Safety Answering Point	Cavalier, North Dakota	(701) 265-4122
Pembina County	Cavalier, North Dakota	(701) 265-4231
Pembina County LEPC	Cavalier, North Dakota	(701) 265-4849
Pembina County Water Resource Board	Cavalier, North Dakota	(701) 265-4511
Walsh		
City of Grafton	Grafton, North Dakota	(701) 352-1561
City of Lankin	Lankin, North Dakota	(701) 593-6322
City of Minto	Minto, North Dakota	(701) 248-3480
City of Park River	Park River, North Dakota	(701) 284-6426
Golden Township	Park River, North Dakota	(701) 284-6846
Local Public Safety Answering Point	Grafton, North Dakota	(701) 352-2041

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Norton Township	Fordville, North Dakota	(701) 593-6249
Town of Norton	Park River, North Dakota	(701) 331-0810
Vesta Township	Adams, North Dakota	(701) 944-2790
Walsh County LEPC	Grafton, North Dakota	(701) 352-2311
Nelson		
Adler Township, Nelson County	Petersburg, North Dakota	(701) 345-8287
Dodds Township, Nelson County	Lakota, North Dakota	(701) 247-2279
Local Public Safety Answering Point	Lakota, North Dakota	(701) 662-5323
Michigan City	Michigan, North Dakota	(701) 259-2553
Nelson County	Lakota, North Dakota	(701) 247-2463
Nelson County Fire Department	Lakota, North Dakota	(701) 247-2474
Nelson County First Responder	Lakota, North Dakota	(701) 247-2474
Petersburg Township, Nelson County	Petersburg, North Dakota	(701) 345-6134
Steele		
City of Finley	Finley, North Dakota	(701) 352-1651
Local Public Safety Answering Point	Finley, North Dakota	(701) 524-2742
Steele County	Finley, North Dakota	(701) 945-2572
Steele County LEPC	Finley, North Dakota	(701) 524-2742
Barnes		
Barnes County	Sanborn, North Dakota	(701) 646-6983
Barnes County Emergency Manager (LEPC)	Valley City, North Dakota	(701) 845-8510
Local Public Safety Answering Point	Valley City, North Dakota	(701) 845-3110
Township of Alta	Valley City, North Dakota	(701) 845-2744
Township of Baldwin	Hope, North Dakota	(701) 945-2436
Township of Cuba	Valley City, North Dakota	(701) 845-0533
Township of Grand Prairie	Valley City, North Dakota	(701) 845-2544

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Township of Noltimier	Valley City, North Dakota	(701) 845-3835
Township of Norma	Oriska, North Dakota	(701) 924-8629
Valley City	Valley City, North Dakota	(701) 845-1700 ext. 17
Ransom		
City of Lisbon	Lisbon, North Dakota	(701) 683-4472 Rvrsd Bldg Ctr
Local Public Safety Answering Point	Lisbon, North Dakota	(701) 683-5255
Ransom County LEPC	Lisbon, North Dakota	(701) 683-5823, x125
Sargent		
City of Forman	Forman, North Dakota	(701) 724-3673
Denver Township	Gwinner, North Dakota	(701) 753-7671
Jackson Township	Forman, North Dakota	(701) 724-3420
Local Public Safety Answering Point	North Dakota	(800) 472-2121
Sargent County First Responder	Forman, North Dakota	(701) 724-3302
Sargent County LEPC	Forman, North Dakota	(701) 724-6241, x113
Southwest Township	Forman, North Dakota	(701) 724-3452
Verner Township	Oakes, North Dakota	(701) 742-3711
Verner Township	Gwinner, North Dakota	(701) 753-7161

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EXTERNAL NOTIFICATION REFERENCES

South Dakota

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marshall		
BDM Rural Water System, Inc.	Britton, South Dakota	(605) 448-5417
City of Britton, South Dakota	Britton, South Dakota	(605) 448-5721
Local Public Safety Answering Point	Britton, South Dakota	(605) 448-5181
Marshall County LEPC	Britton, South Dakota	(605) 448-2339
Marshall County South Dakota	Britton, South Dakota	(605) 448-2116
Day		
City of Webster, South Dakota	Webster, South Dakota	(605) 345-3241
Day County, South Dakota LEPC	Webster, South Dakota	(605) 345-3222
Local Public Safety Answering Point	Webster, South Dakota	(605) 345-3222
Clark		
City of Clark, South Dakota	Clark, South Dakota	(605) 532-3512
Clark County, South Dakota	Clark, South Dakota	(605) 532-5921
Clark County, South Dakota LEPC	Clark, South Dakota	(605) 532-3822
Local Public Safety Answering Point	South Dakota	(605) 532-3822
Beadle		
Beadle County, South Dakota	Huron, South Dakota	(605) 352-5010
Beadle County, South Dakota LEPC	Huron, South Dakota	(605) 353-8421
City of Huron, South Dakota	Huron, South Dakota	(605) 353-8500
Local Public Safety Answering Point	Huron, South Dakota	(605) 353-8424
Kingsbury		
City of De Smet, South Dakota	De Smet, South Dakota	(605) 854-3731
Kingsbury County Fire Department / First Responder	De Smet, South Dakota	(605) 854-3832

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Kingsbury County, South Dakota	De Smet, South Dakota	(605) 854-3832
Kingsbury County, South Dakota LEPC	De Smet, South Dakota	(605) 854-3711
Local Public Safety Answering Point	De Smet, South Dakota	(605) 353-8550 (after 3 am)
Miner		
Local Public Safety Answering Point	Howard, South Dakota	(605) 772-4501
Miner County Fire Department / First Responder	Howard, South Dakota	(605) 772-4671
Miner County, South Dakota LEPC	Howard, South Dakota	(605) 772-4533
Hanson		
Edgerton Township	Alexandria, South Dakota	(605) 239-4361
Hanson County Fire Department	Alexandria, South Dakota	(605) 239-4717
Hanson County, South Dakota	Alexandria, South Dakota	(605) 239-4717
Hanson County, South Dakota LEPC	Alexandria, South Dakota	(605) 239-4218
Local Public Safety Answering Point	South Dakota	(605) 239-4409
Spring Lake Township	Canova, South Dakota	(605) 523-2546
McCook		
Local Public Safety Answering Point	Mitchell, South Dakota	(605) 425-2761
McCook Co., SD County Emergency Management	Salem, South Dakota	(605) 425-2791
McCook County, South Dakota LEPC	Salem, South Dakota	(605) 425-2466
Hutchinson		
City of Olivet	Olivet, South Dakota	(605) 387-5596
Grandview Township	Freeman, South Dakota	(605) 925-4142
Hutchinson County, South Dakota	Menno, South Dakota	(605) 387-4217
Hutchinson County, South Dakota LEPC	Menno, South Dakota	(605) 770-7927
Local Public Safety Answering Point	Mitchell, South Dakota	(605) 995-8400
Molan Township	Menno, South Dakota	(605) 387-5250
Pleasant Township	Bridgewater, South Dakota	(605) 449-4669
Valley Township	Menno, South Dakota	(605) 387-5480

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Yankton		
City of Yankton Fire Department	Yankton, South Dakota	(605) 668-5210
City of Yankton, Department of Public Works	Yankton, South Dakota	(605) 668-5251
City of Yankton, South Dakota	Yankton, South Dakota	(605) 668-5210
Jamesville Township	Jamesville, South Dakota	(605) 387-5756
Mission Hill Township	Mission Hill, South Dakota	(605) 665-7592
Utica Township	Utica, South Dakota	(605) 665-1341
Yankton County Fire Department	Yankton, South Dakota	(605) 668-3567
Yankton County LEPC	Yankton, South Dakota	(605) 668-5289
Yankton County Local Public Safety Answering Point	Yankton, South Dakota	(605) 668-5210
Yankton County, South Dakota	Yankton, South Dakota	(605) 668-3567

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RESPONSE ZONE INFORMATION

Kansas, Missouri, Illinois

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Kansas, Missouri, Illinois
Areas/Counties Traversed:	Audrain, Bond, Brown, Buchanan, Butler, Caldwell, Carroll, Chariton, Clay, Clinton, Cowley, Dickinson, Doniphan, Fayette, Lincoln, Madison, Marion, Marshall, Montgomery, Nemaha, Randolph, St. Charles, Washington

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 28,787 Bbls

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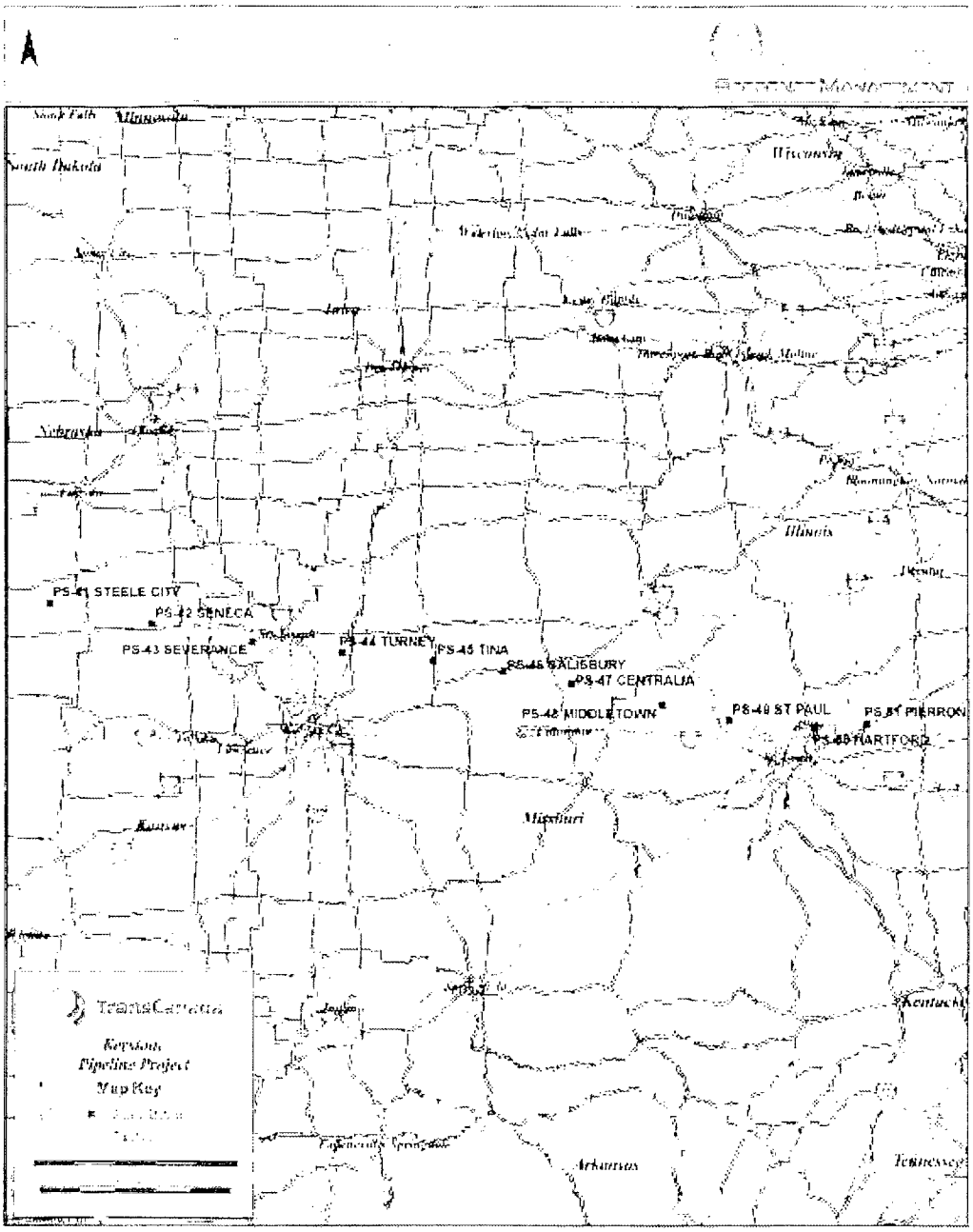

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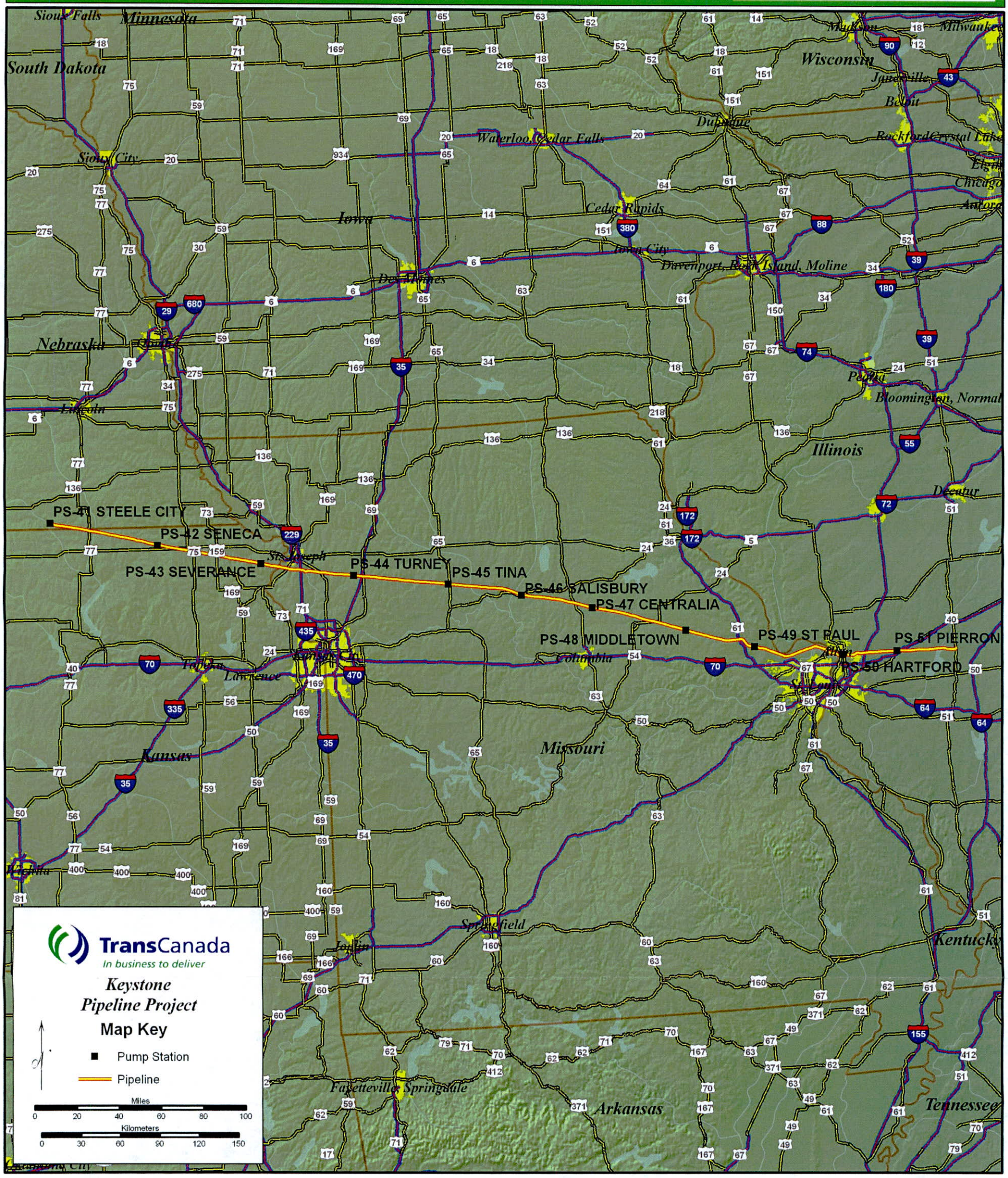
Response Zone Layout Map
Kansas, Missouri, & Illinois

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT



RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Kansas, Missouri, Illinois Qualified Individuals			
NAME	**OFFICE**	**HOME**	**CELL**
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	**Type of Oil**	**State**	**County**
State Line / Seneca PS	Crude Oil	Kansas	Marshall, Nemaha
Seneca PS / Severance PS	Crude Oil	Kansas	Nemaha, Brown, Doniphan
Severance PS / Turney PS	Crude Oil	Kansas , Missouri	Doniphan, Buchanan, Clinton
Turney PS / Tina PS	Crude Oil	Missouri	Clinton, Caldwell, Carroll
Tina PS / Salisbury PS	Crude Oil	Missouri	Carroll, Chariton
Salisbury PS / Centralia PS	Crude Oil	Missouri	Chariton, Randolph, Audrain
Centralia PS / Middletown PS	Crude Oil	Missouri	Audrain, Montgomery
Middletown PS / Saint Paul PS	Crude Oil	Missouri	Montgomery, Lincoln
Saint Paul PS / Hartford PS	Crude Oil	Illinois , Missouri	Lincoln, St. Charles, Madison
Hartford PS / Patoka Terminal	Crude Oil	Illinois	Madison, Bond, Fayette, Marion

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
St. Joseph OSRV	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 34' Response Trailer	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 20' Work Boat	St. Joseph, MO	See Inventory - Appendix A
St. Joseph 20' Boom Trailer	St. Joseph, MO	See Inventory - Appendix A
Middletown 34' Response Trailer	Middletown P.S., MO	See Inventory - Appendix A
Middletown 20' Work Boat	Middletown P.S., MO	See Inventory - Appendix A
Hartford 20' Enclosed Trailer	Hartford, P.S., IL	See Inventory - Appendix A
Hartford 20' Work Boat	Hartford P.S., IL	See Inventory - Appendix A
Hartford Zodiac Inflatable Boat	Hartford P.S., IL	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Illinois

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Madison		
City of Edwardsville Fire Department	Edwardsville, Illinois	(618) 692-7541
City of Edwardsville, Illinois Public Works	Edwardsville, Illinois	(618) 692-7535
City of Highland Fire Department	Highland, Illinois	(618) 654-5901
City of Wood River Fire Department	Wood River, Illinois	(618) 251-3100
LPublicSafetyAnsweringPoint Wood River Dispatch (Wood River, Roxanna, Hartford)	Wood River, Illinois	(618) 692-4443
Madison Co. Ambulance (Fire Dept) First Respons	Edwardsville, Illinois	(618) 692-4433
Bond		
Bond Co. IL Emergency Svcs. and Disaster Agency	Greenville, Illinois	(618) 644-1442
Bond County First Responder (Fire Department)	Greenville, Illinois	(618) 664-2151
City of Greenville Public Works Department	Greenville, Illinois	(618) 664-1644
Local Public Safety Answering Point	Greenville, Illinois	(618) 664-2151
Village of Pocahontas	Pocahontas, Illinois	(618) 669-2431
Fayette		
City of Alton Fire Department	Alton, Illinois	(618) 463-3565
City of Vandalia Public Works Department	Vandalia, Illinois	(618) 283-1296
Fayette County Ambulance / First Responder	Vandalia, Illinois	(618) 283-2141
Local Public Safety Answering Point	Vandalia, Illinois	(618) 283-2141
Vandalia Public Safety Answering Point	Vandalia, Illinois	(618) 283-2131
Marion		
Local Public Safety Answering Point	Salem, Illinois	(618) 548-2141 ext 1 if after hrs
Marion Co. Ambulance (Fire Dept) / First Response	Salem, Illinois	(618) 548-2141

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Marion County Department of Environmental Quality	Salem, Illinois	(618) 692-0537

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EXTERNAL NOTIFICATION REFERENCES

Kansas

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Marshall		
Local Public Safety Answering Point	Kansas	(785) 562-3141
Marshall County Public Works Department	Marysville, Kansas	(785) 562-5349
Nemaha		
City of Oneida Sewerage Department	Oneida, Kansas	(785) 336-3038
Local Public Safety Answering Point	Seneca, Kansas	(785) 336-2311
Brown		
Brown County Fire Department	Hiawatha, Kansas	(785) 742-7125
Irving Township	Hiawatha, Kansas	(785) 544-6691
Local Public Safety Answering Point	Hiawatha, Kansas	(785) 742-7125
Mission Township	Hiawatha, Kansas	(785) 474-3564
Morrill Township	Morrill, Kansas	(785) 459-2277
Padonia Township	Hiawatha, Kansas	(785) 742-2777
Powhattan Township	Powhattan, Kansas	(785) 467-3520
Robinson Township	Robinson, Kansas	(785) 544-6831
Walnut Township	Walnut, Kansas	(785) 467-3250
Doniphan		
City of Denton	Denton, Kansas	(785) 359-6952
City of Denton Fire Department	Denton, Kansas	(785) 359-6641
City of Severance	Severance, Kansas	(785) 359-6589
City of Troy	Troy, Kansas	(785) 985-2101
Doniphan Co. Emergency Management / Zoning Dept.	Troy, Kansas	(785) 985-2229
Doniphan County Fire District No. 1	Wathena, Kansas	(785) 989-3265

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Doniphan County Fire District No. 2	Highland, Kansas	(785) 359-6699
Doniphan County Fire District No. 3	Denton, Kansas	(785) 359-6715
Doniphan County Fire District No. 4	Elwood, Kansas	(913) 365-8697
Doniphan County Fire District No. 5	Troy, Kansas	(785) 985-2145
Independence Township	Independence, Kansas	(785) 988-4425
Local Public Safety Answering Point	Troy, Kansas	(785) 985-3711
Union Township	Denton, Kansas	(785) 359-6533
Wayne Township	Troy, Kansas	(785) 985-2400
Wold River Township	Severance, Kansas	(785) 442-3775
Marion		
Local Public Safety Answering Point	Marion, Kansas	(620) 382-2144
Washington		
Local Public Safety Answering Point	Washington, Kansas	(785) 325-2293
Clay		
Local Public Safety Answering Point	Clay Center, Kansas	(785) 632-5601
Dickinson		
Local Public Safety Answering Point	Abilene, Kansas	(785) 263-4041
Butler		
Local Public Safety Answering Point	El Dorado, Kansas	(316) 322-4254
Cowley		
Local Public Safety Answering Point	Winfield, Kansas	(620) 221-5555

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EXTERNAL NOTIFICATION REFERENCES

Missouri

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Buchanan		
City of Gower Clerk	Gower, Missouri	(816) 424-6617
City of St Joseph Council	St Joseph, Missouri	(816) 271-4640
Colony Fire District	St. Joseph, Missouri	(816) 232-5307
Dearborn Fire District, Buchanan County	Dearborn, Missouri	(816) 992-8919
Easton Fire District, Buchanan County	Easton, Missouri	(816) 262-7057
Edgerton Fire District, Buchanan County	Edgerton, Missouri	(816) 790-3362
Local Public Safety Answering Point	St. Joseph, Missouri	(816) 271-4777
Maxwell Heights Fire District, Buchanan County	St. Joseph, Missouri	(816) 233-4160
Rushville Fire District, Buchanan County	Rushville, Missouri	(816) 688-7900
San Antonio Fire District, Buchanan County	San Antonio, Missouri	(816) 232-1664
South Buchanan Fire District, Buchanan County	Faucett, Missouri	(816) 253-9018
Sugar Lake Fire District, Buchanan County	Rushville, Missouri	(816) 579-5115
Village of Agency Clerk	Agency, Missouri	(816) 253-9176
Village of Dekalb Clerk	Amity, Missouri	(816) 685-3305
Village of Lewis & Clark Clerk	Lewis & Clark, Missouri	(816) 579-5737
Clinton		
City of Cameron	Cameron, Missouri	(816) 632-2177
City of Cameron Fire Department	Cameron, Missouri	(816) 632-2345
City of Cameron Police Department / First Responde	Cameron, Missouri	(816) 632-6521
City of Cameron Public Works Department	Cameron, Missouri	(816) 632-2177
City of Cameron Water and Electric Department	Cameron, Missouri	(816) 632-2177

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City of Lathrop	Lathrop, Missouri	(816) 740-4251
Clinton County PWSD No 1	Plattsburg, Missouri	(816) 370-2528
Clinton County PWSD No 4	Plattsburg, Missouri	(816) 580-7211
Lathrop Fire District	Lathrop, Missouri	(816) 740-3218
Local Public Safety Answering Point	Plattsburg, Missouri	(816) 539-2156
Osborne Fire District	Osborne, Missouri	(816) 675-2549
Plattsburg City Hall	Plattsburg, Missouri	(816) 539-2148
Plattsburg Fire District	Plattsburg, Missouri	(816) 539-3017
Stewartsville Fire District	Stewartsville, Missouri	(816) 669-3387
Village of Turney	Turney, Missouri	(816) 664-2009
Caldwell		
Caldwell County	Kingston, Missouri	(816) 586-2571
Cowgill No 1 Water District	Cowgill, Missouri	(660) 255-4421
Grant Township	Livonia, Missouri	(660) 354-2337
Local Public Safety Answering Point	Kingston, Missouri	(816) 586-2681
Rockford Township	Polo, Missouri	(660) 354-3631
Carroll		
Carroll County	Carrollton, Missouri	(660) 542-0615
Carroll County Fire Protection District No. 1	Carrollton, Missouri	(660) 542-2178
City of Carrollton	Carrollton, Missouri	(660) 542-1414
Hale Fire Protection District	Hale, Missouri	(660) 565-2212
Local Public Safety Answering Point	Carrollton, Missouri	(660) 542-3911
Norborne Fire Protection District	Norborne, Missouri	(660) 594-3505
North Central Fire Protection District	Bogard, Missouri	(660) 731-5371
Stet Fire Protection District	Norborne, Missouri	(660) 484-3179
Chariton		

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Chariton County, Missouri	Keytesville, Missouri	(660) 288-3200
City of Keytesville, Missouri	Keytesville, Missouri	(660) 288-3745
City of Salisbury, Missouri	Salisbury, Missouri	(660) 388-6197
Local Public Safety Answering Point	Keytesville, Missouri	(660) 288-3040
Randolph		
City of Huntsville, Missouri	Huntsville, Missouri	(660) 277-3110
City of Moberly, Missouri Public Works	Moberly, Missouri	(660) 269-8705
Local Public Safety Answering Point	Moberly, Missouri	(660) 263-0346
Randolph County County Government	Huntsville, Missouri	(660) 277-4714
Audrain		
Audrain County, Missouri	Mexico, Missouri	(573) 473-5822
City of Mexico, Missouri	Mexico, Missouri	(573) 581-2100
Local Public Safety Answering Point	Mexico, Missouri	(573) 473-5800
Montgomery		
City of Montgomery, Missouri	Montgomery City, Missouri	(573) 564-3160
Local Public Safety Answering Point	Montgomery City, Missouri	(573) 564-3378
Montgomery County	Montgomery City, Missouri	(573) 564-8084
Lincoln		
Lincoln County Fire Protection District	Troy, Missouri	(636) 528-8567
Lincoln County, Missouri	Troy, Missouri	(636) 528-6300
Local Public Safety Answering Point	Troy, Missouri	(636) 528-6100
St. Charles		
Central County Fire & Rescue	St. Peters, Missouri	(636) 970-9700
City of O'Fallon, Missouri	O'Fallon, Missouri	(636) 379-5500
City of St. Charles City/Municipal Government	St. Charles City, Missouri	(636) 949-3260
City of St. Charles Fire Department	St. Charles, Missouri	(636) 949-3250
City of St. Peters, Missouri	St. Peters, Missouri	(636) 477-9920

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Dardenne Prairie Township	O'Fallon, Missouri	(636) 300-0014
Local Public Safety Answering Point	Missouri	(636) 949-0809 Ext: 1
O'Fallon Fire Protection District	O'Fallon, Missouri	(636) 272-3493
O'Fallon Township	O'Fallon, Missouri	(636) 978-4144
St. Charles County First Responder	St. Charles, Missouri	(636) 949-1818
St. Charles County Government	St. Charles, Missouri	(636) 949-7455
Wentzville Fire Protection District	Wentzville, Missouri	(636) 327-6239
Wentzville Township	Wentzville, Missouri	(636) 332-5101

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RESPONSE ZONE INFORMATION

Cushing Extension

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	1-800-447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Kansas, Nebraska, Oklahoma
Areas/Counties Traversed:	Atoka, Bryan, Butler, Clay, Coal, Cowley, Dickinson, Hughes, Jefferson, Kay, Lincoln, Marion, Noble, Okfuskee, Payne, Seminole, Washington

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 105,000 Bbls

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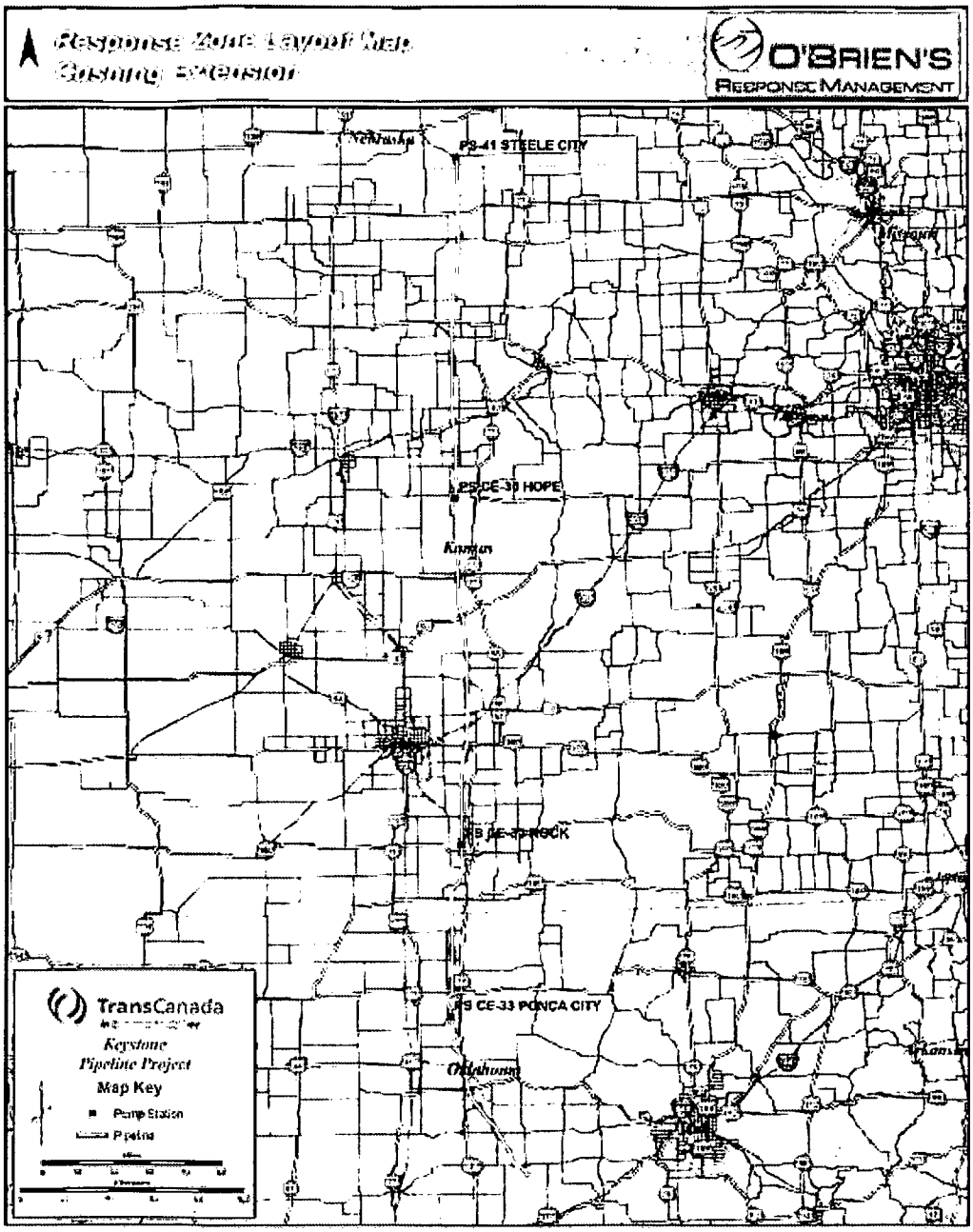

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Response Zone Layout Map
Cushing Extension

Map Prepared By
O'Brien's Response Management
Shared Services, GIS Group
(281)320-9796

O'BRIEN'S RESPONSE MANAGEMENT

PS-41 STEELE CITY

PS CE-30 HOPE

PS CE-32 ROCK

PS CE-33 PONCA CITY

Nebraska

Kansas

Oklahoma

Missouri

Arkansas

Lawrence

Joplin

TransCanada
In business to deliver

Keystone
Pipeline Project

Map Key

Pump Station

Pipeline

Miles
0 10 20 30 40 50

Kilometers
0 20 40 60 80 100

RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
Gateway Area Manager		Traves Guthmiller	(816) 233-6033, ext 224 (Office) (816) 351-3396 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Cushing Extension Area Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Traves Guthmiller	(816) 233-6033, ext 224		(816) 351-3396
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Station Steele City / Hope PS	Crude Oil	Kansas , Nebraska	Jefferson, Washington, Clay, Dickinson
Hope PS / Rock PS	Crude Oil	Kansas	Marion, Dickinson, Butler, Cowley
Rock PS / Ponca City PS	Crude Oil	Kansas , Oklahoma	Cowley, Kay
Ponca City PS / Cushing Extension	Crude Oil	Oklahoma	Kay, Noble, Payne

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Company Owned Response Equipment		
NAME	**LOCATION**	**DESCRIPTION**
Wichita 20' Enclosed Trailer	Wichita, KS	See Inventory - Appendix A
Wichita 20' Work Boat	Wichita, KS	See Inventory - Appendix A
Cushing 20' Enclosed Trailer	Cushing, OK	See Inventory - Appendix A
Cushing 20' Work Boat	Cushing, OK	See Inventory - Appendix A
Cushing 20" Boom Trailer	Cushing, OK	See Inventory - Appendix A
Cushing Zodiac Inflatable Boat	Cushing, OK	See Inventory - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL
BO-TK-01 KXL	Cushing Terminal	350000	Crude
BO-TK-02 KXL	Cushing Terminal	350000	Crude
BO-TK-03 KXL	Cushing Terminal	350000	Crude
BO-TK-04 BML	Cushing Terminal	350000	Crude
BO-TK-05 BML	Cushing Terminal	350000	Crude
BO-TK-06 CML	Cushing Terminal	250000	Crude
BO-TK-07 CML	Cushing Terminal	250000	Crude

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EXTERNAL NOTIFICATION REFERENCES

Kansas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Marion		
City of Marion Fire Department	Marion, Kansas	(620) 382-3703
Lost Springs Fire Dept.	Lost Springs, Kansas	(785) 983-4410
Marion County EMS	Marion, Kansas	(620) 382-6271
Marion County Environmental Dept.	Marion, Kansas	(620) 382-2550
Marion County Sheriff	Marion, Kansas	(620) 382-2144
Washington		
City of Linn Fire Department	Linn, Kansas	(785) 348-5373
Hanover Fire Department	Washington, Kansas	(785) 325-2293
Hanover Hospital	Hanover, Kansas	(785) 337-2214
Washington County Sheriff	Washington, Kansas	(785) 325-2293
Washington Hospital	Washington, Kansas	(785) 325-2211
Clay		
Clay Center Fire Dept.	Clay Center, Kansas	(785) 632-5606
Clay County (First Responder)	Kansas	(785) 632-5601
Clay County Ambulance Service	Clay Center, Kansas	(785) 632-2166
Clay County Health Dept.	Clay Center, Kansas	(785) 632-3193
Clay County Sheriff	Clay Center, Kansas	(785) 632-5601
Milford Fire Dept.	Milford, Kansas	(785) 463-5490
Dickinson		
City of Abilene Fire Dept.	Abilene, Kansas	(785) 263-1121
City of Enterprise Fire Dept.	Enterprise, Kansas	(785) 263-8323
Dickinson County Emergency Management	Abilene, Kansas	(785) 263-3608

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Dickinson County EMS	Abilene, Kansas	(785) 263-0716
Dickinson County Environmental Services	Abilene, Kansas	(785) 263-4780
Dickinson County Sherriff	Abilene, Kansas	(785) 263-4081
Herrington Fire Dept.	Herrington, Kansas	(785) 258-3020
Butler		
Augusta Fire Dept.	Augusta, Kansas	(316) 775-4500
Butler County Emergency Communications	El Dorado, Kansas	(316) 322-4207
Butler County EMS	El Dorado, Kansas	(316) 321-9264
Butler County Fire District No. 3	Rose Hill, Kansas	(316) 776-0401
Butler County Sherriff	El Dorado, Kansas	(316) 322-4254
El Dorado Fire Department	El Dorado, Kansas	(316) 321-9100
Towanda Fire Department	Towanda, Kansas	(316) 536-2751
Cowley		
Arkansas City Fire Department	Arkansas City, Kansas	(620) 441-0238
Arkansas City Police Dept.	Arkansas City, Kansas	(620) 441-4444
Winfield Ambulance Service	Winfield, Kansas	(620) 221-2300
Winfield Fire Department	Winfield, Kansas	(620) 221-5563
Winfield Police Dept.	Winfield, Kansas	(620) 221-5555

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EXTERNAL NOTIFICATION REFERENCES

Nebraska

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Butler		
Butler County First Responder / Sheriff	David City, Nebraska	(402) 367-7400
Butler County LEPC	David City, Nebraska	(402) 367-3125
David City Electric & Light Department	David City, Nebraska	(402) 367-3197
David City Park & Auditorium Department	David City, Nebraska	(402) 367-3914
David City Police Department	David City, Nebraska	(402) 367-3133
David City Power Plant	David City, Nebraska	(402) 367-3138
Jefferson County Ambulance	Fairbury, Nebraska	(402) 729-3304
Jefferson County Emergency Management	Fairbury, Nebraska	(402) 729-3602
Local Public Safety Answering Point	David City, Nebraska	(402) 367-7400
Jefferson		
Fairbury Clinic	Fairbury, Nebraska	(402) 729-3351
Jefferson County Ambulance	Fairbury, Nebraska	(402) 729-3304
Jefferson County Emergency Management	Fairbury, Nebraska	(402) 729-3602

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EXTERNAL NOTIFICATION REFERENCES

Oklahoma

OTHER POTENTIAL REQUIRED NOTIFICATIONS		
DIAL 911 for all Police, Fire and Ambulance Services. *** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**		
AGENCY	**LOCATION**	**OFFICE / ALTERNATE**
Kay		
Kay County Emergency Management	Newkirk, Oklahoma	(580) 362-3825
Kay County Sheriff's Office	Newkirk, Oklahoma	(580) 362-2517
Local Public Safety Answering Point	Ponca City, Oklahoma	(580) 763-8011
Local Public Safety Answering Point	Ponca City, Oklahoma	(580) 763-8011
Newkirk Ambulance Service	Newkirk, Oklahoma	(580) 362-3131
Newkirk Fire Dept.	Newkirk, Oklahoma	(580) 362-3606
Ponca City Fire Dept.	Ponca City, Oklahoma	(580) 767-0368
Noble		
City of Perry Fire Dept.	Perry, Oklahoma	(580) 336-9755
Local Public Safety Answering Point	Perry, Oklahoma	(580) 336-3517
Marland Fire Dept.	Marland, Oklahoma	(580) 268-3468
Morrison Fire Dept.	Morrison, Oklahoma	(580) 724-3535
Noble County Sherriff	Perry, Oklahoma	(580) 336-2141
Payne		
City of Stillwater Fire Dept.	Stillwater, Oklahoma	(405) 742-8308
Cushing City Ambulance	Cushing, Oklahoma	(918) 225-1790
Cushing Fire Dept.	Cushing, Oklahoma	(918) 225-3361
Local Public Safety Answering Point	Stillwater, Oklahoma	(405) 372-4522
Payne County Sherriff	Stillwater, Oklahoma	(405) 372-4522
Lincoln		
Local Public Safety Answering Point	Chandler, Oklahoma	(405) 258-9933
Okfuskee		

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Local Public Safety Answering Point	Okemah, Oklahoma	(918) 623-1234
Hughes		
Local Public Safety Answering Point	Holdenville, Oklahoma	(405) 379-2203
Seminole		
Local Public Safety Answering Point	Seminole, Oklahoma	(405) 382-9340
Coal		
Local Public Safety Answering Point	Coalgate, Oklahoma	(580) 927-2121
Atoka		
Local Public Safety Answering Point	Atoka, Oklahoma	(580) 889-2221
Bryan		
Local Public Safety Answering Point	Durant, Oklahoma	(580) 924-3737

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RESPONSE ZONE INFORMATION

Gulf Coast

RESPONSE ZONE CONTACT INFORMATION

Owner Name:	TransCanada
Addresses:	***(Physical Address)*** 450 - 1st Street Calgary, Alberta T2P 5H1
24 Hour Emergency Contact Phone Numbers:	(800) 447-8066 (24 Hours)
Telephone/Fax:	Telephone references, including 24-hour numbers, for the Facility, Owner, and Qualified Individual/Alternate Qualified Individual are provided in Figure 2.2.
Provinces/States Traversed:	Oklahoma, Texas
Areas/Counties Traversed:	Angelina, Atoka, Bryan, Cherokee, Coal, Creek, Delta, Fannin, Franklin, Hardin, Hopkins, Hughes, Jefferson, Johnston, Lamar, Liberty, Lincoln, Nacogdoches, Okfuskee, Orange, Payne, Polk, Pontotoc, Rusk, Seminole, Smith, Upshur, Wood

INFORMATION SUMMARY

Determination of Significant and Substantial Harm (United States Department of Transportation/ Pipeline and Hazardous Materials Safety Administration):

This Response Zone has been determined to meet the significant and substantial harm classification because at least one (1) line section within the response zone has met at least one of the criteria listed in 49CFR194.103(c)(1).

Worst Case Discharge (Refer to Appendix B for calculations):

- **Potential Oil Group:** 3
- **United States Department of Transportation/Pipeline and Hazardous Materials Safety Administration Planning Volume:** 34,539 Bbls

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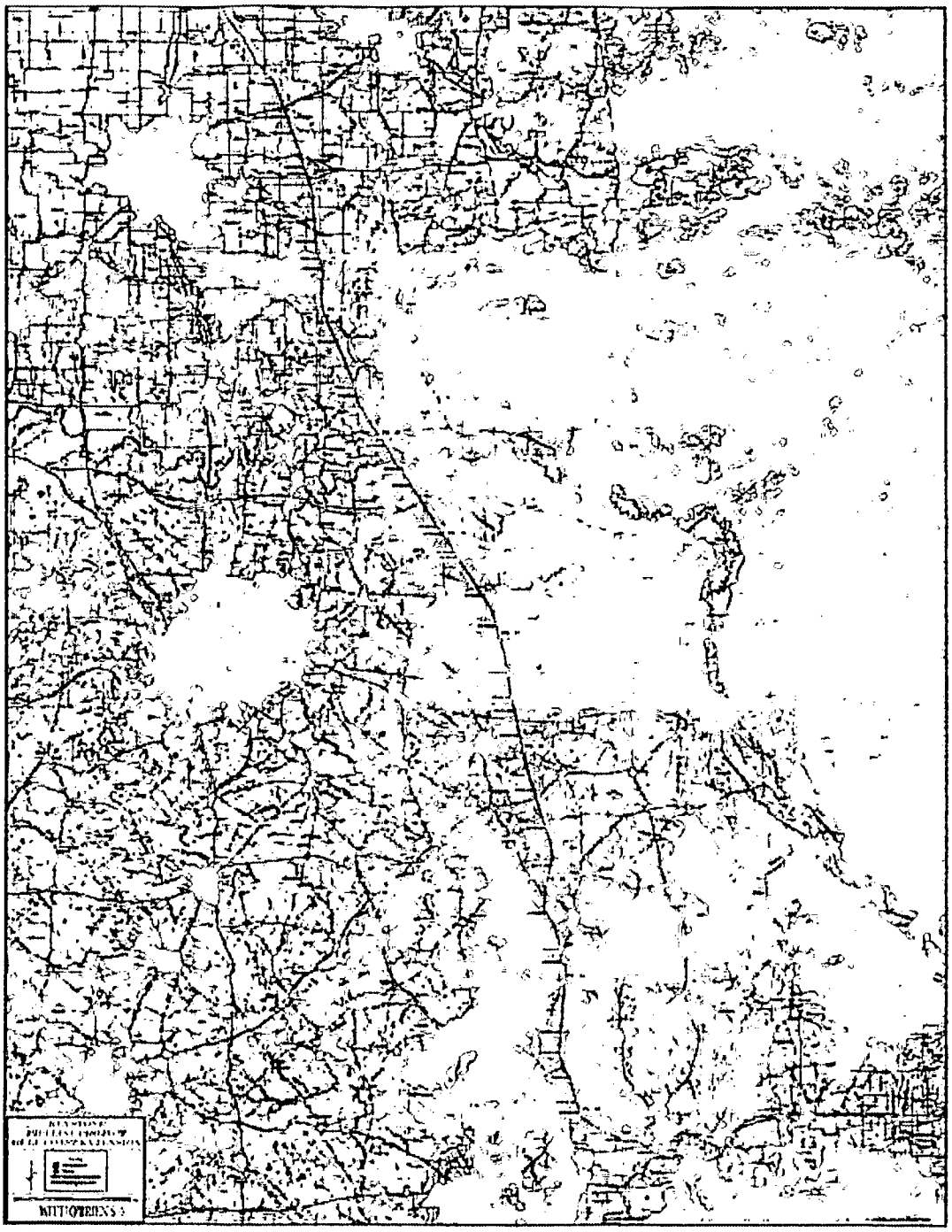

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RESPONSE ZONE COMPANY CONTACTS			
TITLE	ICS ROLE	NAME	NUMBER
Qualified Individual	Environmental Unit Leader	Robert Baumgartner	(832) 320-5538 (Office) (402) 960-0483 (Cell)
Red River Area Manager	Incident Commander, Operations Section Chief	Jeff Brown	(903) 939-0109 (Office) (254) 893-3082 (Home) (903) 714-5434 (Cell)
Incident Response Specialist	Planning Section Chief	Danielle Dracy	(402) 492-7413 (Office) (402) 677-8668 (Cell)
Sr Operations Manager, Oil Operation	Incident Commander, Operations Section Chief	Rick Duncan	(816) 233-6033 ext 223 (Office) (785) 288-0365 (Cell)
		Dennis Granger	(903) 939-0109, ext 255 (Office) (832) 364-3929 (Cell)
		Doug Harvey	(403) 920-6506 (Office) (403) 829-3136 (Cell)
	Operations Section Chief	Jon Wickersham	(402) 492-7406 (Office) (402) 672-6386 (Cell)

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Area: Gulf Coast Qualified Individuals			
NAME	OFFICE	HOME	CELL
Robert Baumgartner	(832) 320-5538		(402) 960-0483
Jeff Brown	(903) 939-0109	(254) 893-3082	(903) 714-5434
Danielle Dracy	(402) 492-7413		(402) 677-8668
Rick Duncan	(816) 233-6033 ext 223		(785) 288-0365
Jon Wickersham	(402) 492-7406		(402) 672-6386

Pipeline Specifications			
Location	Type of Oil	State	County
Cushing South PS/ Cromwell PS	Crude Oil	Oklahoma	Payne, Lincoln, Creek, Okfuskee, Seminole
Cromwell PS/ Tupelo PS	Crude Oil	Oklahoma	Seminole, Hughes, Pontotoc, Coal
Tupelo PS/ Bryan PS	Crude Oil	Oklahoma	Coal, Atoka, Johnston, Bryan
Bryan PS/ Delta PS	Crude Oil	Oklahoma , Texas	Bryan, Fannin, Lamar, Delta
Delta PS/ Winnsboro PS	Crude Oil	Texas	Delta, Hopkins, Franklin
Winnsboro PS/ Lake Tyler PS	Crude Oil	Texas	Franklin, Upshur, Wood, Rusk, Smith
Lake Tyler PS/ Lufkin PS	Crude Oil	Texas	Smith, Nacogdoches, Cherokee
Lufkin PS/ Corrigan PS	Crude Oil	Texas	Cherokee, Angelina, Polk
Corrigan PS/ Liberty PS	Crude Oil	Texas	Polk, Hardin, Liberty
Liberty PS/end of pipleine	Crude Oil	Texas	Liberty, Jefferson, Orange

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Company Owned Response Equipment		
NAME	LOCATION	DESCRIPTION
Equipment Response Trailer	Bryan County, OK	See Equipment List - Appendix A
Tyler Equipment Response Trailer	Tyler, TX	See Equipment List - Appendix A
Liberty Equipment Response Trailer	Liberty, TX	See Equipment List - Appendix A

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Breakout Tanks			
TANK NAME	FACILITY NUMBER	CAPACITY (Bbls)	TYPE OF OIL

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EXTERNAL NOTIFICATION REFERENCES

Oklahoma

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Payne		
Cushing City Ambulance	Cushing, Oklahoma	(918) 225-1790
Cushing City Hall	Cushing, Oklahoma	(918) 225-2394
Cushing Police Department	Cushing, Oklahoma	(918) 225-1212
Cushing Regional Hospital	Cushing, Oklahoma	(918) 225-2915
Cushing Water Department	Cushing, Oklahoma	(918) 225-2394
Lifenet Medical Emergency Services	Stillwater, Oklahoma	(405) 707-0007
Pawnee Fire Department	Pawnee, Oklahoma	(918) 762-3166
Payne County Sheriff's Office	Stillwater, Oklahoma	(405) 372-4522
Perkins Police Department	Perkins, Oklahoma	(405) 547-2445
PerkinsCity Hall	Perkins, Oklahoma	(405) 547-2445
Ripley City Hall	Ripley, Oklahoma	(918) 372-4287
Stillwater Police Department	Stillwater, Oklahoma	(405) 372-4171
Yale CIty Hall	Yale, Oklahoma	(918) 387-2406
Yale Emergency Medical Services	Yale, Oklahoma	(918) 387-2447
Yale Police Department	Yale, Oklahoma	(918) 387-2403
Creek		
Creek County ER Ambulance	Creek County, Oklahoma	(918) 227-4111
Creek County Sheriff's Office	Sapulpa, Oklahoma	(918) 224-4964
Depew Police Department	Depew, Oklahoma	(918) 324-5060
Depew Water Department	Depew, Oklahoma	(918) 324-5251
Drumright City Hall	Drumright, Oklahoma	(918) 352-2631

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Drumright Fire Department	Drumright, Oklahoma	(918) 352-3131
Drumright Police Department	Drumright, Oklahoma	(918) 352-2251
Drumwright Regional Hospital	Drumwright, Oklahoma	(918) 382-2300
Oaklake Trails Naturist Park	Depew, Oklahoma	(918) 324-5999
Oilton Fire Department	Oilton, Oklahoma	(918) 862-3778
Oilton Police Department	Oilton, Oklahoma	(918) 862-3662
Lincoln		
Agra Fire Department	Agra, Oklahoma	(918) 375-2304
Agra Police Department	Agra, Oklahoma	(918) 375-2344
Chandler Fire Department	Chandler, Oklahoma	(405) 258-1202
Chandler Fire Dept. Station 1	Chandler, Oklahoma	(405) 258-1202
Chandler Police Department	Chandler, Oklahoma	(405) 258-1460
Chandler Water Department	Chandler, Oklahoma	(405) 258-3200
Davenport City Hall	Davenport, Oklahoma	(918) 377-2235
Davenport Ambulance	Davenport, Oklahoma	(918) 377-2300
Davenport Fire Department	Davenport, Oklahoma	(918) 377-2304
Davenport Police Department	Davenport, Oklahoma	(918) 377-2911
Lincoln Co RWD #1	Sparks, Oklahoma	(918) 866-2444
Lincoln Co RWD #2	Chandler, Oklahoma	(405) 258-0147
Lincoln County Sheriff's Office	Chandler, Oklahoma	(405) 258-1191
Prague Police Department	Prague, Oklahoma	(405) 567-2239
Prague Water Department	Prague, Oklahoma	(405) 567-2270
Stroud City Hall	Stroud, Oklahoma	(918) 968-2571
Stroud Fire Department	Stroud, Oklahoma	(918) 968-2733
Stroud Police Department	Stroud, Oklahoma	(918) 968-2733
Stroud Regional Medical Center	Stroud, Oklahoma	(918) 968-3571

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Stroud Utilities Authority	Stroud, Oklahoma	(918) 987-0221
Tatanka Ranch	Stroud, Oklahoma	(918) 368-2251
Okfuskee		
Bearden City Hall	Bearden, Oklahoma	(870) 687-2204
Boley Police Department	Boley, Oklahoma	(918) 667-3700
Creek Nation Community Hospital	Okemah, Oklahoma	(918) 623-1424
Creek Nation Community Hospital Ambulance	Okemah, Oklahoma	(918) 623-2015
Okemah Fire Department	Okemah, Oklahoma	(918) 623-1234
Okemah Police Department	Okemah, Oklahoma	(918) 623-1234
Okemah Utilities Authority	Okemah, Oklahoma	(918) 623-1050
Okfuskee Co RWD #1 (Boley)	Boley, Oklahoma	(918) 667-3477
Okfuskee County Sheriff's Office	Okemah, Oklahoma	(918) 623-1122
Paden Water Department	Paden, Oklahoma	(405) 932-4441
Hughes		
Calvin Water Department	Calvin, Oklahoma	(405) 645-2434
Holdenville City Hall	Holdenville, Oklahoma	(405) 379-3397
Holdenville Fire Department	Holdenville, Oklahoma	(405) 379-2413
Holdenville General Hospital	Holdenville, Oklahoma	(405) 379-4200
Holdenville Police Department	Holdenville, Oklahoma	(405) 379-6627
Holdenville Water Department	Holdenville, Oklahoma	(405) 379-3397
Hughes County Emergency Med	Holdenville, Oklahoma	(405) 379-7046
Hughes County Sheriff's Office	Holdenville, Oklahoma	(405) 379-2203
Moss School Water Department	Holdenville, Oklahoma	(405) 379-2273
Wetumka Water Department	Wetumka, Oklahoma	(405) 452-3253
Seminole		
Bowlegs Lima Water	Bowlegs, Oklahoma	(405) 382-1255

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Cromwell Police Department	Cromwell, Oklahoma	(405) 944-5525
Cromwell Volunteer Fire Department	Cromwell, Oklahoma	(405) 944-5432
Seminole City Hall	Seminole, Oklahoma	(405) 382-4330 Ext 210
Seminole Co RWD #7	Seminole, Oklahoma	(405) 243-5451
Seminole County Sheriff's Office	Wewoka, Oklahoma	(405) 257-5445
Seminole Fire Department	Seminole, Oklahoma	(405) 382-1314
Seminole Medical Center	Seminole, Oklahoma	(405) 303-4000
Seminole Police Department	Seminole, Oklahoma	(405) 382-3434
Seminole Water Department	Seminole, Oklahoma	(405) 382-4330
Wewoka Ambulance Service	Wewoka, Oklahoma	(405) 257-5421
Wewoka City Hall	Wewoka, Oklahoma	(405) 257-2413
Wewoka Fire Department	Wewoka, Oklahoma	(405) 257-5421
Wewoka Police Department	Wewoka, Oklahoma	(405) 257-3366 / (405) 257-3367
Wewoka Water Works	Wewoka, Oklahoma	(405) 257-5140
Pontotoc		
Allen Ambulance Service	Allen, Oklahoma	(405) 421-1130 / (405) 322-4466
Allen City Hall	Allen, Oklahoma	(580) 857-2461
Allen Fire Department	Allen, Oklahoma	(580) 857-2100
Allen Police Department	Allen, Oklahoma	(580) 857-2722
Allen PWA	Allen, Oklahoma	(580) 857-2461
Francis Water Department	Francis, Oklahoma	(580) 332-3967
Pontotoc County Sheriff's Office	Ada, Oklahoma	(580) 332-4169
Stonewall City Hall	Stonewall, Oklahoma	(580) 265-4511
Stonewall PWA	Stonewall, Oklahoma	(580) 265-4511
Valley View Regional Hospital	Ada, Oklahoma	(580) 421-6074
Coal		

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Coal County Emergency Services	Coalgate, Oklahoma	(580) 927-9008
Coal County Sheriff's Office	Coalgate, Oklahoma	(580) 927-2121
Coalgate City Hall	Coalgate, Oklahoma	(580) 927-3915
Coalgate Fire Department	Coalgate, Oklahoma	(580) 927-3913
Coalgate Police Department	Coalgate, Oklahoma	(580) 927-3913
Coalgate PWA	Coalgate, Oklahoma	(580) 927-3914
Lehigh Water Department	Lehigh, Oklahoma	(580) 927-9953
Mary Hurley Hospital	Coalgate, Oklahoma	(580) 927-2327
Tupelo Police Department	Tupelo, Oklahoma	(580) 845-2412
Johnston		
Bromide City Hall	Bromide, Oklahoma	(580) 638-2334
Bromide Water Department	Bromide, Oklahoma	(580) 638-2334
Johnston County Ambulance Service	Johnston County, Oklahoma	(580) 371-0569
Johnston County Sheriff's Of	Tishomingo, Oklahoma	(580) 371-2691
Johnston Memorial Hospital	Tishomingo, Oklahoma	(580) 371-2327
Tishomingo Fire Department	Tishomingo, Oklahoma	(580) 371-3051
Tishomingo Police Department	Tishomingo, Oklahoma	(580) 371-2319
Wapanucka City Hall	Wapanucka, Oklahoma	(580) 937-4272
Wapanucka Water Department	Wapanucka, Oklahoma	(580) 937-4272
Atoka		
Atoka City Hall	Atoka, Oklahoma	(580) 889-3341
Atoka County Ambulance Service	Atoka, Oklahoma	(580) 889-5228
Atoka County RWS & SWMD #4	Atoka, Oklahoma	(580) 889-5715
Atoka County Sheriff's Office	Atoka, Oklahoma	(580) 889-2221
Atoka Fire Department	Atoka, Oklahoma	(580) 889-2121
Atoka Memorial Hospital	Atoka, Oklahoma	(580) 889-3333

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Atoka Memorial Hospital	Atoka, Oklahoma	(580) 889-3333
Atoka Police Department	Atoka, Oklahoma	(580) 889-3250
Atoka PWS	Atoka, Oklahoma	(580) 889-2362
Howard McLeod Corr Center	Atoka, Oklahoma	(580) 889-6651
Mack Alford Corr Center	Stringtown, Oklahoma	(580) 346-7301
Rural Water District	Caddo, Oklahoma	(580) 889-3135
Stringtown Fire Department	Stringtown, Oklahoma	(580) 346-7035
Stringtown Police Department	Stringtown, Oklahoma	(580) 346-7200 / (580) 889-2424
Stringtown PWA	Stringtown, Oklahoma	(580) 346-7224
Tushka City Hall	Tushka, Oklahoma	(580) 889-3046
Bryan		
Bennington Police Department	Bennington, Oklahoma	(580) 847-2311
Bokchito City Hall	Bokchito, Oklahoma	(580) 295-3775
Bokchito Police Departmen	Bokchito, Oklahoma	(580) 295-3818
Bryan County RWD #7	Bennington, Oklahoma	(580) 295-2624
Bryan County Sheriff's Office	Durant, Oklahoma	(580) 924-3000
Caddo City Hall	Caddo, Oklahoma	(580) 367-2244
Caddo Fire Department	Caddo, Oklahoma	(580) 367-2244
Caddo Police Department	Caddo, Oklahoma	(580) 367-9806
Caddo Water Department	Caddo, Oklahoma	(580) 367-2244
Eastern Bryan County Ambulance Service	Bokchito, Oklahoma	(580) 295-3611
Kenefic City Hall	Kenefic, Oklahoma	(580) 367-2744
Kenefic Water Department	Kenefic, Oklahoma	(580) 367-2744
Medical Center of Southeastern Oklahoma	Durant, Oklahoma	(580) 924-3080

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EXTERNAL NOTIFICATION REFERENCES

Texas

OTHER POTENTIAL REQUIRED NOTIFICATIONS

DIAL 911 for all Police, Fire and Ambulance Services.

*** Calls to 911 concerning petroleum spills will usually alert LEPC; however, it is advisable to notify them directly for any spill that requires a 911 notification.**

AGENCY	LOCATION	OFFICE / ALTERNATE
Orange		
Bridge City Fire Department	Bridge City, Texas	(409) 735-2419
Bridge City Police Department	Bridge City, Texas	(409) 735-5028
City Hall Bridge City	Bridge City, Texas	(409) 735-6801
City Hall Rose City	Rose, Texas	(409) 769-6809
Memorial Hermann Baptist Orange Hospital	Orange, Texas	(409) 883-9361
Orange City Hall	Orange, Texas	(409) 883-1016
Orange County Sheriff's Office	Orange, Texas	(409) 883-2612
Orange Fire Department	Orange, Texas	(409) 883-1050
Orange Police Department	Orange, Texas	(409) 883-1026
Pinehurst City Hall	Pinehurst, Texas	(409) 886-3873
Vidor City Hall	Vidor, Texas	(409) 769-5473
Vidor Police Department	Vidor, Texas	(409) 769-4561
West Orange City Hall	West Orange, Texas	(409) 883-3468
West Orange Fire Department	West Orange, Texas	(409) 883-3468
West Orange Police Department	West Orange, Texas	(409) 883-7574
Hardin		
Acadian Ambulance Service	Hardin County, Texas	(409) 385-4500
Hardin County Constable Precinct 5	Lumberton, Texas	(409) 658-1500
Hardin County Sheriff's Department	Kountze, Texas	(409) 246-5100 / (409) 246-3441
Local Public Safety Answering Point	Kountze, Texas	(409) 246-5100
Lumberton City Hall	Lumberton, Texas	(409) 755-3700

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Lumberton Police Department	Lumberton, Texas	(409) 755-2650
Lumberton Volunteer Fire Department	Lumberton, Texas	(409) 751-5862
Mayor Bevil City Hall	Bevil Oaks, Texas	(409) 753-1475
Sour Lake City Hall	Sour Lake, Texas	(409) 287-3573
Sour Lake Police Department	Sour Lake, Texas	(409) 287-3574
Sour Lake Volunteer Fire Department	Sour Lake, Texas	(409) 287-3062
Liberty		
Ames City Hall	Ames, Texas	(936) 336-5883
Cleveland Regional Medical Ctr	Cleveland, Texas	(281) 593-1811
Daisetta City Hall	Daisetta, Texas	(936) 536-6120
Daisetta Police Department	Daisetta, Texas	(936) 536-6120
Dayton Fire Department	Dayton, Texas	(936) 258-5323
Dayton Police Department	Dayton, Texas	(936) 258-7621
Doctors Diagnostic Hospital	Cleveland, Texas	(281) 622-2900
Hardin City Hall	Hardin, Texas	(936) 298-2117
Liberty City Hall	Liberty, Texas	(936) 336-3684
Liberty County Sheriff's Office	Liberty, Texas	(936) 336-4500
Liberty Fire Department	Liberty, Texas	(936) 336-3922
Liberty Police Department	Liberty, Texas	(936) 336-5666
Local Public Safety Answering Point	Liberty, Texas	(936) 336-4505
Jefferson		
Beaumont City Hall	Beaumont, Texas	(409) 980-8311 or 311
Beaumont Fire Department	Beaumont, Texas	(409) 880-3901
Beaumont Police Department	Beaumont, Texas	(409) 880-3801
Bevil Oaks City Hall	Bevil Oaks, Texas	(409) 781-4440
Christus Hospital	Beaumont, Texas	(409) 892-7171

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Groves City Hall	Groves, Texas	(409) 962-4471
Groves Fire Department	Groves, Texas	(409) 962-4471
Groves Police Department	Groves, Texas	(409) 962-0244
Jefferson County Sheriff's Office	Beaumont, Texas	(409) 835-8411
Local Public Safety Answering Point	Port Arthur, Texas	(409) 835-8411
Memorial Hermann Baptist Beaumont Hospital	Beaumont, Texas	(409) 212-5012
Nederland City Hall	Nederland, Texas	(409) 723-1503
Nederland Police Department	Nederland, Texas	(409) 723-1518
Port Arthur Fire Department	Port Arthur, Texas	(409) 983-3676
Port Arthur Mayor	Port Arthur, Texas	(409) 983-8105
Port Arthur Police Department	Port Arthur, Texas	(409) 983-8600
Port Neches Fire Department	Port Neches, Texas	(409) 722-5885
Port Neches Police Department	Port Neches, Texas	(409) 722-1424
Renaissance Hospital Groves	Groves, Texas	(409) 962-5733
The Medical Center Of Southeast Texas	Port Arthur, Texas	(409) 853-5900
Lamar		
Lamar County Sheriff's Office	Paris, Texas	(903) 737-2400
Local Public Safety Answering Point	Paris, Texas	(903) 784-7655
Paris City Hall	Paris, Texas	(903) 785-7511
Paris Fire Department	Paris, Texas	(903) 784-9225
Paris Police Department	Paris, Texas	(903) 784-6688
Paris Regional Medical Center	Paris, Texas	(903) 785-4521
Reno City Hall	Reno, Texas	(903) 785-0722
Delta		
City of Cooper Water Department	Cooper, Texas	(903) 395-4433
Cooper City Hall	Cooper, Texas	(903) 395-4433

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Cooper Volunteer Fire Depa	Cooper, Texas	(903) 395-2217
Delta County Ambulance District	Delta County, Texas	(970) 874-7001
Delta County Sheriff's Department	Cooper, Texas	(903) 395-2146
Local Public Safety Answering Point	Cooper, Texas	(903) 395-2146
Pecan Gap City Office	Pecan Gap, Texas	(903) 359-6565
Franklin		
Ambulance Service - Franklin County	Franklin County, Texas	(800) 522-4486
City of Mount Vernon Water Department	Mount Vernon, Texas	(903) 537-4643
East Texas Medical Center Mount Vernon	Mount Vernon, Texas	(903) 537-4552
Franklin County Sheriff's Office	Mount Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Local Public Safety Answering Point	Mt. Vernon, Texas	(903) 537-4539
Mount Vernon Fire Department	Mount Vernon, Texas	(903) 537-4539
Mount Vernon Police Department	Mount Vernon, Texas	(903) 537-4681
Mt Vernon City Hall	Mt Vernon, Texas	(903) 537-2252
Hopkins		
Como City Hall	Como, Texas	(903) 488-3434
Como Police Department	Como, Texas	(903) 488-3434
Hopkins County Memorial Hospital	Sulphur Springs, Texas	(903) 885-7671
Hopkins County Sheriff's Office	Sulphur Springs, Texas	(903) 438-4040
Local Public Safety Answering Point	Sulhpur Springs, Texas	(903) 438-4040
Sulphur Springs Fire Department	Sulphur Springs, Texas	(903) 885-7547
Sulphur Springs Police Department	Sulphur Springs, Texas	(903) 885-7602
Wood		

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East Texas Medical Center Quitman	Quitman, Texas	(903) 763-4500
Hawkins Police Department	Hawkins, Texas	(903) 769-3628
Local Public Safety Answering Point	Quitman, Texas	(903) 763-5462
Mother Frances Hospital	Winnsboro, Texas	(903) 342-5227
Quitman City Hall	Quitman, Texas	(903) 537-2252
Quitman Fire Department	Quitman, Texas	(903) 763-2222
Quitman Police Department	Quitman, Texas	(903) 763-4410
Winnsboro City Hall	Winnsboro, Texas	(903) 342-3654
Winnsboro Police Department	Winnsboro, Texas	(903) 342-3620
Wood County Sheriff's Office	Quitman, Texas	(903) 763-5461
Upshur		
Big Sandy City Hall	Big Sandy, Texas	(903) 636-4343
Big Sandy Fire Department	Big Sandy, Texas	(903) 636-4343
Big Sandy Police Department	Big Sandy, Texas	(903) 636-4200
East Texas Medical Center - Gilmer	Gilmer, Texas	(903) 841-7100
Gilmer City Hall	Gilmer, Texas	(903) 843-2553
Gilmer Police Department	Gilmer, Texas	(903) 843-5547
Gladewater City Hall	Gladewater, Texas	(903) 845-2196
Gladewater Fire Department	Gladewater, Texas	(903) 845-2484
Gladewater Police Department	Gladewater, Texas	(903) 845-2166
Local Public Safety Answering Point	Gilmer, Texas	(903) 843-2541
Upshur County Sheriff's Office	Gilmer, Texas	(903) 843-2541
Smith		
Arp City Hall	Arp, Texas	(903) 859-6131
East Texas Medical Center	Tyler, Texas	(903) 597-0351
Mother Frances Hospital	Tyler, Texas	(903) 593-8441

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Overton Police Department	Overton, Texas	(903) 834-3145
Overton Police Department	Overton, Texas	(903) 834-3145
Smith County Sheriff's Office	Tyler, Texas	(903) 590-2600
Texas Spine And Joint Hospital	Tyler, Texas	(903) 525-3300
Troup Fire Department	Troup, Texas	(903) 842-3498
Troup Police Department	Troup, Texas	(903) 842-3211
Tyler City Hall	Tyler, Texas	(903) 531-1250
Tyler Fire Department	Tyler, Texas	(903) 535-0005
Tyler Police Department	Tyler, Texas	(903) 531-1000
Whitehouse City Manager	Whitehouse, Texas	(903) 839-4115
Whitehouse Fire Department	Whitehouse, Texas	(903) 839-2884
Whitehouse Police Department	Whitehouse, Texas	(903) 839-2828
Rusk		
Etmc Henderson	Henderson, Texas	(903) 657-7541
Henderson City Hall	Henderson, Texas	(903) 657-6551
Henderson Fire Department	Henderson, Texas	(903) 657-6551
Henderson Police Department	Henderson, Texas	(903) 657-3512
Local Public Safety Answering Point	Tyler, Texas	(903) 566-6600
New London City Hall	New London, Texas	(903) 895-4466
Reklaw City Hall	Reklaw, Texas	(936) 369-4368
Rusk County Sheriff's Office	Henderson, Texas	(903) 657-3581
Cherokee		
Alto City Hall	Alto, Texas	(936) 858-4711
Alto Fire Department	Alto, Texas	(936) 858-4444
Alto Police Department	Alto, Texas	(936) 858-2221
Cherokee County Sheriff's Office	Rusk, Texas	(903) 683-2271

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East Texas Medical Center Jacksonville	Jacksonville, Texas	(903) 541-5000
Local Public Safety Answering Point	Jacksonville, Texas	(903) 683-2271
Mother Frances Hospital Jacksonville	Jacksonville, Texas	(903) 541-4500
New Summerfield Fire Department	New Summerfield, Texas	(903) 726-3568
New Summerfield Police Department	New Summerfield, Texas	(903) 726-3726
Reklaw Fire Department	Reklaw, Texas	(936) 369-9917
Reklaw Police Department	Reklaw, Texas	(936) 369-4228
Rusk City Hall	Rusk, Texas	(903) 683-2213
Rusk Police Department	Rusk, Texas	(903) 683-2213
Nacogdoches		
Cushing City Hall	Cushing, Texas	(936) 326-4665
Local Public Safety Answering Point	Nacogdoches, Texas	(936) 559-2607
Memorial Hospital	Nacogdoches, Texas	(936) 564-4611
Nacogdoches City Hall	Nacogdoches, Texas	(936) 559-2516
Nacogdoches County Ambulance Service	Nacogdoches County, Texas	(936) 564-1212
Nacogdoches County Sheriff's Office	Nacogdoches, Texas	(936) 560-7790
Nacogdoches Fire Department	Nacogdoches, Texas	(936) 559-2541
Nacogdoches Medical Center	Nacogdoches, Texas	(936) 569-9481
Nacogdoches Police Department	Nacogdoches, Texas	(936) 559-2607
Angelina		
Angelina County Sheriff's Office	Lufkin, Texas	(936) 634-3331
Diboll City Hall	Diboll, Texas	(936) 829-4757
Diboll Fire Department	Diboll, Texas	(936) 829-2511
Diboll Police Department	Diboll, Texas	(936) 829-5586
Hudson Police Department	Lufkin, Texas	(936) 875-3028
Local Public Safety Answering Point	Lufkin, Texas	(936) 633-0356

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Lufkin City Mayor	Lufkin, Texas	(936) 633-0299
Lufkin Fire Department	Lufkin, Texas	(936) 633-0356
Lufkin Police Department	Lufkin, Texas	(936) 633-0300
Lufkin Public Safety Answering Point	Lufkin, Texas	(936) 829-5586
Memorial Health System Of East Texas- Lufkin	Lufkin, Texas	(936) 634-8111
Woodland Heights Medical Center	Lufkin, Texas	(936) 634-8311
Polk		
City Hall of Goodrich	Goodrich, Texas	(936) 365-2228
Corrigan City Office	Corrigan, Texas	(936) 398-5363
Corrigan Police Department	Corrigan, Texas	(936) 398-2551
Livingston City Hall	Livingston, Texas	(936) 327-4311
Livingston Fire Department	Livingston, Texas	(936) 327-4411
Livingston Police Department	Livingston, Texas	(936) 327-3117
Local Public Safety Answering Point	Livingston, Texas	(936) 327-6810
Memorial Medical Center Livingston	Livingston, Texas	(936) 327-4381
Polk County Sheriff's Department	Livingston, Texas	(936) 327-6810
Fannin		
Bonham Public Safety Answering Point	Bonham, Texas	(903) 583-2144
Fannin County Sheriff's Office	Bonham, Texas	(903) 583-2143
Honey Grove City Hall	Honey Grove, Texas	(903) 378-2323
Honey Grove Police Department	Honey Grove, Texas	(903) 378-2222
Honey Grove Volunteer Fire Department	Honey Grove, Texas	(903) 378-3435
Local Public Safety Answering Point	Bonham, Texas	(903) 583-2143
Red River Regional Hospital	Bonham, Texas	(903) 583-8585

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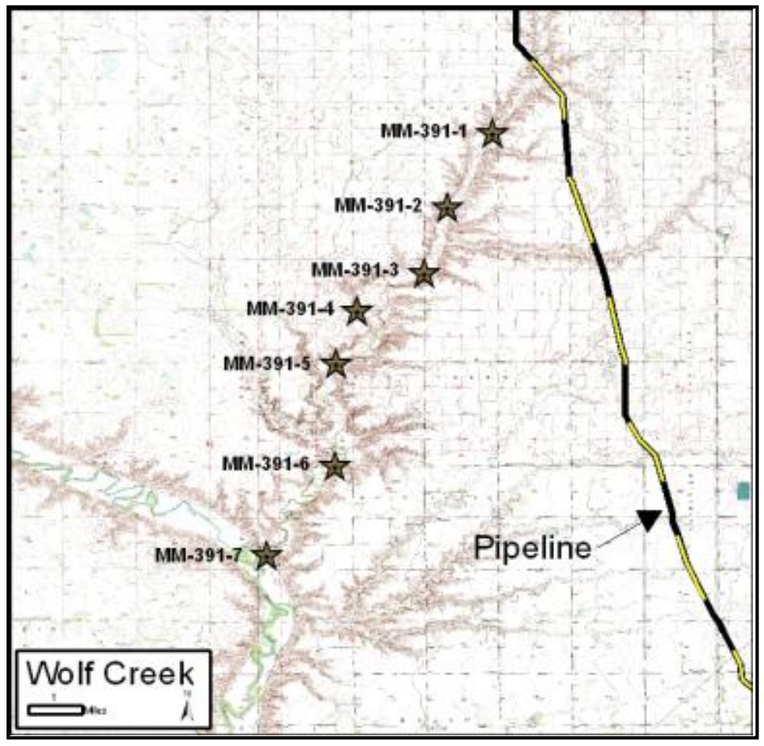


INFORMATION

Location/Site:MM-391-1 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 27' 52" N, 97° 33' 40" W	Landowner: Hutchinson County Olivet, SD
Upstream CP: Pipeline	Phone: 605-387-4217
Downstream CP: CP2	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	1
Response Boat - Jon Boat	2

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy multiple layers of deflection boom bank, angle dependent on river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on Hwy 44, right on CR-14, left on CR-22 (272 Ave). Right on 432nd Ave to bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Small creek, 30' across.

Bank Characteristics:

North/South Shore- Exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

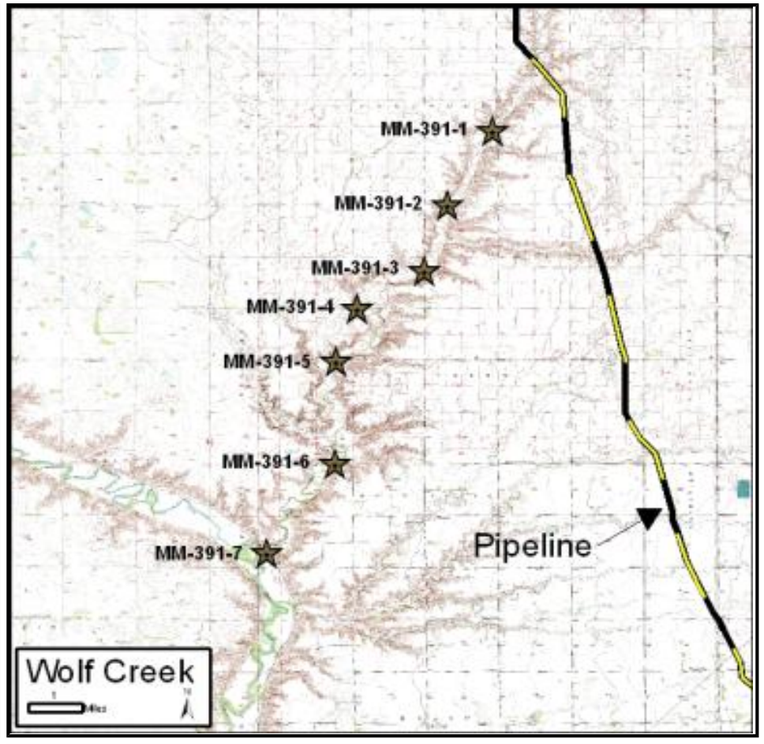
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

1.5 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-391-2 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 26' 37" N, 97° 34' 25" W	Landowner: Hutchinson County Olivet, SD
Upstream CP: CP1	Phone: 605-387-4217
Downstream CP: CP3	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	1

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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on Hwy. 44, right on CR-14, left on CR-22 (272 Ave.) to bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/West Shore- Exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

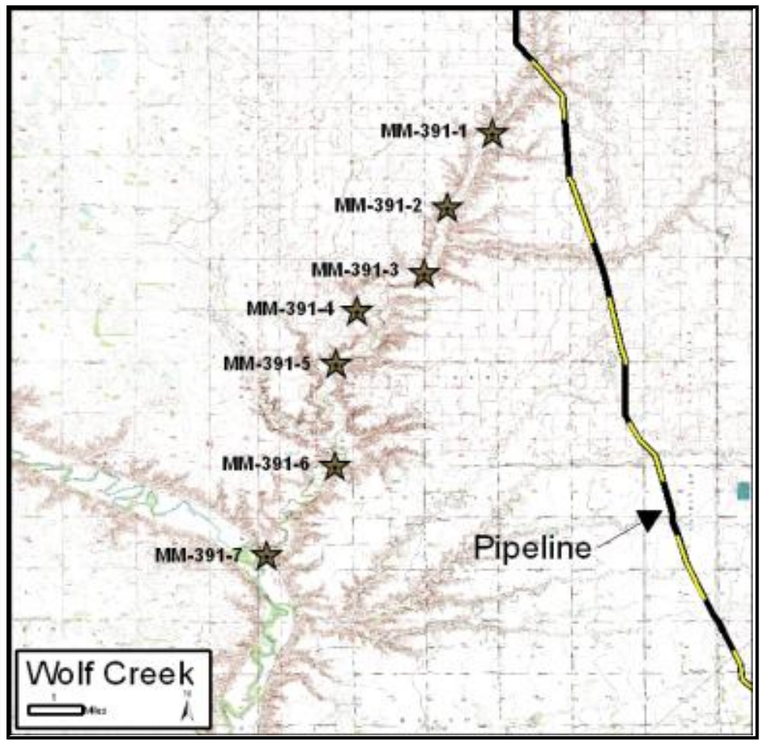
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

3 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-391-3 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 25' 31" N, 97° 34' 47" W	Landowner: Hutchinson County Olivet, SD
Upstream CP: CP2	Phone: 605-387-4217
Downstream CP: CP4	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Trucks	1

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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on Hwy. 44, right on 431st Ave. to bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/ West Shore- Exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

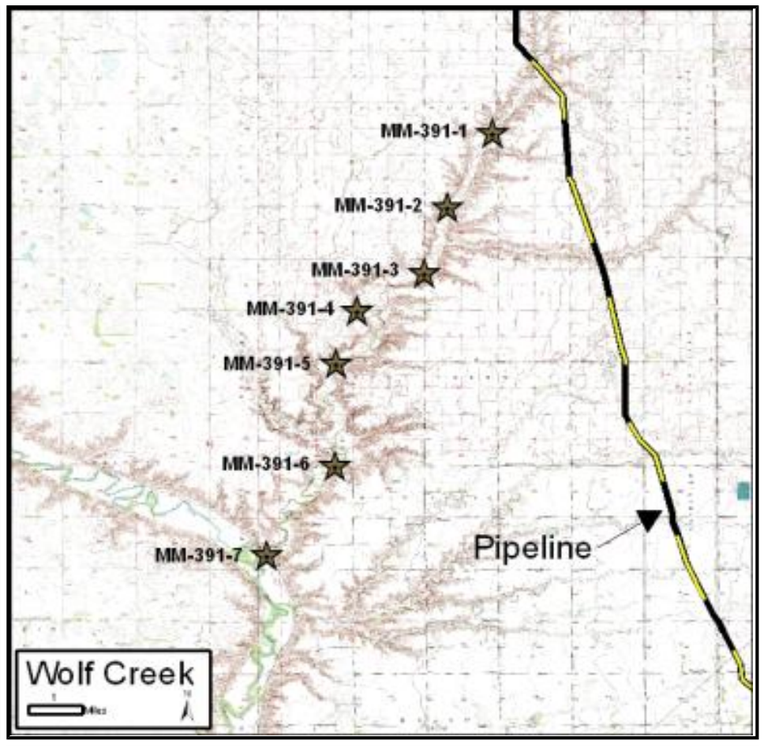
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

4.5 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-391-4 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 24' 52" N, 97° 35' 53" W	Landowner: Hutchinson County Olivet, SD
Upstream CP: CP3	Phone: 605-387-4217
Downstream CP: CP5	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	1

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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on Hwy. 44, right on 431st Ave, left on 274th St. to bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/West Shore- Exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

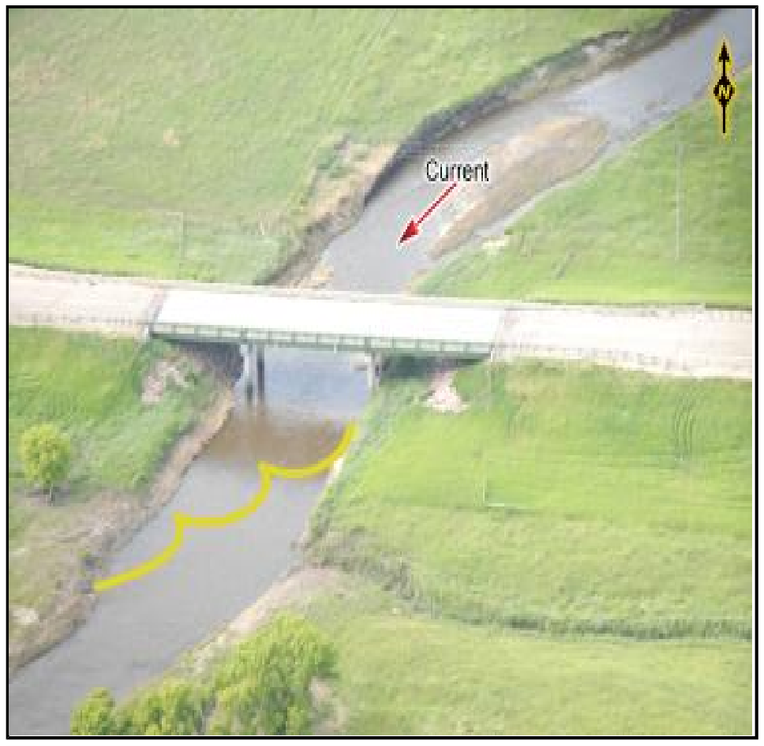
Decontamination Areas:

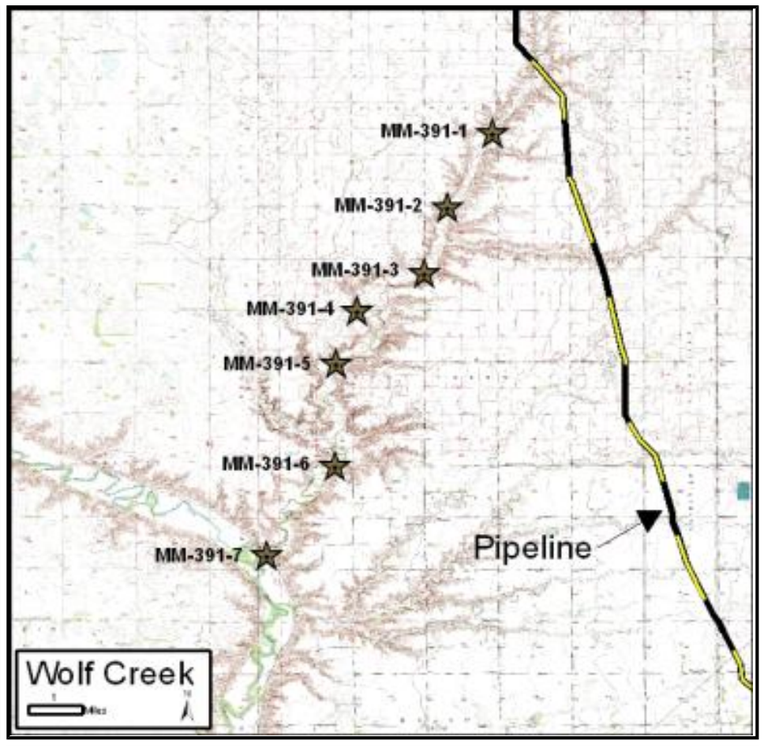
Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

5.75 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.





INFORMATION

Location/Site:MM-391-5 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 24' 0" N, 97° 36' 13" W	Landowner: Hutchinson County Olivet, SD Phone: 605-387-4217
Upstream CP: CP4	
Downstream CP: CP6	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	1

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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy. 81 North, left on Hwy. 44 to bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/West Shore- Exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

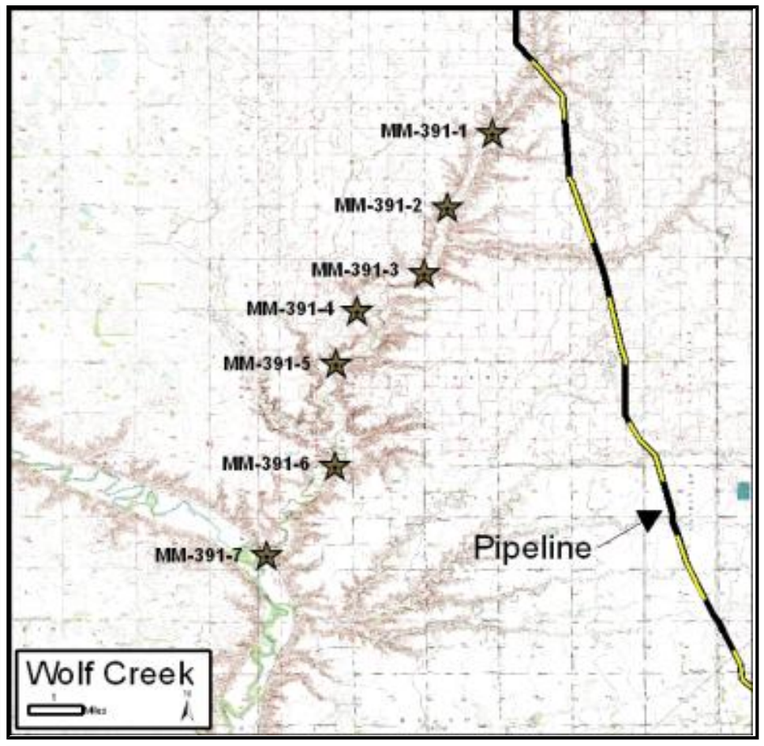
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

7.25 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-391-6 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 22' 17" N, 97° 36' 16" W	Landowner: Hutchinson County Olivet, SD
Upstream CP: CP5	Phone: 605-387-4217
Downstream CP: CP7	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Trucks	1

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Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on CR-28, right on 430th Ave., continue to 277th bridge.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/West Shore- exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

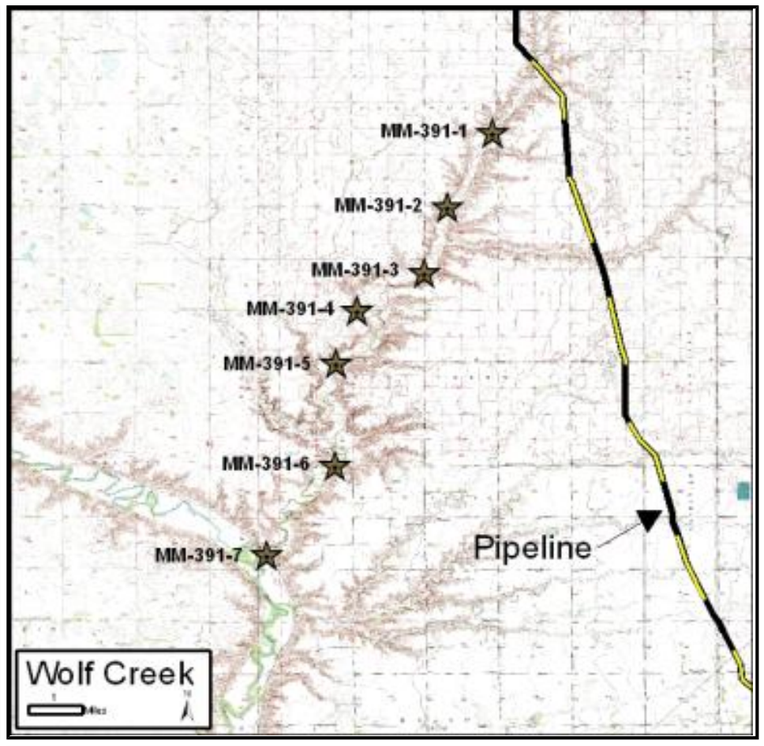
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

9.25 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-391-7 Wolf Creek
Nearest City: Bridgewater, South Dakota

Latitude/Longitude: 43° 20' 46" N, 97° 37' 22" W	Landowner: Hutchinson County Olivet, SD Phone: 605-387-4217
Upstream CP: CP6	
Downstream CP: N/A	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	9
18" Containment Boom	1,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	1

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Hwy 81 North, left on CR-28, right on CR-11.

Location of Staging Area / Boat Launch:

Establish Very Small 10' X 10' Staging area.

No boat ramp, hand carry only.

Description of Watercourse:

Meandering stream (rocky, shallow).

Bank Characteristics:

East/West Shore- exposed eroding river banks, low vegetation, gently sloping banks.

Intermittent riprap and exposed bed rocks, mid stream sand bars, width: <100 ft; depth: <4ft; Flow: South, 0.5-5 knots.

Environmental Sensitivities:

Critical distance to Environmental Sensitive Areas.

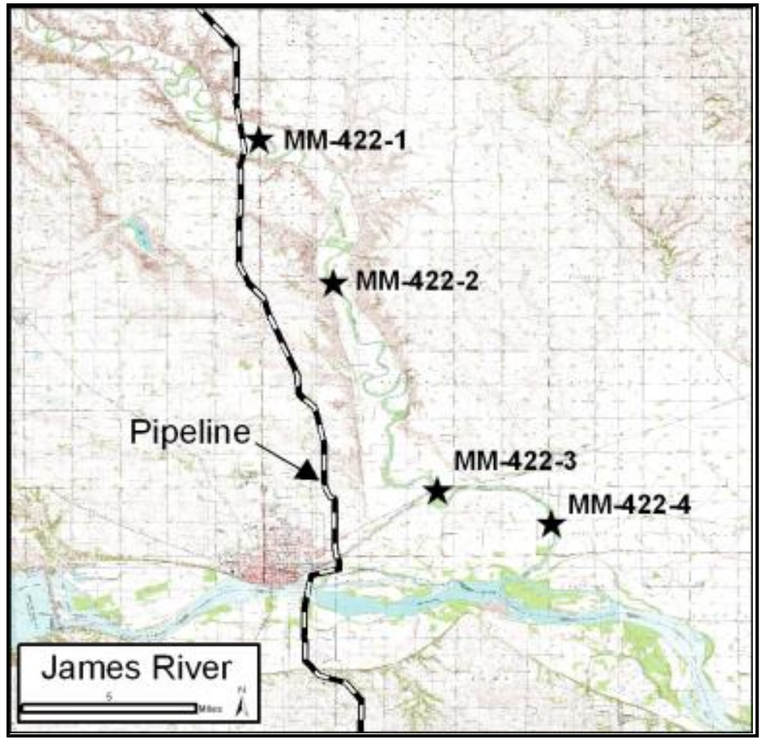
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

11 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-422-1 James River
Nearest City: Yankton, South Dakota

Latitude/Longitude: 40° 03' 25" N, 97° 23' 57" W	Landowner: ,
Upstream CP: Pipeline	Phone:
Downstream CP: MM-422-2	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	10
18" Containment Boom	4,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	2
Response Boat - Jon Boat	2
Roll-Off Boxes	1

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Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy containment/deflection boom to prevent oil from progressing further.

Deploy waterborne Skimmer assests for J, V, U shape collection of free floating oil.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

TBD

Access to Area:

From Yankton, SD, travel 10 miles North on Hwy 81. Access is boat launch on left just before the James River Bridge.

Location of Staging Area / Boat Launch:

Establish Small 20' X 20' Staging Area for Supplies near road.

Access to primitive boat launch at control point.

Description of Watercourse:

River is 145' wide at this point, average speed is 2-3 knots, depth 10'-15', depending on flooding conditions.

Bank Characteristics:

Both banks are muddy with heavy vegetation.

Boat launch leading to waterway.

Environmental Sensitivities:

Distance to High Population Area and Environmental Sensitive Areas downstream.

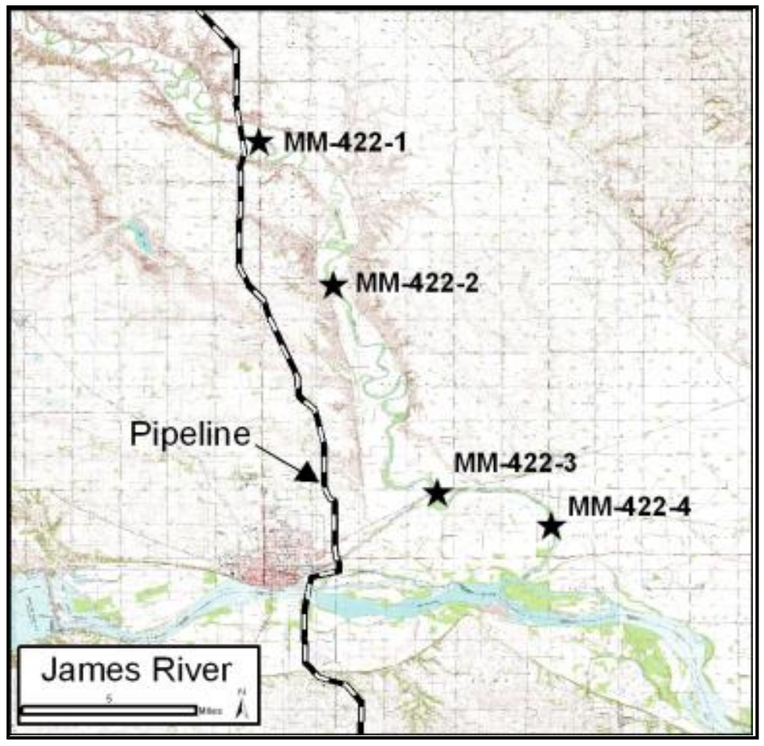
Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Management Guide.

Comments:

Annual flooding can prevent access to this Tactical Control Point.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-422-2 James River
Nearest City: Yankton, South Dakota

Latitude/Longitude: 42° 59' 45" N, 97° 22' 06" W	Landowner: ,
Upstream CP: MM-422-1	Phone:
Downstream CP: MM-422-3	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	10
18" Containment Boom	4,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	2
Response Boat - Jon Boat	2
Roll-Off Boxes	1

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RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Hand deploy deflection boom from bank using bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

TBD

Access to Area:

From Yankton, SD, travel 6 miles North on Hwy 81. Turn right on 303rd Street. Head East on 303rd 1.4 miles to bridge.

Location of Staging Area / Boat Launch:

Staging Area for Supplies will need to be set up away from control point.

Access boat launch upstream at control point 422-1.

Description of Watercourse:

River is 140' wide at this point, average speed is 2-3 knots, depth 10'-15', depending on flooding conditions.

Bank Characteristics:

Both banks are muddy with heavy vegetation.

Sloping banks lead to waterway.

Environmental Sensitivities:

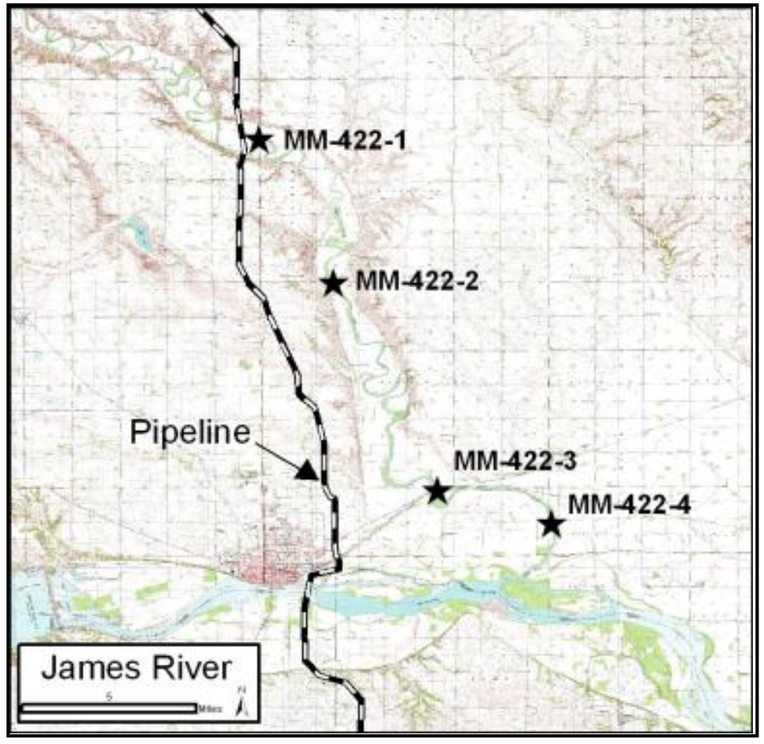
Distance to High Population Area and Environmental Sensitive Areas downstream.

Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Management Guide.

Comments:

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-422-3 James River
Nearest City: Yankton, South Dakota

Latitude/Longitude: 42° 54' 28" N, 97° 19' 30" W	Landowner: ,
Upstream CP: MM-422-2	Phone:
Downstream CP: MM-422-4	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	10
18" Containment Boom	4,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	2
Response Boat - Jon Boat	2
Roll-Off Boxes	1

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818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

TBD

Access to Area:

From Yankton, SD, travel 3 miles East on Co Rd 336. Approx 0.2 miles West of the bridge there is primitive road access that provides foot access to bank.

Location of Staging Area / Boat Launch:

Establish Small 20' X 20' Staging Area for Supplies near road.

Boat must be hand carried to water.

Description of Watercourse:

River is 225' wide at this point, average speed is 2-3 knots, depth 12'-15', depending on flooding conditions.

Bank Characteristics:

Both banks are muddy with heavy vegetation. Some cleared area to work on West bank. Rocks and riprap may be submerged during flood levels.

Boat must be hand carried to water.

Environmental Sensitivities:

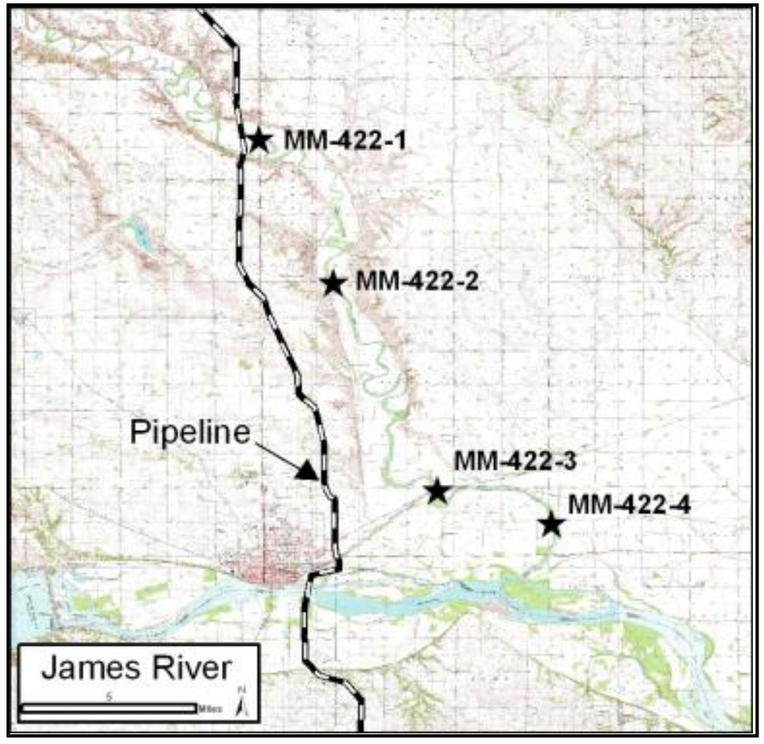
Distance to High Population Area and Environmental Sensitive Areas downstream.

Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Management Guide.

Comments:

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-422-4 James River
Nearest City: Yankton, South Dakota

Latitude/Longitude: 42° 52' 49" N, 97° 16' 40" W	Landowner: ,
Upstream CP: MM-422-3	Phone:
Downstream CP: MM-435-1	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	10
18" Containment Boom	4,000'
Response Trailer	1
Skimming System - Drum	1
Vacuum Truck	2
Response Boat - Jon Boat	2
Roll-Off Boxes	1

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy deflection boom from bank upcurrent of bridge, angle dependent river current speed.

Use land based oil recovery systems as needed.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

TBD

Access to Area:

From Yankton, SD, travel 5 miles East on Hwy 50 to bridge.

Location of Staging Area / Boat Launch:

Establish Small 20' X 20' Staging Area for Supplies in median of Hwy.

Access to boat launch at control point 422-1. No boat access at this control point.

Description of Watercourse:

River is 225' wide at this point, average speed is 2-3 knots, depth 12'-15', depending on flooding conditions.

Bank Characteristics:

Both banks are rocky with mud and riprap.

Rocks and riprap will be submerged during flood levels.

Environmental Sensitivities:

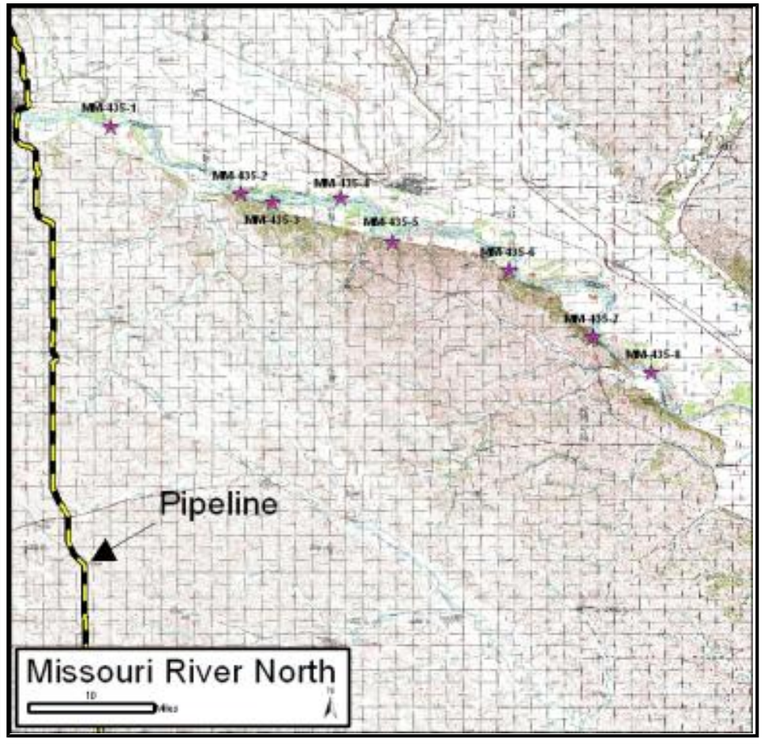
Distance to High Population Area and Environmental Sensitive Areas downstream.

Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Management Guide.

Comments:

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.



INFORMATION

Location/Site:MM-435-2 Missouri River (North)
Nearest City: Wynot, Nebraska

Latitude/Longitude: 42° 46' 19" N, 97° 7' 17" W	Landowner: Clay County Vermillion, SD
Upstream CP: CP1	Phone: 605-677-7185
Downstream CP: CP3	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	20
18" Containment Boom	8,000'
Response Trailer	2
Skimming System - Drum	2
Skimming System - Boat	1
Vacuum Truck	2
Response Boat	5
Roll-Off Boxes	2
Frak Tank	1

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy containment/deflection boom to prevent oil from progressing further.

Deploy waterborne Skimmer assests for J, V, U shape collection of free floating oil.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Take Hwy. 81 South from Yankton, South Dakota, turn left on Hwy. 50, turn right on 454th St. to the Myron Grove boat ramp.

Location of Staging Area / Boat Launch:

Establish Staging Area as needed, large area available.

Boat ramp available.

Description of Watercourse:

Large meandering river with high silt content and at least 6 distict habitats. General river flow is Southeast. At this location the river ranges from approximetly 800-2000 ft. wide, with a depth ranging from 10-45 ft., and a current of 3-10 knots dependin

Bank Characteristics:

North and South bank are generall gently sloping with low vegetation and trees, areas of riprap.

Areas along the southern bank have eroding river banks with occasional bluffs (e.g. due South of the boat ramp). Numerous sand bars and islands can be found on the river. CP2 is located West of the Goat Island.

Environmental Sensitivities:

Critical distance to population center.

Critical distance to Intakes and Environmental Sensitive Areas.

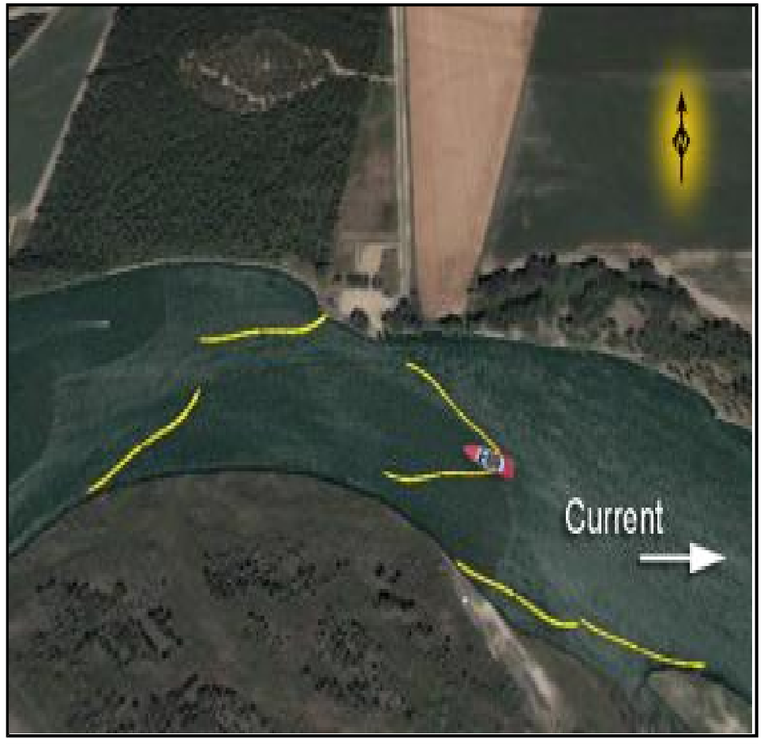
Decontamination Areas:

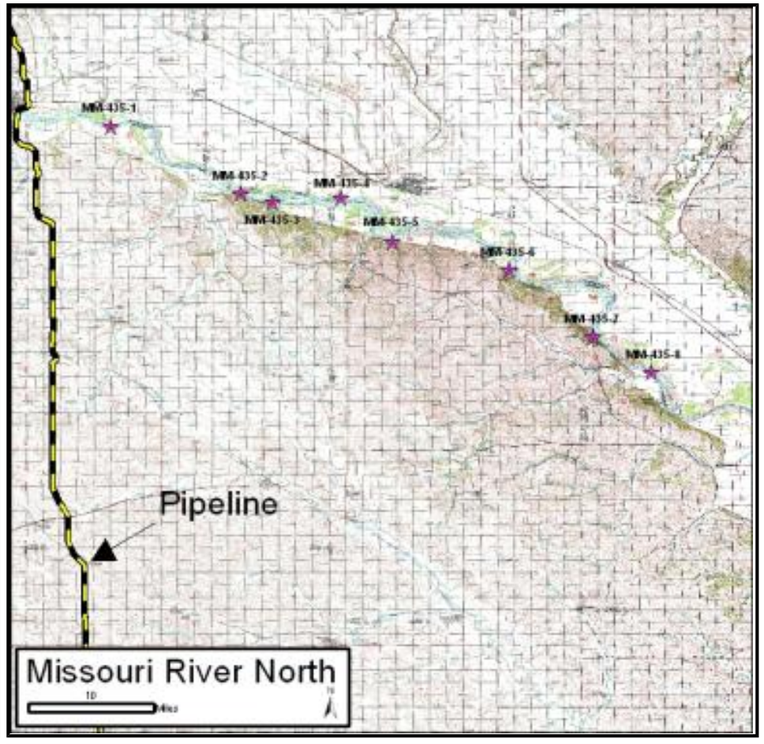
Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

16.5 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.





INFORMATION

Location/Site:MM-435-4 Missouri River (North)
Nearest City: Vermillion, South Dakota

Latitude/Longitude: 42° 45' 58" N, 97° 0' 13" W	Landowner: Clay County Vermillion, SD
Upstream CP: CP3	Phone: 605-677-7185
Downstream CP: CP5	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	20
18" Containment Boom	8,000'
Response Trailer	2
Skimming System - Drum	2
Skimming System - Boat	1
Vacuum Truck	2
Response Boat	5
Roll-Off Boxes	2
Frak Tank	1

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy containment/deflection boom to prevent oil from progressing further.

Deploy waterborne Skimmer assests for J, V, U shape collection of free floating oil.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

Take Hwy. 81 South from Yankton, SD, turn left on Hwy. 50, turn right on 460th Ave. and continue to the Clay County Park.

Location of Staging Area / Boat Launch:

Establish Staging Area as needed, large area available.

Boat ramp available.

Description of Watercourse:

Large meandering river with a high silt content and at least 6 distinct habitats. Flow is Southeast, estimated 500-1500 ft. wide, with a depth ranging from 10-45 ft. and a current of 3-10 knots.

Bank Characteristics:

North and South bank are general gently sloping with low vegetation and trees, areas of riprap.

Depending on the current, there may be eroding river banks with occasional bluffs. Numerous sand bars and islands can be found along the river.

Environmental Sensitivities:

Critical distance to population center. Critical distance to Intakes and Environmental Sensitive Areas.

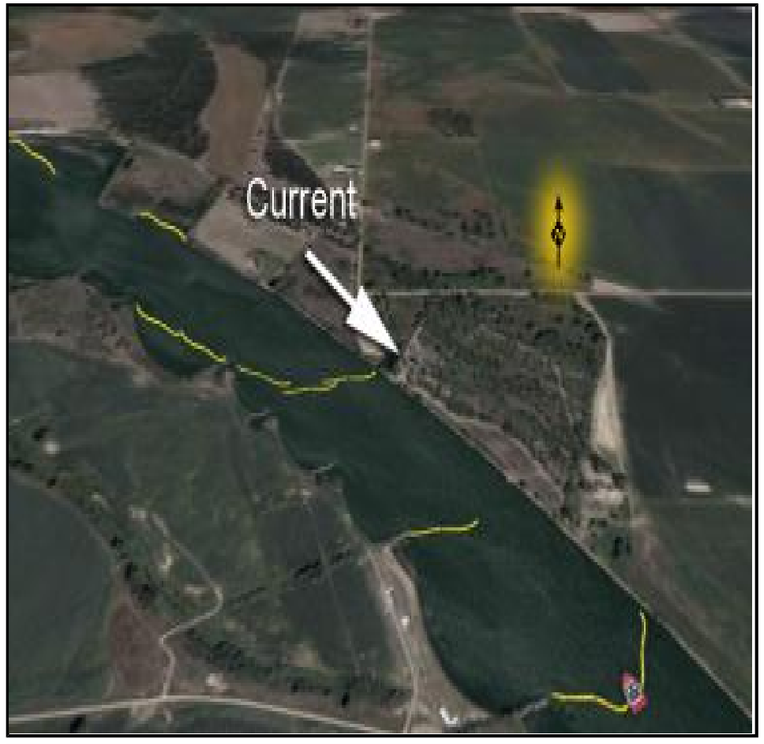
Decontamination Areas:

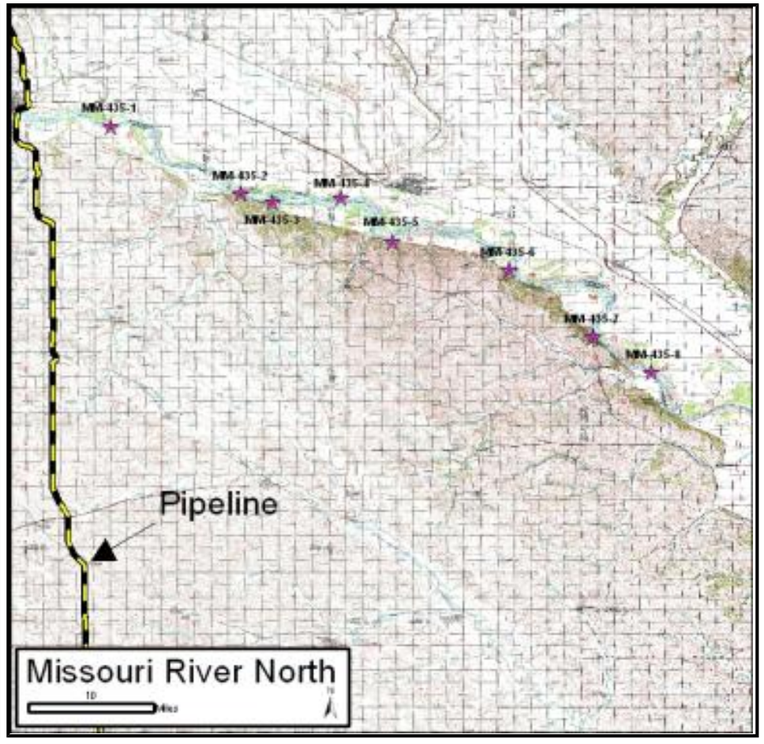
Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

22.75 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.





INFORMATION

Location/Site:MM-435-8 Missouri River (North)
Nearest City: Ponca, Nebraska

Latitude/Longitude: 42° 33' 36" N, 96° 38' 41" W	Landowner: Union County Elk Point, SD Phone: 605-356-2679
Upstream CP: CP7	
Downstream CP: N/A	

EQUIPMENT AND PERSONNEL

Equipment/Personnel	Quantity
Personnel	20
18" Containment Boom	8,000'
Response Trailer	2
Skimming System - Drum	2
Skimming System - Boat	1
Vacuum Truck	2
Response Boat	5
Roll-Off Boxes	2
Frak Tank	1

O' Brien's Response Management Inc.
818 Town and Country Blvd., Houston, TX 77024
Phone 281-320-9796 http://www.obriensrm.com

RESPONSE OBJECTIVES

Establish perimeter to control access.

Establish Staging Area and Personnel DECON.

Deploy containment/deflection boom to prevent oil from progressing further.

Deploy waterborne Skimmer assests for J, V, U shape collection of free floating oil.

SAFETY

Develop a Site Safety Plan, brief all response personnel accordingly before and after the shifts.

Require the wearing of Personal Floatation Device (PFD) within 6' of the water's edge.

When Air and Water temperatures collectively are equal or less then 100 degrees Fahrenheit, Cold Weather Gear shall be worn.

RESPONSE STRATEGY

Nearest Response Equipment:

To Be Determined.

Access to Area:

From Sioux City, travel North/West 12.5 miles on Interstate 29, exit Jefferson. Head West 3.5 miles on 330th St., turn South onto 478th Ave. to river.

Location of Staging Area / Boat Launch:

Establish Staging Area as needed, large area available.

Boat ramp available.

Description of Watercourse:

Large meandering river with a high silt content and at least 6 distinct habitats. Flow is southeast, estimated 1200-3000ft wide, with a depth ranging from 10-45ft and a current of 3-10 knots.

Bank Characteristics:

North and South bank are general gently sloping with low vegetation and trees, areas of riprap.

Depending on the current, there may be eroding river banks with occasional bluffs. Numerous sand bars and islands can be found along the river.

Environmental Sensitivities:

Critical distance to population center.

Critical distance to Intakes and Environmental Sensitive Areas.

Decontamination Areas:

Establish Small 10' X 10' Personnel DECON next to Staging Area per Spill Mangement Guide.

Comments:

50.25 miles downstream from pipeline.

Note: This Tactical Control Plan is provided as a general guidance tool for response to an incident emanating from this location. The selection of response strategy equipment, manpower and deployment site may vary based on actual field conditions (e.g. terrain, weather conditions, product type/volume) and incident details.

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DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

April 8, 2009

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
503 South Pierre Street
P.O. Box 160
Pierre, SD 57501

Subject: TransCanada Keystone Emergency Response Plan

Dear Mr. Koenecke,

On April 7, 2009, the department received the Emergency Response Plan for the Keystone Pipeline System. I am returning the document to you because the department does not have the authority to hold it confidential as you requested. Any application for department approval under SDCL 34A-18 is considered public record and cannot be held confidential. To discuss this issue further, contact Roxanne Giedd with the Office of the Attorney General at 605.773.3215 or Joe Nadenicek, DENR Staff Attorney, at 605.773.3151 or feel free to contact me at 605.773.3296 to arrange a meeting with the department's attorneys.

Sincerely,

Brian J. Walsh
Hydrology Specialist
Ground Water Quality Program

Enclosure (1)

cc: Roxanne Giedd, Office of the Attorney General, Pierre SD (w/o enclosure)
Joe Nadenicek, DENR, Pierre SD (w/o enclosure)

Walsh, Brian

From: Walsh, Brian
Sent: Thursday, August 27, 2009 4:43 PM
To: Brett Koenecke (koenecke@magt.com)
Cc: Walsh, Brian
Subject: Emergency Response Plan - Clarification Questions

Brett,

I am working on my review of the Keystone Emergency Response Plan and I have a question concerning the location of the pipeline worst case discharge for response zone 3 (page 11 of Appendix B). Under the description it states the location as 29,400 feet downstream of **Valve MP 4324**. I cannot find this milepost in ND, SD or NE. I think it is possible it should be MP 432.4 which would be a valve near Yankton, SD. If possible, could you please look into this and let me know the correct location for the pipeline worst case discharge in response zone 3?

Thanks for your help!

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

==========

Walsh, Brian

From: Brett Koenecke [Brett@MAGT.COM]
Sent: Thursday, August 27, 2009 10:02 PM
To: Walsh, Brian
Subject: FW: Emergency Response Plan - Clarification Questions - RESPONSE

fyi

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
P.O. Box 160
503 S. Pierre Street
Pierre, SD 57501
(605) 224-8803

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From: Meera Kothari [mailto:meera_kothari@transcanada.com]
Sent: Thursday, August 27, 2009 6:05 PM
To: Brett Koenecke; Jim White
Cc: John Hayes
Subject: RE: Emergency Response Plan - Clarification Questions - RESPONSE

The valve is located at MP 432.4. It is the 7.5 mi valve upstream of the Missouri River Yankton SD.

From: Brett Koenecke [mailto:Brett@MAGT.COM]
Sent: Thursday, August 27, 2009 3:45 PM
To: Meera Kothari
Cc: Jim White
Subject: FW: Emergency Response Plan - Clarification Questions

Meera, can you help us with this or get it to someone who can?

Thank you.

BK

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
P.O. Box 160
503 S. Pierre Street
Pierre, SD 57501
(605) 224-8803

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From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Thursday, August 27, 2009 4:43 PM
To: Brett Koenecke
Cc: Brian.Walsh@state.sd.us
Subject: Emergency Response Plan - Clarification Questions

Brett,

I am working on my review of the Keystone Emergency Response Plan and I have a question concerning the location of the pipeline worst case discharge for response zone 3 (page 11 of Appendix B). Under the description it states the location as 29,400 feet downstream of **Valve MP 4324**. I cannot find this milepost in ND, SD or NE. I think it is possible it should be MP 432.4 which would be a valve near Yankton, SD. If possible, could you please look into this and let me know the correct location for the pipeline worst case discharge in response zone 3?

Thanks for your help!

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

==========

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DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

September 4, 2009

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
503 South Pierre Street
PO Box 160
Pierre, SD 57501

Subject: Transcanada / Keystone Emergency Response Plan

Dear Mr. Koenecke,

Pursuant to South Dakota Codified Law 34A-18-2, the department is reviewing TransCanada / Keystone's Emergency Response Plan. In order to complete the review, the department requires the submittal of the following information:

- SDCL 34A-18-2 (3) states the plan must include the name, address and telephone number of the oil spill response organization. The mailing address for the oil spill response organization, National Response Corporation, was not readily identifiable in the plan. Please submit a page insert identifying the appropriate mailing address for National Response Corporation for inclusion in Section 2.0 of the final plan.

- In accordance with SDCL 34A-18-7, the department should be included in the list of agencies to be notified of plan modifications as described in Section 1.4, under the sub-heading "*Agency Revision Requirements*". Please make this change and submit a replacement page for inclusion in the final plan.

- Please submit a replacement page for page 11 in Appendix B with the correct valve milepost location for the worst-case discharge. The department understands the correct valve location is Valve MP 432.4 not Valve MP 4324.

- Although the plan provides substantial information about response activities and resources, the information is not South Dakota specific. To help the department understand Transcanada's response capabilities specific to South Dakota please submit a supplement to the plan containing the following information: description and location of company owned response equipment in South Dakota, description and location of the oil spill response organization's response resources in South Dakota including South Dakota based sub-contractors if applicable, and a description of anticipated spill response times for spills in South Dakota.

If you have any questions or comments concerning this letter, please feel free to contact me at 605.773.3296 or Brian.Walsh@state.sd.us.

Sincerely,

Brian J. Walsh
Hydrology Specialist
Ground Water Quality Program

Walsh, Brian

From: Brett Koenecke [Brett@MAGT.COM]
Sent: Sunday, November 01, 2009 3:56 PM
To: Walsh, Brian
Cc: John Hayes; Jim White
Subject: Keystone ERP

Brian,

The Keystone Emergency Response Plan has been updated to address deficiencies noted in the SD Department of Environment and Natural Resources letter dated September 4, 2009. The deficiencies identified and resulting changes to the Plan are summarized below. The attachment shows the changed pages for your use.

1. "SDCL 34A-18-2 (3) states the plan must include the name, address and telephone number of the oil spill response organization. The mailing address for the oil spill response organization, National Response Corporation, was not readily identifiable in the plan. Please submit a page insert identifying the appropriate mailing address for National Response Corporation for inclusion in Section 2.0 or the final plan."

   Modification has been in Section 2.0 to comply with SDCL 34A-18-2 (3) as requested and the mailing address of the National Response Corporation has been included.

2. "In accordance with SDCL 34A-18-7, the department should be included in the list agencies to be notified of plan modifications as described in Section 1.4, under the sub-heading *"Agency Revision Requirements"*. Please make this change and submit a replacement page inclusion in the final plan."

   The South Dakota Department of Environment and Natural Resources has been added to Section 1.4 "Agency Revision Requirements" per SDCL 34A-18-7.

3. "Please submit a replacement page for page 11 in Appendix B with the correct valve milepost location for the worst-case discharge. The department understands the correct valve location is Valve MP 432.4 not Valve MP 4324."

   Page 11 in Appendix B has been corrected to reflect the accurate Valve MP 432.4.

4. "Although the plan provides substantial information about response activities and resources, the information is not South Dakota specific. To help the department understand TransCanada's response capabilities specific to South Dakota please submit a supplement to the plan containing the following information: description and location of company owned response equipment in South Dakota, description and location of the oil spill response organization's response resources in South Dakota including South Dakota based sub-contractors if applicable, and a description of anticipated spill response times for spills in South Dakota."

   An operator's "South Dakota Supplemental Emergency Response and Equipment Statement" has been added to Appendix F. Based on the criteria presented in the above referenced letter from the SD DENR, appropriate attention has been given to satisfy both the letter and spirit of the law in regards to specific South Dakota requirements.

I trust this meets your requirements. If not, please do let me know right away. If you desire this sent by US Mail rather than email, let me know that also. Thank you.

BK

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
P.O. Box 160
503 S. Pierre Street
Pierre, SD 57501
(605) 224-8803

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Walsh, Brian

From: Robert Latimer [Rob_Latimer@transcanada.com]
Sent: Thursday, December 10, 2009 7:04 AM
To: Walsh, Brian; John Hayes
Cc: koenecke@magt.com
Subject: RE: Keystone/KXL Emergency Response items

Brian, please accept my apologies for the delay in getting you the information that John Hayes had reference in early Nov.

John indeed had asked me to get you the information and it was me that dropped the ball.

I have an overnight package in the mail today (9th) that you should receive the 10th.

The information / materials you will receive will include:

1. 3 sets (10 each) of our Keystone specific external brochures for respective audiences:
   a. Excavators
   b. Emergency Officials (fold out brochure – double sided with MSDS, etc.)
   c. Affected Publics and Public Officials - Part of Your Community
2. 1 Copy of our typical Emergency Information Binder (E.I.B.) Controlled copy #237 containing an overview of the following information:
   a. Emerg. Officials Brochure
   b. MSDS
   c. Keystone Regional Contacts
   d. Mapping information including (Federal National Pipeline Mapping System, Overall System map, General System maps for SD)
   e. One Call information
3. Additional copies (10 each) of General system maps for SD (Map sheets 3, 4, 5)
4. 10 copies of our 2010 Pipeline Safety Calendar for landowners / tenants and Emergency Officials along our system
5. 1 blue TransCanada Keystone Pipelines "Emergency Folder" that we used up and down our system to package above materials in and hand out at State Pipeline Assoc. meetings.

When you've had a chance to review, I'll follow-up with you and review how we have typically used each examples of these materials and answer any questions you might have on such.

Regards,

Rob Latimer SR/WA
Land & Community Relations Specialist
TransCanada Keystone US Operations
Omaha NE
Voice: 402.492.7454
Cell: 402.332.8122

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Tuesday, December 08, 2009 8:20 PM
To: John Hayes
Cc: koenecke@magt.com; Robert Latimer; Brian.Walsh@state.sd.us
Subject: RE: Keystone/KXL Emergency Response items

John, thanks for the update - I'll keep an eye out for the information from Robert.

Robert - I am out of the office on 12/9 but will be in on Thursday and Friday if you need to get a hold of me.

Brian Walsh
605.773.3296

From: John Hayes [mailto:john_hayes@transcanada.com]
Sent: Tue 12/8/2009 6:07 PM
To: Walsh, Brian
Cc: koenecke@magt.com; Robert Latimer
Subject: RE: Keystone/KXL Emergency Response items

Brian, I was under the impression that you and Robert Latimer had connected and information was forthcoming only days after we met in Pierre,SD. The intent was for you to receive the information, review it and advise me of any gaps or deficiencies. I had contacted Robert and information is being sent expeditiously. Please email me back after you have taken a look at the information and we will fill in any areas of concern.

Thanks and I look forward to future dialogue.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Tuesday, December 08, 2009 3:44 PM
To: John Hayes
Cc: koenecke@magt.com; Brian.Walsh@state.sd.us
Subject: RE: Keystone/KXL Emergency Response items

John,

I wanted to check with you on the status of the additional information you were putting together concerning the ERP for the Keystone pipeline. Please let me know when you anticipate submitting the information to the department.

Thank you,

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

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-----Original Message-----

From: John Hayes [mailto:john_hayes@transcanada.com]
Sent: Thursday, November 05, 2009 7:26 AM
To: McIntosh, Kim; Markley, Bill; Walsh, Brian
Cc: Brett Koenecke; Jim White; Bill Taylor; woodsfuller.com, james.moore; jrauh@neilpalmerllc.com; Robert Jones; Jim Krause
Subject: Keystone/KXL Emergency Response items

It was a pleasure meeting with you to discuss the Keystone/KXL Emergency Response Program. I trust I answered all of your questions and you were left with a better sense on our program and our commitment to emergency response. With all our programs including our plan, training, equipment, resources, continual improvement and the education of public officials we have made employee and public safety our number one priority.
I appreciated our open and honest dialogue and I look forward to continued strong relationships. I have a few take away items I will address in the next few days.

In the interim, if you have any follow up questions, please do not hesitate to give me a call. I look forward to visiting with you again in the near future.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

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Walsh, Brian

From: Walsh, Brian
Sent: Friday, December 11, 2009 3:30 PM
To: 'Robert Latimer'; John Hayes
Cc: koenecke@magt.com; Walsh, Brian
Subject: RE: Keystone/KXL Emergency Response items

Rob,

Thank you for the information you submitted concerning TransCanada Keystone's emergency response capabilities. Unfortunately, it was not the information we were looking for nor did it address what we had requested from John Hayes during our meeting in November. During our meeting, John presented us with lots of good information about TransCanada Keystone's response capabilities in South Dakota. Based on that, we requested a brief, written description of what would happen during a release event in South Dakota. Basically, we are looking for a narrative describing the sequence of response activities that would occur during a release in South Dakota. Information to be incorporated into the narrative should include, but is not limited to: the notification sequence, contact information the DENR should use to stay in communication during the event, description and role of local TransCanada resources (including local contractors(environmental and yellow steel)), and estimated response times for both local and out-of-state resources.

Please provide the requested information as soon as possible so the department can move forward with it's review of the Keystone Emergency Response plan. If you have any questions, please feel free to contact me.

Thank you,

==========
Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us
==========

-----Original Message-----
From: Robert Latimer [mailto:Rob_Latimer@transcanada.com]
Sent: Thursday, December 10, 2009 7:04 AM
To: Walsh, Brian; John Hayes
Cc: koenecke@magt.com
Subject: RE: Keystone/KXL Emergency Response items

Brian, please accept my apologies for the delay in getting you the information that John Hayes had reference in early Nov.

John indeed had asked me to get you the information and it was me that dropped the ball.

I have an overnight package in the mail today (9th) that you should receive the 10th.

The information / materials you will receive will include:

1. 3 sets (10 each) of our Keystone specific external brochures for respective audiences:
   a. Excavators
   b. Emergency Officials (fold out brochure – double sided with MSDS, etc.)
   c. Affected Publics and Public Officials - Part of Your Community
2. 1 Copy of our typical Emergency Information Binder (E.I.B.) Controlled copy #237 containing an overview of the following information:
   a. Emerg. Officials Brochure
   b. MSDS
   c. Keystone Regional Contacts
   d. Mapping information including (Federal National Pipeline Mapping System, Overall System map, General System maps for SD)
   e. One Call information
3. Additional copies (10 each) of General system maps for SD (Map sheets 3, 4, 5)
4. 10 copies of our 2010 Pipeline Safety Calendar for landowners / tenants and Emergency Officials along our system
5. 1 blue TransCanada Keystone Pipelines "Emergency Folder" that we used up and down our system to package above materials in and hand out at State Pipeline Assoc. meetings.

When you've had a chance to review, I'll follow-up with you and review how we have typically used each examples of these materials and answer any questions you might have on such.

Regards,

Rob Latimer SR/WA
Land & Community Relations Specialist
TransCanada Keystone US Operations
Omaha NE
Voice: 402.492.7454
Cell: 402.332.8122

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Tuesday, December 08, 2009 8:20 PM
To: John Hayes
Cc: koenecke@magt.com; Robert Latimer; Brian.Walsh@state.sd.us
Subject: RE: Keystone/KXL Emergency Response items

John, thanks for the update - I'll keep an eye out for the information from Robert.

Robert - I am out of the office on 12/9 but will be in on Thursday and Friday if you need to get a hold of me.

Brian Walsh
605.773.3296

From: John Hayes [mailto:john_hayes@transcanada.com]
Sent: Tue 12/8/2009 6:07 PM
To: Walsh, Brian
Cc: koenecke@magt.com; Robert Latimer
Subject: RE: Keystone/KXL Emergency Response items

Brian, I was under the impression that you and Robert Latimer had connected and information was forthcoming only days after we met in Pierre,SD. The intent was for you to receive the information, review it and advise me of any gaps or deficiencies. I had contacted Robert and information is being sent expeditiously. Please email me back

after you have taken a look at the information and we will fill in any areas of concern.

Thanks and I look forward to future dialogue.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Tuesday, December 08, 2009 3:44 PM
To: John Hayes
Cc: koenecke@magt.com; Brian.Walsh@state.sd.us
Subject: RE: Keystone/KXL Emergency Response items

John,

I wanted to check with you on the status of the additional information you were putting together concerning the ERP for the Keystone pipeline. Please let me know when you anticipate submitting the information to the department.

Thank you,

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

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Subject: Keystone/KXL Emergency Response items

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Walsh, Brian

From: John Hayes [john_hayes@transcanada.com]

Sent: Monday, December 21, 2009 10:41 AM

To: Walsh, Brian

Cc: Brett Koenecke; Rob Sillner; Jim Krause; Robert Latimer; jrauh@neilpalmerllc.com

Subject: Supplemental Information

Brian, in addition to the material sent to you and your follow-up email, I have prepared a *DRAFT* document that hopefully addresses your questions.

Please contact me if you have any additional questions or comments and we can discuss.

Keystone is committed to excellence in all aspects of our Emergency Response Program and we are pleased work with your agency going forward.

Thank you and enjoy the Holiday Season.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

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Supplemental Information for South Dakota DENR

The document represents supplementary information to the Keystone Pipeline Emergency Response Program and as it applies to procedures for mitigating emergencies resulting from a request from Mr. Brian Walsh, South Dakota DENR. Keystone is committed to a comprehensive approach to emergency management including considering stakeholder comment.

1. Keystone Pipeline

The 2,148-mileKeystone Pipeline will transport crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River and Patoka, Illinois and eventually to Cushing, Oklahoma. The U.S. portion of the project includes construction of approximately 1,379 miles of 30" diameter pipeline and related pump stations.

The Keystone Pipeline will have an initial capacity of 435,000 barrels per day in late 2009 and will be expanded to a nominal capacity of 590,000 barrels per day in late 2010. Keystone has contracts with shippers totaling 495,000 barrels per day with and average term of 18 years.

2. Definition of an Emergency

- The following defines an emergency on the Keystone Pipeline:

  An unforeseen or imminent event which requires:

  - A priority to protect the health, safety and welfare of the public and our employees;
  - Protection of the environment;
  - Minimizing damage to property, company operations and reputation;
  - Efficient coordination of resources including highly trained response personnel; and
  - Prompt communications and notifications.

In all cases, employee and public safety remain the top priority.

3. Keystone Emergency Response Program

A critical aspect of operating the Keystone Pipeline system is to have a comprehensive Emergency Response Program. A key component of the program includes having an Emergency Response Plan. The plan was prepared to achieve a number of goals - ensure regulatory compliance, appropriate for all key stakeholders including field operations, include all emergencies and response measures, timely internal and external notification procedures, and training requirements. In addition, the plan contains information related to worst case discharge, company owned equipment, environmental sensitivities, contract resources and public officials, and tactical control plans.

The Plan will be distributed to key internal and external stakeholders and delivered to TransCanada personnel through a secure internet portal hosted by TransCanada's emergency response provider and preparer of the plan. The plan has been submitted to the National Energy Board in Canada and the United States Department of Transportation's Pipeline and Hazardous Material Safety Administration office. The plan will be updated regularly.

The Keystone Emergency Response Plan combined with a rigorous training program, retention of and access to the industry's most knowledgeable response experts, and a state of the art pipeline integrity and maintenance program make emergency response for the Keystone Pipeline system fully endorsed at all levels within TransCanada.

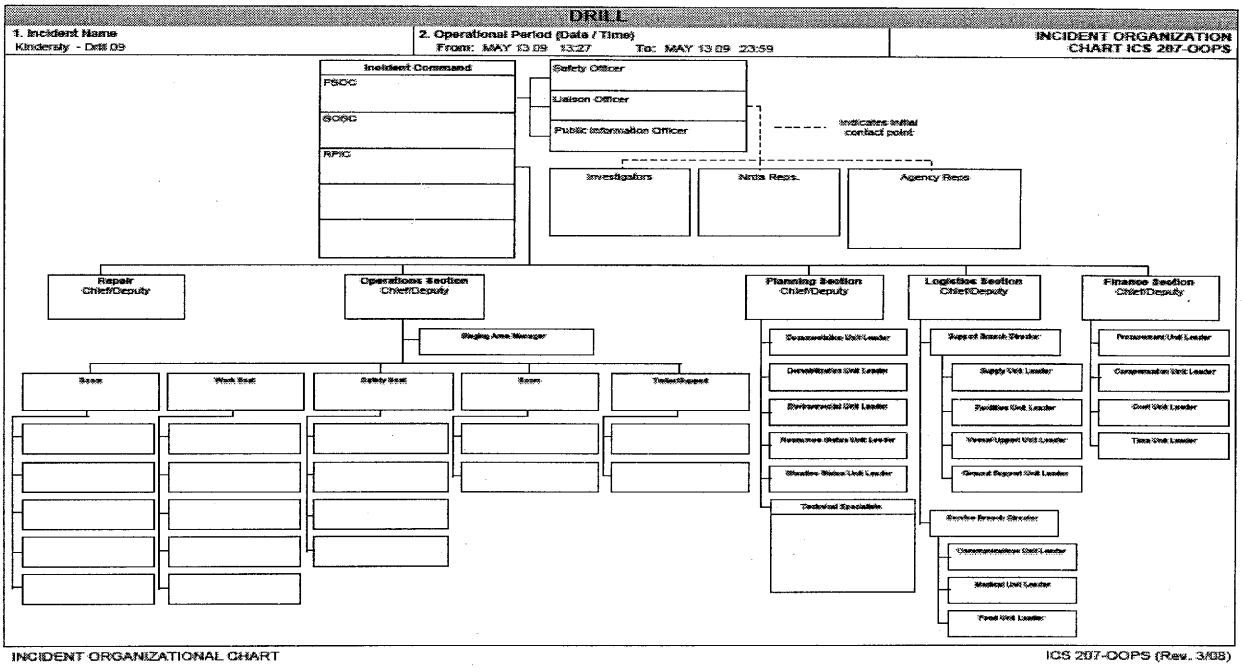
4. Initial Response Actions

Initial response actions are those taken by Keystone on call personnel immediately upon becoming aware of a discharge or emergency incident. Timely implementation of these actions is critical because they can greatly affect the overall response action. Keystone has committed to a **4 Hour response time to secure the site. This means that a Keystone on call employee will be on site in no more than 4 hours to secure the site and ensure employee and public safety.**

Note: The 24 Hour Toll free Numbers for TCPL is 1-800-447-8066

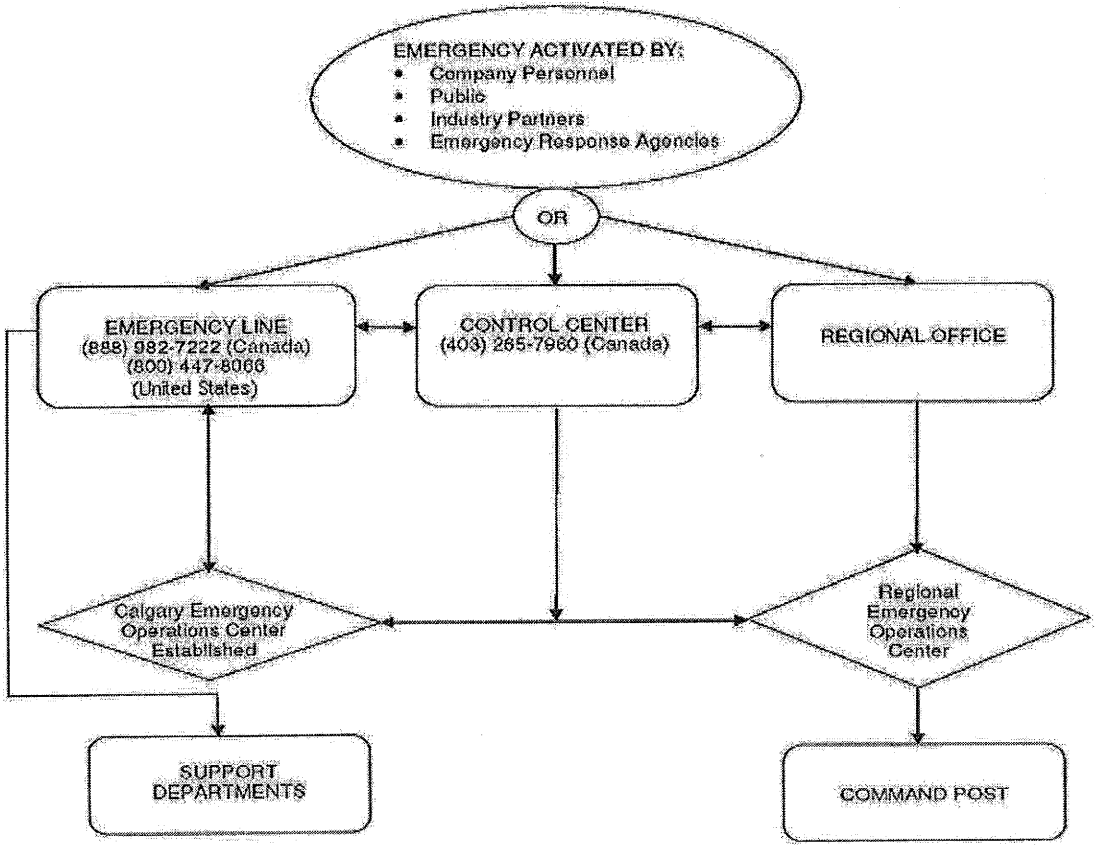
In the event of an incident, the *first person* on site shall:

1. Take appropriate personal protective measures.
2. Secure the site and protect the public.
3. Call for medical assistance (911) if an injury has occurred.
4. Notify Keystone Console and area management an incident has occurred.
5. Eliminate any possible sources of ignition in the vicinity of the spill.
6. Take any necessary fire response actions.
7. Advise personnel and public in the vicinity of the spill of potential threats and or evacuations. This includes contacting the Federal, State and Local emergency response agencies.
8. Identify/isolate the source and minimize lost product.
9. Restrict access to the site as the situation demands.
10. Verify the product types and estimate the quantity released.
11. Direct any media inquires to Company Management.
12. Established the Incident Command System/Unified Command



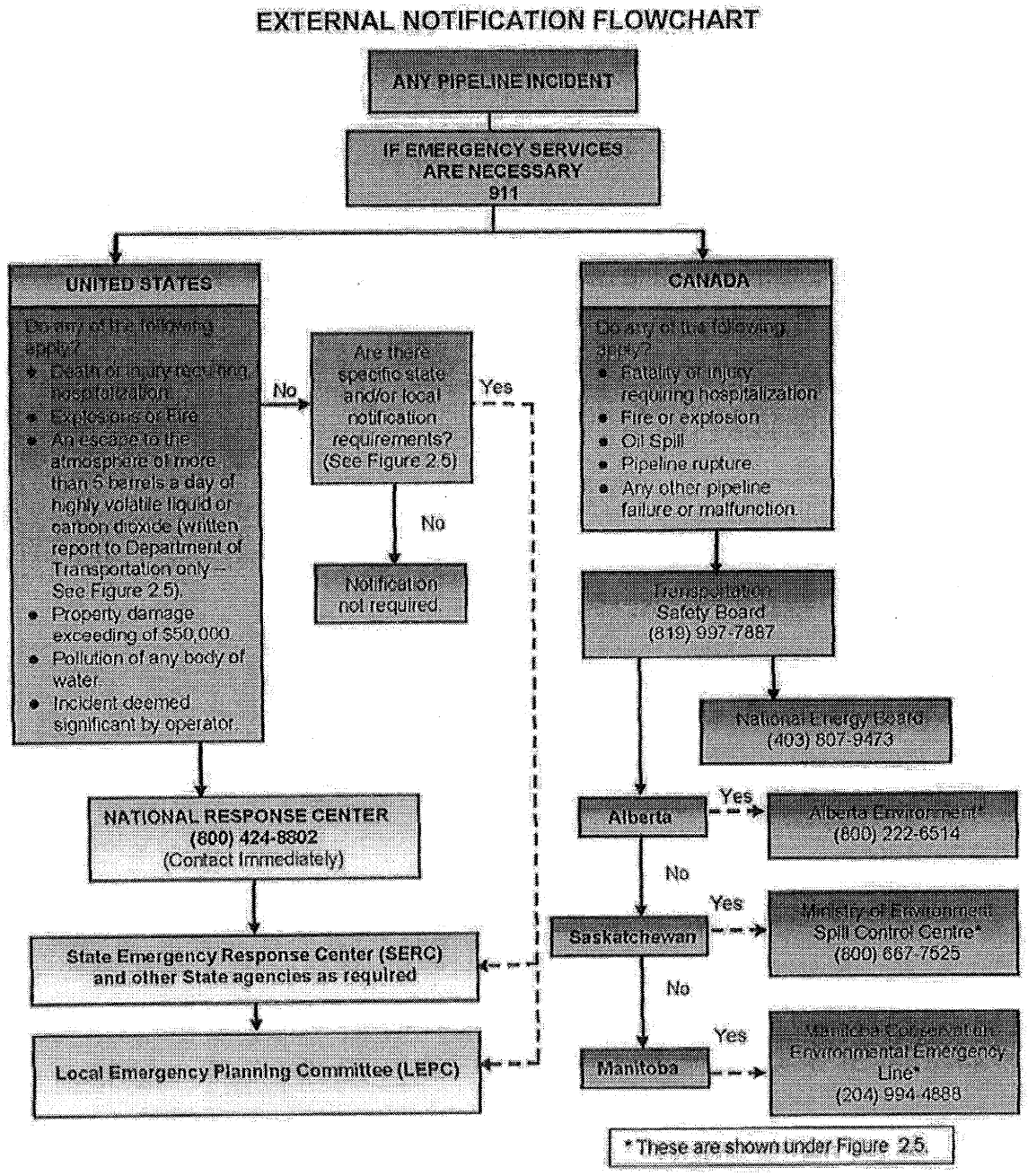
5. Notification and Reporting

Internal Notification Sequence



External Notification

External Notification is the responsibility of Keystone. The Keystone Console has several reporting responsibilities within specified timelines, to regulatory agencies based on certain criteria. The External Notification Flowchart is identified below.



South Dakota Specific Spill/Release Reporting

A responsible party must report the discharge of a regulated substance (petroleum products, pesticides, fertilizer, chemicals, solvents, heavy metals, etc) to the DENR immediately, pursuant to ARSD 74:34:01.

Reportable Quantities

- The discharge may impact surface water or ground water;
- The discharge may endanger human health or safety;
- The discharge exceeds 25 gallons;
- The discharge causes a sheen on water;
- Surface water or ground water standards are exceeded;
- The discharge may threaten wildlife or aquatic life;
- The discharge quantity meets the SARA Title III reportable quantity.

South Dakota Department and Natural Resources (DENR) should be notified during normal business hours at (605) 773-3296. Notification of a release to DENR fulfills the requirement for notification to the State Emergency Response Commission (SERC).

After Hours notification should be made to the Office of Public Safety and State Radio Communications at **(605) 773-3231**. The duty officer for the Office of Public Safety will notify all appropriate state agencies such as DENR, Dept of Transportation, Highway Patrol, Game Fish and Parks, etc. The Duty Officer for the Office of Public Safety will communicate directly with the appropriate County Emergency Manager. The County Emergency Manager is the primary point of contact for the Local Emergency Planning Committee (LEPC). Notification of reportable releases can be made directly to the County Emergency Manager. The Office of Public Safety and DENR maintain a current list of each Emergency Manager and their contact numbers.

6. Incident Command System

The Incident Command System that will be implemented by Keystone is a flexible, scalable, structure that provides standardized processes, procedures, organizational structure and common terminology for incident management and emergency response. The system creates an organized response encompassing all stakeholder and agency concerns. The ICS structure is built around five major response functional areas: Command, Planning, Operations, Logistics, and Finance. If necessary, Keystone will use a Unified Command Structure, when multi-jurisdictional agencies are involved in the response.

During an incident, the South Dakota DENR will be provided with a contact

number that will normally be the Liaison Officer within the Incident Command Structure. Keystone encourages all applicable agencies to become part of Unified Command as soon as practical.

7. Spill Response Resources

Internal Resources

Keystone has highly trained staff strategically situated along the route. All Keystone operations personnel have been trained in Hazwoper, participated in several training drills, completed ICS 100/200 and 300 emergency management programs, Boat and equipment handling courses and Table Top drills. Keystone also has several corporate staff trained and able to occupy several roles in the aforementioned Incident Command structure.

Keystone has purchased equipment and boom trailers that are immediately available to respond to any incident. These custom designed trailers contain over 700 pieces of response equipment and include a Command Post. The trailers are situated in Valley City, ND, Yankton, SD, St. Joseph, MS, and St. Louis, MS.

External Resources

Keystone has retained several industry spill experts to assist in the event of a release from our pipeline. These include:

1) The National Response Corporation that has established a far reaching network of spill responders across the continent including several in South Dakota (once finalized, TransCanada will provide the SD DENR with a list of South Dakota based response contractors) It should be noted that NRC is Keystones identified OSRO and has a significant amount of company owned equipment available to Keystone within 12 hours.

2) The O'Brien's Response Management Company is a world class spill management company that has up to 160 individuals available to assist Keystone in an event of an emergency. These individuals would be immediately dispatched to an event and able to occupy any role and function in an Incident command structure. In addition, this group would assist with immediate Incident Command within one hour while resources are being dispatched to the scene.

3) Keystone has several contracts with pipeline, construction and heavy equipment contractors along its route that are available to assist in primarily land based spills. These contractors have been approved by Keystone for safety using ISN Networld.

4) In addition to the Keystone Emergency response trailers that contain a mobile Command Post, Keystone has identified hotels and facilities along the route to function as a remote Command Post if necessary. Several other external mobile Command Posts have been identified and are anticipated to be on site within 12 hours to relieve or support the company owned Command Post.

8. Conclusion

Keystone Pipeline has developed a comprehensive Emergency Response Program including a plan, equipment, resources, training and public awareness. We are committed to working with local state and federal agencies to ensure stakeholder needs are addressed and understood.

The top priority at any incident remains employee and public safety.

Walsh, Brian

From: Walsh, Brian
Sent: Friday, January 08, 2010 4:56 PM
To: 'John Hayes'
Cc: Brett Koenecke; Rob Sillner; Jim Krause; Robert Latimer; jrauh@neilpalmerllc.com; Walsh, Brian
Subject: RE: Supplemental Information

John,

The department has reviewed the additional information you submitted concerning South Dakota specific emergency response issues and has the following questions / requests. If possible, please incorporate your responses into a finalized version of the document you sent via the 12/21/09 email below. Thanks again for your efforts to prepare this South Dakota specific response document.

Page 2. #4 Initial Response Actions

1) Please include additional information about what "4 Hour response time to **secure** the site" means. The department would like a more specific definition of what "secure" means. For example, does a TransCanada employee or contractor need to be present for the site to be secure? Does secure mean the leak will be stopped and contained? Will cleanup efforts be underway?

2) The narrative states, "the first person on site shall...". Does the list provided apply to the first TransCanada employee or contractor on site or any first responder (i.e. local police or fire)?

3) Please include a more specific description of the anticipated role of the local first responder. The reason for this request is, based on past department experience, it is likely the local first responder will take action (i.e. deploy boom, constructing berms to control product flow, etc..) prior to the arrival of the first TransCanada employee or representative. Because of this, the department would like to know what TransCanada expects from the local first responders.

Page 4. Internal Notification Flow Chart

1) Please prepare and include as South Dakota specific external notification flowchart. To help in this process the attached .pdf file contains the South Dakota release notification requirements.

Sincerely,

==========
Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us
==========

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From: John Hayes [mailto:john_hayes@transcanada.com]
Sent: Monday, December 21, 2009 10:41 AM
To: Walsh, Brian
Cc: Brett Koenecke; Rob Sillner; Jim Krause; Robert Latimer; jrauh@neilpalmerllc.com

Subject: Supplemental Information

Brian, in addition to the material sent to you and your follow-up email, I have prepared a *DRAFT* document that hopefully addresses your questions.

Please contact me if you have any additional questions or comments and we can discuss.

Keystone is committed to excellence in all aspects of our Emergency Response Program and we are pleased work with your agency going forward.

Thank you and enjoy the Holiday Season.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
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Walsh, Brian

From: John Hayes [john_hayes@transcanada.com]
Sent: Thursday, January 14, 2010 12:29 PM
To: Walsh, Brian
Cc: Rob Sillner; Brett@MAGT.COM; Robert Latimer; Jim Krause; Jeff Rauh
Subject: Response to your Request

Brian, please see comments below.

The department has reviewed the additional information you submitted concerning South Dakota specific emergency response issues and has the following questions / requests. If possible, please incorporate your responses into a finalized version of the document you sent via the 12/21/09 email below. Thanks again for your efforts to prepare this South Dakota specific response document.

Page 2. #4 Initial Response Actions

1) Please include additional information about what "4 Hour response time to **secure** the site" means. The department would like a more specific definition of what "secure" means. For example, does a TransCanada employee or contractor need to be present for the site to be secure? Does secure mean the leak will be stopped and contained? Will cleanup efforts be underway? Basically Keystone has committed to have the site secured (roads blocked, notification completed etc within the four hour time frame. I expect we will not take that long in most cases but we have positioned our on –call staff to meet this response time. As we move forward with our Integrated Public Awareness program and educate first responders and public officials, our messaging is clear that we ask them to secure the site and maintain the first priority of public safety. "Secure" means we are protecting the public and employees and in most instances the line will have been stopped by our Oil Control Centre. Some containment may be started by our highly trained staff and contractors, but only if it is safe to do so.

2) The narrative states, "the first person on site shall...". Does the list provided apply to the first TransCanada employee or contractor on site or any first responder (i.e. local police or fire)?It could be any of the three, but in most cases we are confident it will be a TCPL employee. The comments above are applicable to this question as well.

3) Please include a more specific description of the anticipated role of the local first responder. The reason for this request is, based on past department experience, it is likely the local first responder will take action (i.e. deploy boom, constructing berms to control product flow, etc..) prior to the arrival of the first TransCanada employee or representative. Because of this, the department would like to know what TransCanada expects from the local first responders. We only ask First response personnel to secure the site and NOT take any response actions. This is part of our messaging to these groups as noted above. In our information passed on by Rob Latimer it highlights the importance of these responders and the role they can play in a Unified Command for an incident. Again, our priority is employee and public safety and we promte that agressivley through dialogue with allagencies.

Page 4. Internal Notification Flow Chart

1) Please prepare and include as South Dakota specific external notification flowchart. To help in this process the attached .pdf file contains the South Dakota release notification requirements I have included the attached/revised document for your review. I simply reformatted and included your pdf. File into the External Reporting section.

Let me know if you have any final comments.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

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Walsh, Brian

From: Walsh, Brian
Sent: Wednesday, January 20, 2010 3:06 PM
To: 'John Hayes'
Cc: Walsh, Brian
Subject: RE: Response to your Request

John,

The department has reviewed the revised supplemental information document and requests the following two changes be made prior to departmental approval. Once we have received the revised document we will move forward with our approval.

1) In the first paragraph under **#4. Initial Response Actions** delete the last two sentences beginning with "In the event that...." as shown below.

4. Initial Response Actions

Initial response actions are those taken by Keystone on call personnel immediately upon becoming aware of a discharge or emergency incident. Timely implementation of these actions is critical because they can greatly affect the overall response action. Keystone has committed to a **4 Hour response time to secure the site. This means that a Keystone on call employee will be on site in no more than 4 hours to secure the site and ensure employee and public safety.** ~~**In the event that an external responder arrives near the site prior to the Keystone first responder, we ask them NOT to initiate or take any response actions. Simply secure the site and await the arrival of the highly trained Keystone response personnel.**~~

If you would like to discuss the reason for this request please let me know.

2) In Section **#7 Spill Response Resources** make the following addition to #1) under External Resources

1) The National Response Corporation that has established a far reaching network of spill responders across the continent including several in South Dakota (once finalized, TransCanada will provide the SD DENR with a list of the South Dakota based response contractors). It should be noted that NRC is Keystones identified OSRO and has a significant amount of company owned equipment available to Keystone within 12 hours.

Thanks,

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Brian J. Walsh
Hydrology Specialist
SD DENR
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Brian.Walsh@state.sd.us

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Subject: Response to your Request

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Page 2. #4 Initial Response Actions

1) Please include additional information about what "4 Hour response time to **secure** the site" means. The department would like a more specific definition of what "secure" means. For example, does a TransCanada employee or contractor need to be present for the site to be secure? Does secure mean the leak will be stopped and contained? Will cleanup efforts be underway? Basically Keystone has committed to have the site secured (roads blocked, notification completed etc within the four hour time frame. I expect we will not take that long in most cases but we have positioned our on –call staff to meet this response time. As we move forward with our Integrated Public Awareness program and educate first responders and public officials, our messaging is clear that we ask them to secure the site and maintain the first priority of public safety. "Secure" means we are protecting the public and employees and in most instances the line will have been stopped by our Oil Control Centre. Some containment may be started by our highly trained staff and contractors, but only if it is safe to do so.

2) The narrative states, "the first person on site shall...". Does the list provided apply to the first TransCanada employee or contractor on site or any first responder (i.e. local police or fire)?It could be any of the three, but in most cases we are confident it will be a TCPL employee. The comments above are applicable to this question as well.

3) Please include a more specific description of the anticipated role of the local first responder. The reason for this request is, based on past department experience, it is likely the local first responder will take action (i.e. deploy boom, constructing berms to control product flow, etc..) prior to the arrival of the first TransCanada employee or representative. Because of this, the department would like to know what TransCanada expects from the local first responders. We only ask First response personnel to secure the site and NOT take any response actions. This is part of our messaging to these groups as noted above. In our information passed on by Rob Latimer it highlights the importance of these responders and the role they can play in a Unified Command for an incident. Again, our priority is employee and public safety and we promte that agressivley through dialogue with allagencies.

Page 4. Internal Notification Flow Chart

1) Please prepare and include as South Dakota specific external notification flowchart. To help in this process the attached .pdf file contains the South Dakota release notification requirements I have included the attached/revised document for your review. I simply reformatted and included your pdf. File into the External Reporting section.

Let me know if you have any final comments.

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Walsh, Brian

From: John Hayes [john_hayes@transcanada.com]

Sent: Thursday, January 21, 2010 3:18 PM

To: Walsh, Brian

Cc: Rob Sillner; Brett@MAGT.COM; Robert Latimer; Jeff Rauh; Jim Krause

Brian, thanks for the voice mail and follow-up email with your departments final two concerns. I have made the changes and attached the final draft. Thanks again for your feedback and participation and we will get back to you on our listing of NRC contractors once finalized.

I look forward to seeing you in March if not sooner.

Thanks again,

John W Hayes
Operations Manager
Keystone Pipeline Project
403-920-6467-office
403-461-9245-cell
403-920-2325-fax
email-john_hayes@transcanada.com

This electronic message and any attached documents are intended only for the named addressee (s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Supplemental Information for South Dakota DENR

The document represents supplementary information to the Keystone Pipeline Emergency Response Program and as it applies to procedures for mitigating emergencies resulting from a request from Mr. Brian Walsh, South Dakota DENR. Keystone is committed to a comprehensive approach to emergency management including considering stakeholder comment.

1. Keystone Pipeline

The 2,148-mileKeystone Pipeline will transport crude oil from Hardisty, Alberta to U.S. Midwest markets at Wood River and Patoka, Illinois and eventually to Cushing, Oklahoma. The U.S. portion of the project includes construction of approximately 1,379 miles of 30" diameter pipeline and related pump stations.

The Keystone Pipeline will have an initial capacity of 435,000 barrels per day in late 2009 and will be expanded to a nominal capacity of 590,000 barrels per day in late 2010. Keystone has contracts with shippers totaling 495,000 barrels per day with and average term of 18 years.

2. Definition of an Emergency

- The following defines an emergency on the Keystone Pipeline:

  An unforeseen or imminent event which requires:

  - A priority to protect the health, safety and welfare of the public and our employees;
  - Protection of the environment;
  - Minimizing damage to property, company operations and reputation;
  - Efficient coordination of resources including highly trained response personnel; and
  - Prompt communications and notifications.

In all cases, employee and public safety remain the top priority.

3. Keystone Emergency Response Program

A critical aspect of operating the Keystone Pipeline system is to have a comprehensive Emergency Response Program. A key component of the program includes having an Emergency Response Plan. The plan was prepared to achieve a number of goals - ensure regulatory compliance, appropriate for all key stakeholders including field operations, include all emergencies and response measures, timely internal and external notification procedures, and training requirements. In addition, the plan contains information related to worst case discharge, company owned equipment, environmental sensitivities, contract resources and public officials, and tactical control plans.

The Plan will be distributed to key internal and external stakeholders and delivered to TransCanada personnel through a secure internet portal hosted by TransCanada's emergency response provider and preparer of the plan. The plan has been submitted to the National Energy Board in Canada and the United States Department of Transportation's Pipeline and Hazardous Material Safety Administration office. The plan will be updated regularly.

The Keystone Emergency Response Plan combined with a rigorous training program, retention of and access to the industry's most knowledgeable response experts, and a state of the art pipeline integrity and maintenance program make emergency response for the Keystone Pipeline system fully endorsed at all levels within TransCanada.

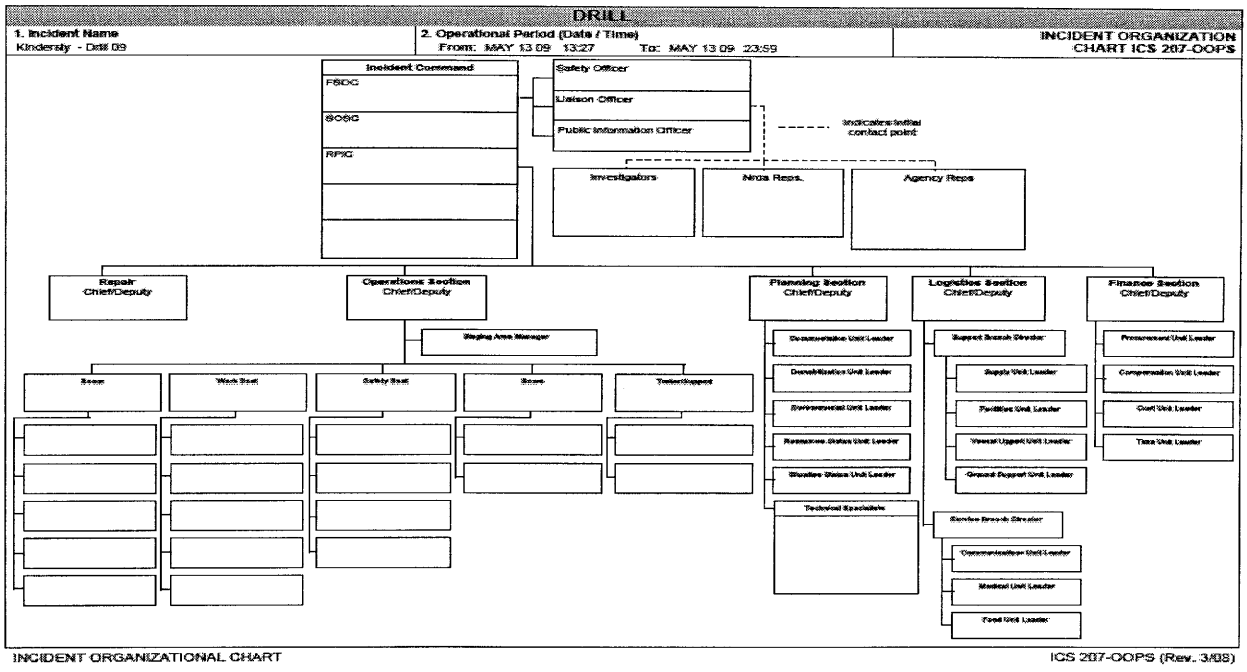
4. Initial Response Actions

Initial response actions are those taken by Keystone on call personnel immediately upon becoming aware of a discharge or emergency incident. Timely implementation of these actions is critical because they can greatly affect the overall response action. Keystone has committed to a **4 Hour response time to secure the site. This means that a Keystone on call employee will be on site in no more than 4 hours to secure the site and ensure employee and public safety.**

Note: The 24 Hour Toll free Numbers for TCPL is 1-800-447-8066

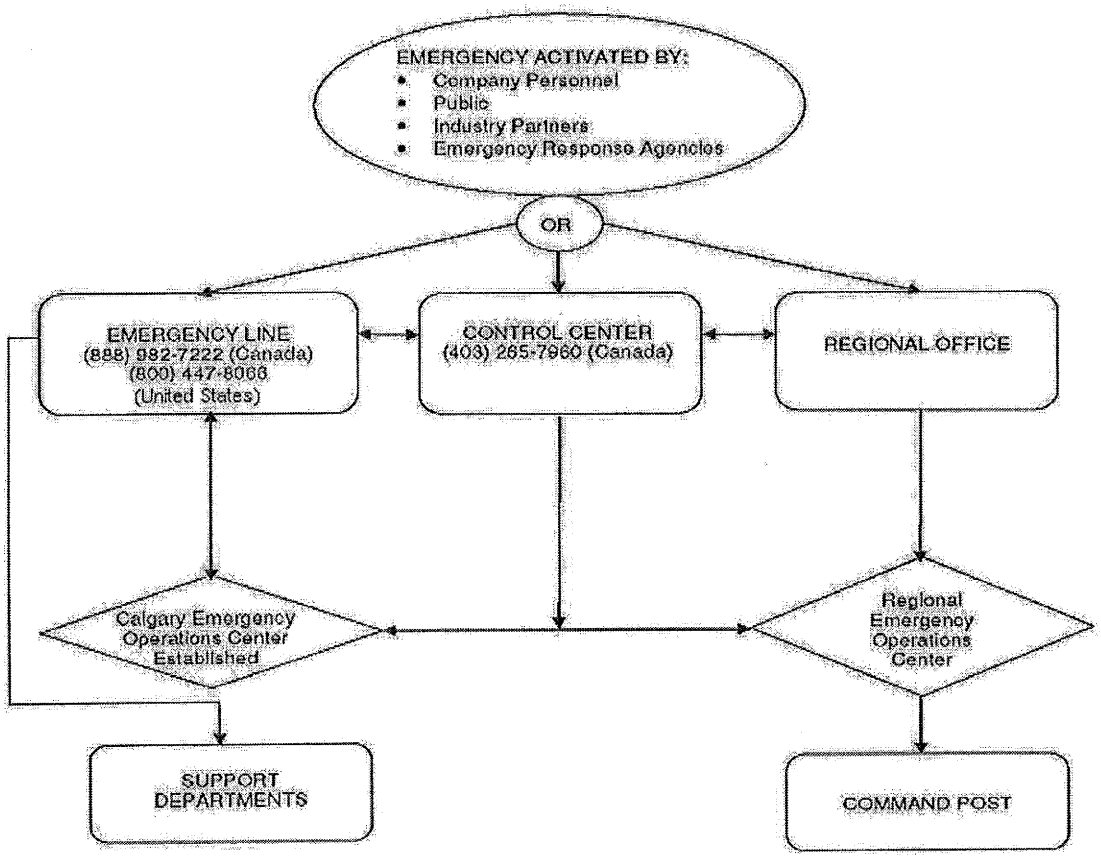
In the event of an incident, the *first person* on site shall:

1. Take appropriate personal protective measures.
2. Secure the site and protect the public.
3. Call for medical assistance (911) if an injury has occurred.
4. Notify Keystone Console and area management an incident has occurred.
5. Eliminate any possible sources of ignition in the vicinity of the spill.
6. Take any necessary fire response actions.
7. Advise personnel and public in the vicinity of the spill of potential threats and or evacuations. This includes contacting the Federal, State and Local emergency response agencies.
8. Identify/isolate the source and minimize lost product.
9. Restrict access to the site as the situation demands.
10. Verify the product types and estimate the quantity released.
11. Direct any media inquires to Company Management.
12. Established the Incident Command System/Unified Command



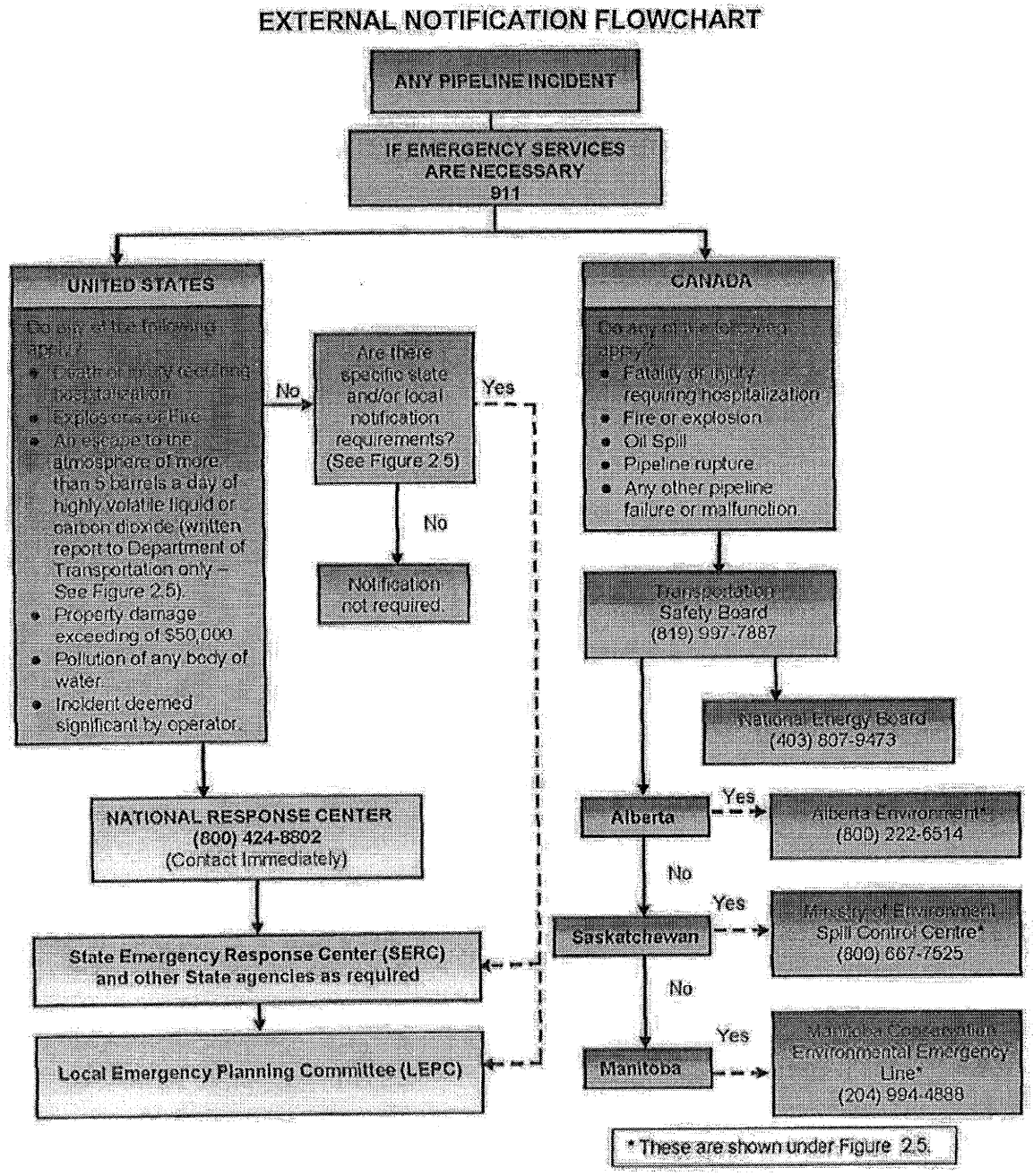
5. Notification and Reporting

Internal Notification Sequence



External Notification

External Notification is the responsibility of Keystone. The Keystone Console has several reporting responsibilities within specified timelines, to regulatory agencies based on certain criteria. The External Notification Flowchart is identified below.



South Dakota Specific Spill/Release Reporting

A responsible party must report the discharge of a regulated substance (petroleum products, pesticides, fertilizer, chemicals, solvents, heavy metals, etc) to the DENR immediately, pursuant to ARSD 74:34:01.

Reportable Quantities

- The discharge may impact surface water or ground water;
- The discharge may endanger human health or safety;
- The discharge exceeds 25 gallons;
- The discharge causes a sheen on water;
- Surface water or ground water standards are exceeded;
- The discharge may threaten wildlife or aquatic life;
- The discharge quantity meets the SARA Title III reportable quantity.

South Dakota Department and Natural Resources (DENR) should be notified during normal business hours at (605) 773-3296. Notification of a release to DENR fulfills the requirement for notification to the State Emergency Response Commission (SERC).

After Hours notification should be made to the Office of Public Safety and State Radio Communications at **(605) 773-3231**. The duty officer for the Office of Public Safety will notify all appropriate state agencies such as DENR, Dept of Transportation, Highway Patrol, Game Fish and Parks, etc. The Duty Officer for the Office of Public Safety will communicate directly with the appropriate County Emergency Manager. The County Emergency Manager is the primary point of contact for the Local Emergency Planning Committee (LEPC). Notification of reportable releases can be made directly to the County Emergency Manager. The Office of Public Safety and DENR maintain a current list of each Emergency Manager and their contact numbers.

6. Incident Command System

The Incident Command System that will be implemented by Keystone is a flexible, scalable, structure that provides standardized processes, procedures, organizational structure and common terminology for incident management and emergency response. The system creates an organized response encompassing all stakeholder and agency concerns. The ICS structure is built around five major response functional areas: Command, Planning, Operations, Logistics, and Finance. If necessary, Keystone will use a Unified Command Structure, when multi-jurisdictional agencies are involved in the response.

During an incident, the South Dakota DENR will be provided with a contact

number that will normally be the Liaison Officer within the Incident Command Structure. Keystone encourages all applicable agencies to become part of Unified Command as soon as practical.

7. Spill Response Resources

Internal Resources

Keystone has highly trained staff strategically situated along the route. All Keystone operations personnel have been trained in Hazwoper, participated in several training drills, completed ICS 100/200 and 300 emergency management programs, Boat and equipment handling courses and Table Top drills. Keystone also has several corporate staff trained and able to occupy several roles in the aforementioned Incident Command structure.

Keystone has purchased equipment and boom trailers that are immediately available to respond to any incident. These custom designed trailers contain over 700 pieces of response equipment and include a Command Post. The trailers are situated in Valley City, ND, Yankton, SD, St. Joseph, MS, and St. Louis, MS.

External Resources

Keystone has retained several industry spill experts to assist in the event of a release from our pipeline. These include:

1) The National Response Corporation that has established a far reaching network of spill responders across the continent including several in South Dakota(once finalized, TransCanada will provide the SD DENR with a list of South Dakota based response contractors) It should be noted that NRC is Keystones identified OSRO and has a significant amount of company owned equipment available to Keystone within 12 hours.

2) The O'Brien's Response Management Company is a world class spill management company that has up to 160 individuals available to assist Keystone in an event of an emergency. These individuals would be immediately dispatched to an event and able to occupy any role and function in an Incident command structure. In addition, this group would assist with immediate Incident Command within one hour while resources are being dispatched to the scene.

3) Keystone has several contracts with pipeline, construction and heavy equipment contractors along its route that are available to assist in primarily land based spills. These contractors have been approved by Keystone for safety using ISN Networld.

4) In addition to the Keystone Emergency response trailers that contain a mobile Command Post, Keystone has identified hotels and facilities along the route to function as a remote Command Post if necessary. Several other external mobile Command Posts have been identified and are anticipated to be on site within 12 hours to relieve or support the company owned Command Post.

8. Conclusion

Keystone Pipeline has developed a comprehensive Emergency Response Program including a plan, equipment, resources, training and public awareness. We are committed to working with local state and federal agencies to ensure stakeholder needs are addressed and understood.

The top priority at any incident remains employee and public safety.

File Copy

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

February 8, 2010

Brett Koenecke
May, Adam, Gerdes & Thompson LLP
503 South Pierre Street
PO Box 160
Pierre, SD 57501

Subject: TransCanada / Keystone Emergency Response Plan

Dear Mr. Koenecke,

TranasCanada submitted the Keystone Pipeline System Emergency Response Plan in accordance with SDCL 34-18-5 and anticipates oil entering South Dakota on or around February 15, 2010. Based on this information, the department reviewed the Emergency Response Plan and Supplemental South Dakota Specific Information and approves the plan in accordance with SDCL 34A-18-2. The plan is approved with the following conditions.

- TransCanada shall conduct, with departmental participation, an oil spill response exercise in South Dakota and, if necessary, refine the Emergency Response Plan based on the lessons learned from the exercise.

- Approval of the Emergency Response Plan does not relieve TransCanada from complying with all state laws and rules applicable to an oil release.

Finally, in regards to the confidentiality of the Emergency Response Plan, the department will notify TransCanada (through Mr. Koenecke) of any request to review the Emergency Response Plan.

If you have any questions or comments concerning this letter, please feel free to contact me at 605.773.3296 or Brian.Walsh@state.sd.us.

Sincerely,

Brian J. Walsh
Hydrology Specialist
Ground Water Quality Program

Walsh, Brian

From: matt_schwarz@fws.gov

Sent: Tuesday, December 07, 2010 2:41 PM

To: Walsh, Brian

Subject: Fw: ACTION BY COB NOV. 30, 2010: Identifying and compiling data/info on significant facilities and DOI trust natural resources especially vulnerable to all hazards response and NRDAR

Hello Brian,

As per our discussion earlier today, I am responding to the subject request and would appreciate any feedback you may provide. I am familiar with the Siouxland sub-area contingency plan (SACP) but forgot to ask you if there are any other SACPs in South Dakota?

Thanks for sending me the link to the 2008 South Dakota Underground Pipeline Task Force report. I would also like to receive an electronic copy of any large facility or pipeline specific Emergency Response Plans. My purpose in obtaining the requested information is to allow for planning in case we are needed to assist with response actions including emergency Endangered Species Act consultations. Let me know if any further information is needed and thanks again for your help.

Matt

Matthew S. Schwarz
Environmental Contaminants Specialist
U.S. Fish and Wildlife Service
South Dakota Field Office
420 South Garfield Avenue, Suite 400
Pierre, South Dakota 57501
605-224-8693 x 232
Fax: 605-224-9974
matt_schwarz@fws.gov

----- Forwarded by Matt Schwarz/R6/FWS/DOI on 12/07/2010 02:25 PM -----

John Wegrzyn/R6/FWS/DOI 10/29/2010 04:31 PM	To Barb Osmundson/R6/FWS/DOI@FWS, Chris Cline/R6/FWS/DOI@FWS, John Miesner/R6/FWS/DOI@FWS, Joy Gober/R6/FWS/DOI@FWS, Karen Nelson/R6/FWS/DOI@FWS, Kevin M Johnson/R6/FWS/DOI@FWS, Kimberly Dickerson/R6/FWS/DOI@FWS, Laura Archuleta/R6/FWS/DOI@FWS, Matt Schwarz/R6/FWS/DOI@FWS, Pedro Ramirez/R6/FWS/DOI@FWS, Rick Krueger/R6/FWS/DOI@FWS, Sherry Skipper/RMA/R6/FWS/DOI@FWS, John Isanhart/R6/FWS/DOI@FWS, Gibran Suleiman/R6/FWS/DOI@FWS, David Rouse/R6/FWS/DOI@FWS, Micah Reuber/R6/FWS/DOI@FWS, Lourdes Mena/R6/FWS/DOI@FWS, Brian C Sanchez/R6/FWS/DOI@FWS cc Pam Repp/R6/FWS/DOI@FWS, Kevin M Johnson/R6/FWS/DOI@FWS Subject ACTION BY COB NOV. 30, 2010: Identifying and compiling data/info on significant facilities and DOI trust natural resources especially vulnerable to all hazards response and NRDAR

Hi, folks. The Deputy RD and ARD-ES are requesting data and information on FWS R6 significant facilities and resource areas that may be especially vulnerable to all hazards response and Natural Resource Damage Assessment and Restoration actions. The point of this info and data collection exercise is to generally determine and inventory where, for example, tank farms, pipelines, commercial, industrial, and other types of facilities or other existing situations may especially pose risks and/or threaten DOI trust natural resources if a significant calamity event occurred. Examples of significant DOI trust natural resources might include migratory birds, T&E species, NWRs, significant wetlands, water bodies, other resource areas and other habitats, etc.

Now the easy way out would be to just say everything across the region is at risk. That's likely true but it doesn't help us anticipate what potential worst case scenarios exist in a practical manner. So, please consider the potentially 3 to 5 worst case scenarios for potential risk relative to most vulnerable trust resources you can envision within your field office's jurisdictional geographical area and submit that info by email to me by COB Tuesday, November 30, 2010. Please copy KJ on your field office submittals. One submittal by each field office facility should be sufficient.

What we will attempt here in the RO will be to compile a regional list of worst case vulnerabilities and assess our potential regional EC response and NRDAR capabilities. (I think you can see that the Gulf oil spill probably has had some effect on raising this issue to prominence and thinking among some of our FWS R6 upper management folks. And I'm hoping that this endeavor on our part could ultimately be beneficial for our R6 EC-related programs.)

I'll compile your info and put together a draft work product (maybe in Excel so it can be further tweaked and re-worked) and then send it back out to you for review/comment before submitting it to the ARD-ES for his consideration. Please contact me if you have questions or if you need additional info from me. Thanks very much for your consideration. ..... j.

John Wegrzyn
U.S. Fish & Wildlife Service - Region 6
Natural Resource Injury / Spills Program Coordinator
Phone: 303.236.4261
Fax: 303.236.0027

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
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JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

August 9, 2013

John McHugh
Vice President Consulting Services
Witt O'Briens
818 Town and Country Blvd.
Suite 200
Houston, TX 77024

Subject: TransCanada's Emergency Response Plan for the Keystone Pipeline System

Dear Mr. McHugh,

Thank you for providing the South Dakota Department of Environment and Natural Resources the opportunity to perform a courtesy review of TransCanada's Emergency Response Plan for the Keystone Pipeline System. Attached for your use are the department's comments regarding the response plan. If you have any questions about these comments please feel free to contact me at 605.773.3296 or brian.walsh@state.sd.us.

Sincerely,

Brian J. Walsh
Environmental Scientist III
Ground Water Quality Program

c. Bob Baumgartner, TransCanada, Houston, TX

South Dakota Department of Environment and Natural Resources Comments on TransCanada's Emergency Response Plan – Keystone Pipeline System July 2013

General Comments:

1. The following comments were prepared as part of a courtesy review of TransCanada's Emergency Response Plan dated July 2013. These comments do not reflect a full regulatory review of the document. DENR expects TransCanada to comply with the requirements of SDCL 34A-18 prior to commencing operation of the Keystone XL pipeline in South Dakota.

Specific Comments:

2. **Section 1.2 – Scope of Plan**. In addition to the regulatory references noted in this section please be aware of South Dakota's laws regarding regulated substance discharges and emergency response plans for crude oil pipelines. These requirements can be found in SDCL 34A-12 and 34A-18.

3. **Section 2.0 – Notifications**. This section does not list any local reporting requirements for South Dakota. If an incident occurs near a South Dakota city the department recommends TransCanada provide that city with a courtesy notification (see comment #17 below).

   In addition, one call to the South Dakota Department of Environment and Natural Resources (DENR) Spills Section is sufficient for all DENR notifications. 605.773.3296 is the appropriate phone number for notifications during business hours and 605.773.3231 is the appropriate phone number for afterhours notifications. DENR recommends noting the distinction between the two numbers in the Emergency Response Plan.

4. **Section 2.0 – Notifications – Page 2-68**. The Ramada in Aberdeen is listed twice on the table shown on page 2-68. Each listing shows the same address and phone number.

5. **Section 3.0 – Response Actions – Page 3-3**. Although DENR understands the response times shown on page 3-3 are prescribed in federal regulations DENR expects TransCanada to respond to releases in South Dakota immediately and deploy the necessary response resources as soon as possible.

6. **Figure 3.1 – Spill Classification**. Based on this figure it appears impacts to water bodies or groundwater are needed to elevate the spill classification to "Major" or "Critical". If a spill is near rural water systems, well head or source water protection areas or drinking water wells DENR recommends elevating the spill classification to "Major" until impacts to the nearby water supply are ruled out. If impacts to the water supply are discovered, the release should be classified as "Critical".

7. **Section 3.0 – Response Actions – Page 3-10**. In the first sentence following “Note:” DENR suggests replacing “right-of-row” with “right-of-way.”

8. **Section 6.1 – Critical Areas to Protect**. It appears the critical areas described in this section are based primarily on wildlife / habitat and vegetation types. DENR recommends TransCanada consider population areas, rural water systems, well head or source water protection areas or proximity to drinking water wells in their criteria for establishing critical areas to protect.

9. **Section 6.5 – Containment and Recovery of Spilled Product – Page 6-6**. The third bullet on this page suggests controlled burning as an effective method to remove product. It is DENR’s opinion this method would likely only remove visual evidence of spilled product and residual contamination may remain in the environment after a burn. If controlled burning was approved in South Dakota, DENR would require additional sampling to confirm residual contamination levels comply with state cleanup requirements.

10. **Section 6.5 – Containment and Recovery of Spilled Product – Pages 6-8 and 6-9**. Two methods of containment are discussed on these pages (underflow and overflow dams). It appears the first paragraph on page 6-9 addresses underflow dams and should be placed under the bullet titled “Underflow dam” on page 6-8.

11. **Section 6.7 – Alternative Response Strategies**. In South Dakota, in addition to approval from the Federal On-Scene Coordinator alternative response strategies would also need to be approved by DENR.

12. **Section 6.7 – Alternative Response Strategies – Page 6-20**. Regarding dispersants, because dispersants only break up the oil and spread it throughout the water column DENR would not necessarily consider dispersant as a final cleanup action. If DENR approves the use of dispersants additional sampling would be required to confirm residual contamination levels comply with state cleanup requirements.

13. **Appendix A – A.1 Company Owned Response Equipment**. This section indicates there is a response/equipment trailer located in Brookings, South Dakota. However, later in Appendix A (starting on page A-9) where U.S. equipment is listed there is no equipment listed in Brookings, South Dakota. If equipment is located in Brookings, please list it in Appendix A.

14. **Appendix C**. DENR suggests including information in this Appendix on the criteria used to determine when a shut-down is necessary and the length of time it takes to shut-down the pipeline once the shut-down procedure is initiated.

15. **Appendix E – Section E.5 – Waste Disposal**. The last sentence on page E-5 mentions authorizations from the Coast Guard, EPA, and National Energy Board regarding approved waste disposal sites. The list of required approvals should also include the appropriate state regulatory agency with authority over waste disposal in the area of the release.

16. **Appendix F – Section 1.1 (no page number)**. In the title “Supplemental Emergency Response and Equipment Staement” replace “Staement” with “Statement”.

17. **Regulatory Cross Reference**. DENR suggest this section include a regulatory cross reference table for SDCL 34-A-18-2.

18. **Response Zone Annexes – External Notification References – South Dakota**. In the event of a release in South Dakota the primary notification should be to DENR’s Spills Section with the phone numbers provided in comment number 2 above. However, location notifications are important. Upon review of the information listed in this section DENR found that many of phone numbers provided do not match the information available to DENR. DENR recommends TransCanada review this section and confirm the information is correct. As a reference, contact information for County Emergency Managers is available at the following website:

    http://dps.sd.gov/emergency_services/emergency_management/county_emergency_managers_list.aspx.

WITT | O'BRIEN'S

RECEIVED

OCT 29 2013

DEPT. OF ENVIRONMENT &
NATURAL RESOURCES,
GROUND WATER PROGRAM

October 28, 2013

South Dakota Department of Environment and Natural Resources
Groundwater Quality Program
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3182

Attn: Mr. Brian Walsh

Dear Mr. Walsh:

Thank you very much for your thorough review of the Emergency Response Plan (ERP) plan and with such quick turnaround. We have reviewed the comments and with TransCanada's direction, have made appropriate changes to the best extent practicable. Our explanation of how we responded to each comment is included on the document that follows.

Again, we appreciate your input and value the effort that you made to improve the effectiveness of the ERP. Please contact Bob Baumgartner at (402) 960-0483 or (832) 320-5538 if you have any questions or if you would like to see a revised version of the plan.

Respectfully,

John McHugh
Vice President, Compliance Services
Witt O'Brien's

cc. Bob Baumgartner, TransCanada
Niki Affleck, TransCanada

South Dakota Department of Environment and Natural Resources Comments on TransCanada's Emergency Response Plan- Keystone Pipeline System July 2013

General Comments:

1. The following comments were prepared as part of a courtesy review of TransCanada's Emergency Response Plan dated July 2013. These comments do not reflect a full regulatory review of the document. DENR expects TransCanada to comply with the requirements of SDCL 34A-18 prior to commencing operation of the Keystone XL pipeline in South Dakota.

   TransCanada Response: TransCanada originally developed the ERP to comply with the requirements of SDCL 34A-18. However, to demonstrate an understanding of the rule and to assist plan users and reviewers, we have included a cross reference into the plan located in the Regulatory Cross Reference section of the plan.

Specific Comments:

2. **Section 1.2 - Scope of Plan.** In addition to the regulatory references noted in this section please be aware of South Dakota's laws regarding regulated substance discharges and emergency response plans for crude oil pipelines. These requirements can be found in SDCL 34A-12 and 34A-18.

   TransCanada Response: We have added a statement into Section 1.2 that makes it clear that the plan's purpose is to comply with all regulations of any state in which the pipeline transverses, including South Dakota. Further, we reviewed the pertinent sections to confirm that the plan does, in fact, comply with the aforementioned rules.

3. **Section 2.0 - Notifications.** This section does not list any local reporting requirements for South Dakota. If an incident occurs near a South Dakota city the department recommends TransCanada provide that city with a courtesy notification (see comment #17 below).

   In addition, one call to the South Dakota Department of Environment and Natural Resources (DENR) Spills Section is sufficient for all DENR notifications. 605.773.3296 is the appropriate phone number for notifications during business hours and 605.773.3231 is the appropriate phone number for after-hours notifications. DENR recommends noting the distinction between the two numbers in the Emergency Response Plan.

   TransCanada Response: Local agency notifications start on page 2-34. For Local/City Emergency Services that may be called during an incident another list is located in the Response Zone Annex since this section is designed to accommodate only local contacts. In addition, we have removed several DENR contacts and replaced it with the

one call numbers described in this document.

4. **Section 2.0 - Notifications- Page 2-68.** The Ramada in Aberdeen is listed twice on the table shown on page 2-68. Each listing shows the same address and phone number.

   TransCanada Response: We are aware of the duplication. The reason for this duplication is because the Ramada in Aberdeen is a suitable site for both the Fort Ransom to Ludden section and the Ludden to Ferney section. Therefore it was listed in each to aid the responder during an emergency.

5. **Section 3.0 - Response Actions – Page** 3-3. Although DENR understands the response times shown on page 3-3 are prescribed in federal regulations DENR expects TransCanada to respond to releases in South Dakota immediately and deploy the necessary response resources as soon as possible.

   TransCanada Response: TransCanada understands the importance of responding immediately and will do so during an emergency. The plan's listed response time is a reference only to the regulatory required maximum time to respond. It is understood that we will respond as quickly as it is safe to do so.

6. **Figure 3.1 -Spill Classification.** Based on this figure it appears impacts to water bodies or groundwater are needed to elevate the spill classification to "Major" or "Critical". If a spill is near rural water systems, well head or source water protection areas or drinking water wells DENR recommends elevating the spill classification to "Major" until impacts to the nearby water supply are ruled out. If impacts to the water supply are discovered, the release should be classified as "Critical".

   TransCanada Response: Table 3.1 has been modified to escalate potential threats and immediate threats to "Major" and "Critical" respectively.

7. **Section 3.0 - Response Actions- Page 3-10.** In the first sentence following "Note:" DENR suggests replacing "right-of-row" with "right-of-way."

   TransCanada Response: The typo has been corrected.

8. **Section 6.1 – Critical Areas to Protect.** It appears the critical areas described in this section are based primarily on wildlife / habitat and vegetation types. DENR recommends TransCanada consider population areas, rural water systems, well head or source water protection areas or proximity to drinking water wells in their criteria for establishing critical areas to protect.

   TransCanada Response: All of the aforementioned categories were added as high sensitivity areas. In addition, the ERP already addressed High Consequence Areas which include population areas, drinking water sources, etc.

9. **Section 6.5 - Containment and Recovery of Spilled Product- Page 6-6.** The third bullet on this page suggests controlled burning as an effective method to remove product. It is DENR's opinion this method would likely only remove visual evidence of spilled product and residual contamination may remain in the environment after a burn. If controlled burning was approved in South Dakota, DENR would require additional sampling to confirm residual contamination levels comply with state cleanup requirements.

   TransCanada Response: Suggested material has been added into conditions of using intentional ignition for in-situ burning. The state of South Dakota, through the mechanism of Unified Command and supported by the National Contingency Plan (NCP), will have the authority to approve or disapprove of in-situ burning. In-situ burning is identified as only one possible mechanism among many to effectively clean up an oil spill. TransCanada will work closely with regulatory agencies to ensure we meet clean-up standards via approved means.

10. **Section 6.5 - Containment and Recovery of Spilled Product- Pages 6-8 and 6-9.** Two methods of containment are discussed on these pages (underflow and overflow dams). It appears the first paragraph on page 6-9 addresses underflow dams and should be placed under the bullet titled "Underflow dam" on page 6-8.

    TransCanada Response: The paragraph has been moved accordingly as suggested.

11. **Section 6.7 - Alternative Response Strategies.** In South Dakota, in addition to approval from the Federal On-Scene Coordinator alternative response strategies would also need to be approved by DENR.

    TransCanada Response: The text in Section 6.7 has been rewritten to make it clear that the Federal On-Scene Coordinator (OSC) and the State On-Scene Coordinator (SOSC) would make a joint decision, through UC, on the use the alternative response strategies.

12. **Section 6.7 – Alternative Response Strategies- Page 6-20.** Regarding dispersants, because dispersants only break up the oil and spread it throughout the water column DENR would not necessarily consider dispersant as a final cleanup action. If DENR approves the use of dispersants additional sampling would be required to confirm residual contamination levels comply with state cleanup requirements.

    TransCanada Response: Text has been changed to add the possible need for water sampling to gauge the effects of dispersants in the water column. As noted above, alternative response strategies outlined in the ERP are suggested response methods and not mandatory. We will work closely with regulatory agencies to ensure any methods being proposed for clean-up will be acceptable and not cause further environmental damage.

13. **Appendix A - A.1 Company Owned Response Equipment.** This section indicates there is a response/equipment trailer located in Brookings, South Dakota. However, later in Appendix A (starting on page A-9) where U.S. equipment is listed there is no equipment listed in Brookings, South Dakota. If equipment is located in Brookings, please list it in Appendix A

    TransCanada Response: Section A.1 has been amended to remove the listing of individual locations because they are listed, by location, in Figure A.1. Please note that the trailer is in Yankton, SD.

14. **Appendix C.** DENR suggests including information in this Appendix on the criteria used to determine when a shut-down is necessary and the length of time it takes to shut-down the pipeline once the shut-down procedure is initiated.

    TransCanada Response: The criteria for the shut-down of the pipeline is typically contained in the Operations and Maintenance Manual (O&M) and the Control Center Plan, both required by PHMSA under 49 CFR 195. The ERP does however, make mention to response actions for abnormal operations in Section 3.0.

15. **Appendix E — Section E.5 - Waste Disposal.** The last sentence on page E-5 mentions authorizations from the Coast Guard, EPA, and National Energy Board regarding approved waste disposal sites. The list of required approvals should also include the appropriate state regulatory agency with authority over waste disposal in the area of the release.

    TransCanada Response: The statement "any authorizing state agency" has been added to the list.

16. **Appendix F- Section** 1.1 (no **page number).** In the title "Supplemental Emergency Response and Equipment Statement" replace "Staement" with "Statement".

    TransCanada Response: The typo has been corrected.

17. **Regulatory Cross Reference.** DENR suggest this section include a regulatory cross reference table for SDCL 34-A-18-2.

    TransCanada Response: The SD DENR cross reference has been added.

18. **Response Zone Annexes- External Notification References- South Dakota.** In the event of a release in South Dakota the primary notification should be to DENR's Spills Section with the phone numbers provided in comment number 2 above. However, location notifications are important. Upon review of the information listed in this section DENR found that many of phone numbers provided do not match the information available to DENR. DENR recommends TransCanada review this section and confirm the information is correct. As a reference, contact information for County Emergency Managers is available at the following website:

http:/fdps.sd.govfemergency servicesfemergency managementfcounty emergency managers list.aspx.

TransCanada Response: A review of the phone numbers identified three that were incorrect. These were changed accordingly.

BW

DEPARTMENT OF ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

May 15, 2014

Robert Baumgartner
Manager, Oil Pipeline Environmental Services
TransCanada Keystone U.S. Operations
717 Texas St.
Houston, TX 77002

Subject: TransCanada Keystone Emergency Response Plan Update

Dear Mr. Baumgartner,

South Dakota Codified Law (SDCL) 34A-18 requires crude oil pipeline operators to prepare an oil spill response plan and submit the plan to the department for approval. In addition, SDCL 34A-18 requires operators to review and update the plan in full every five years.

The department received TransCanada's initial Emergency Response Plan for the Keystone Pipeline System on July 1, 2009. Therefore, in accordance with SDCL 34A-18, the plan is due for review in 2014.

Please review and update the plan as it pertains to South Dakota and submit an up-to-date copy to the department. If TransCanada would like to consult with the department during the review process or has any questions regarding this letter please feel free to contact me at 605.773.3296 or brian.walsh@state.sd.us.

Sincerely,

Brian J. Walsh
Environmental Scientist III
Ground Water Quality Program

Walsh, Brian

From: Walsh, Brian
Sent: Thursday, August 21, 2014 11:56 AM
To: Robert Baumgartner
Cc: Walsh, Brian
Subject: Emergency Response Plan Update
Attachments: TC Keystone ERP Update Request Letter.pdf

Hi Bob,

I am writing to follow-up on May 15, 2014 letter DENR sent TransCanada regarding the required review of the Emergency Response Plan (see attached). Please let me know the status of the Emergency Response Plan review.

Thanks,

Brian J. Walsh
Environmental Scientist III
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.3296
Fax: 605.773.6035
brian.walsh@state.sd.us

Bob called on Aug 22, 2014 - They will be getting DENR an up-to-date plan before the end of 2014.

015730

Patch II
10-0133

2010.083

015731

BW

South Dakota Spill Report Form

Dept. of Ag. Case No. _____ State Case No.: 2010.083

Reported: (mm/dd/yy) 05/21/2010 Time: 6:40 pm Recorded By: Brian Walsh

A. REPORTER

Reported By: Robert Baumgartner
Organization Name: TransCanada Keystone
Organization: ☒ discharger ☐ public ☐ state ☐ local ☐ federal
Address: 13710 FNB Parkway
City: Omaha County: State: NE
Zip: 68154 Phone: 402.492.7464 402.960.0483 (cell)

B. DISCHARGER (Responsible Party)

Name: Same as Above
Address:
City: County: State:
Zip: Phone:

C. INCIDENT LOCATION

As Above in B Street or Approx. Location: Carpenter Pump Station
Survey Description: _____ _____ Sec _____ T _____ R _____
City: County: Clark State: SD

D. DATE

Spill Date: (mm/dd/yy) Spill Time:

E. MATERIAL

Material Type (Code/Name): ☐ hazardous substance ☐ material unknown ☒ oil ☐ other	Quantity Spilled	Spilled in Water	Units (Check 1)	
CRUDE OIL	5 gallons		☐ lb. ☐ bbl.	☒ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.

F. SOURCE

Source of Spill: ☐ AST ☐ UST ☐ railway ☐ vessel ☐ fixed facility ☒ pipeline ☐ highway ☐ air transport
Description: Leaking Suction value

G. MED.

Medium Affected: ☐ air ☒ land ☒ water ☐ groundwater ☐ within facility only
Waterway Affected: rainwater

H. CAUSE

Reported Cause: ☐ transportation accident ☒ equipment failure ☐ operational error ☐ natural phenomenon ☐ dumping ☐ unknown ☐ Other
Description: leaking Suction value

I. DAM.

Damages: No. of injuries _____ No. of deaths _____ Property damage > $50,000 _____

J. ACTIONS

☐ Evacuation Response Action Taken:

K. NOTIFIED

Responding Agency: ☐ DENR ☐ DOA ☒ discharger ☐ federal ☐ EPA ☐ local
Agencies Notified: DENR

L. COMMENTS

Comments: Mobilized vac truck and excavater. Excavated to expose and repair leaking value. Contaminated soil and water segragated and will be properly disposed of. Will collect side wall and bottom of excavation samples before backfilling.

Department of Environment and Natural Resources
Ground Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57501-3182

Business Hours M thru F 8:00 – 5:00pm
Normal business hours – (605) 773-3296
After business hours – (605) 773-3231

015732

2010.083

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

May 24, 2010

Robert Baumgartner
TransCanada Keystone
13710 FNB Parkway
Omaha, NE 68154

Subject: Department of Environment and Natural Resources File Number – 2010.083 – Oil Spill @ Carpenter Pump Station

Dear Mr. Baumgartner:

The Department of Environment and Natural Resources is contacting you regarding the above referenced event. This office has recorded the information provided about this event on an initial spill report form (enclosed for your review). The procedures for assessment and remediation of a release such as this were developed to prevent pollution of the waters of the State. In this situation, the following steps must be taken:

- By June 25, 2010, please complete and return the attached Written Contamination Incident Follow Up Report form (this is a standard form so some questions will not apply to this situation, just skip those questions.
- Please also provide this office with a narrative of actions taken in response to this event, to include: waste disposal receipts.

I have been assigned as the project manager of this case. Once I have reviewed all of the information on this case I will contact you to discuss any further actions that may be needed. If you have any questions or need additional information, please do not hesitate to contact me. If you have questions regarding the appropriate disposal of impacted substances contact our Waste Management Program at (605) 773-3153.

Thank you for your environmental stewardship and willingness to document the response efforts.

Sincerely,

Bob McDonald
Ground Water Quality Program
Phone: (605) 773-3296

Enclosures

cc: Jason Coenen, Clark County Emergency Management, Clark, SD

DENR FILE #: 2010.083

WRITTEN CONTAMINATION INCIDENT FOLLOW-UP REPORT
(Page 1 of 2)

RETURN COMPLETED FORM TO

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GROUND WATER QUALITY PROGRAM
JOE FOSS BUILDING
523 EAST CAPITOL AVENUE
PIERRE SD 57501-3182

RECEIVED
JUN 16 2010
DEPT. OF ENVIRONMENT & NATURAL RESOURCES, GROUND WATER PROGRAM

SITE NAME: TransCanada Keystone Pipeline - Carpenter Pump Station

SPILL LOCATION: 19051 415th Avenue, Carpenter, SD 57322

LATITUDE: 44 37' 24.650" LONGITUDE : -97 55' 17.734"

LEGAL LOCATION (TOWNSHIP/RANGE): T113N R059W Sec. 04

RESPONSIBLE PARTY: TransCanada Keystone Pipeline, LP

MAILING ADDRESS: 13710 FNB Parkway

CITY: Omaha STATE : NE ZIP: 68154

TELEPHONE: _____ (HOME) (402) 492-7300 (WORK)

DATE OF SPILL OR WHEN DETECTED: May 21, 2010 TIME: 13:45 CDT

WHAT WAS THE DURATION OF THE RELEASE? May 21, 2010 (observed) to May 25, 2010

SUBSTANCE(S) RELEASED: Crude oil

QUANTITY RELEASED: ~5 gallons

CHEMICAL NAME: Canadian Sour Crude CAS #: _____
CAS #8002.05.09

IS SUBSTANCE ON THE "SARA 302 LIST"? YES ____ NO ✓ DON'T KNOW ____
"CERCLA HAZARDOUS SUBSTANCE LIST"? YES ____ NO ✓ DON'T KNOW ____
"SOUTH DAKOTA REGULATED SUBSTANCE"? YES ✓ NO ____ DON'T KNOW ____

CONSULTANT: URS Corporation

IDENTIFY KNOWN HEALTH RISKS: None known.

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED? None required.

LAND USE (RESIDENTIAL, INDUSTRIAL, RURAL, OTHER): Rural

UTILITIES INVESTIGATED (WATER, SEWER, TELEPHONE, CATV, STORM WATER, OTHER):

Release occurred in rural setting. No utilities were present.

015734

FOLLOW-UP REPORT CONTINUED
(Page 2 of 2)

DENR FILE #: 2010.083

ENVIRONMENTAL MEDIA IMPACTED (SURFACE SOIL, SUBSURFACE SOIL > 3' BELOW GROUND, GROUND WATER, SURFACE WATER, INDOOR AIR, OUTDOOR AIR, ETC.):

Surface soil; subsurface soil > 3 feet below ground

DISTANCE TO AND NAME OF CLOSEST SURFACE WATER OR DRAINAGE:

Unnamed Tributary to Shue Creek; 0.1 mile to the west

DEPTH/DISTANCE TO AND NAME OF CLOSEST AQUIFER: 50'/0' to Tulare Aquifer

DEPTH/DISTANCE TO NEAREST DRINKING WATERWELL: 72-80' deep; 0.75 mile NE (multiple)

CUBIC YARDS OF SOIL EXCAVATED/TREATED: 185

WAS FREE PHASE OR POOLED PRODUCT PRESENT? Yes

DIMENSIONS OF EXCAVATION: 47 ft by 29 ft

CONTAMINATED MATERIALS DISPOSAL SITE: Waste Management - Spruce Ridge LF

DATE MATERIAL WAS DISPOSED OF: June 9-10, 2010

IMMEDIATE CORRECTIVE ACTION TAKEN AND ADDITIONAL WORK PLANNED:

See attached text.

FORM COMPLETED BY: Bruce Galer, URS DATE: June 10, 2010

Closure 2010.083

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

July 9, 2010

Robert Baumgartner
TransCanada Keystone Pipeline, LP
13710 FNB Parkway
Omaha NE 68154

Subject: Department of Environment and Natural Resources File 2010.083 – TransCanada Keystone Pipeline – Carpenter Pump Station

Dear Mr. Baumgartner,

The Department of Environment and Natural Resources reviewed all information submitted regarding the above referenced spill. The department has determined the case is closed.

On May 21, 2010, TransCanada staff discovered evidence of a leaking value associated with pump station equipment at the Carpenter pump station. In response to the release, TransCanada shut down the pipeline, contained and collected contaminated rainwater on site, and performed a remedial excavation. Approximately 9,356 gallons of contaminated rainwater and 185 cubic yards or contaminated soil were removed from the site and properly disposed of. All post-excavation soil samples were below the department's Tier 1 Action Levels.

The department has concluded based on the clean-up activities and investigation TransCanada conducted, this crude oil spill poses no risk at this time. Therefore, the department will not require TransCanada to take any additional action in this matter. If problems arise because of any remaining contamination, TransCanada may be responsible for conducting additional assessment and remediation.

Please contact Brian Walsh of my staff at (605) 773-3296, if you have any questions. Thank you for your efforts and cooperation regarding this spill.

Sincerely,

Bill Markley

Bill Markley, Administrator
Ground Water Quality Program
(605) 773-3296

cc: Hubert Huls, URS Corp, Minneapolis, MN
Tom Moeding, Beadle County Emergency Manager, Huron, SD

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

MEMORANDUM

To: Bill Markley, Administrator, Ground Water Quality Program

From: Brian Walsh, Hydrology Specialist BJW

Date: July 7, 2010

Subject: Closure for DENR Spill Case 2010.083 – Canadian Sour Crude Oil– TransCanada Carpenter Pump Station Release

---

Introduction

This memo describes the facts associated with DENR spill case 2010.083. The description covers general spill information, removal actions, and remaining contamination. Finally, case closure is recommended. A closure letter is attached for your review and signature.

General Spill Information

Site Name:	TransCanada Keystone Pipeline – Carpenter Pump Station
Location:	44 37' 24.650" latitude and -97 55' 17.734" longitude TransCanada Keystone Pipeline – Carpenter Pump Station Beadle County, South Dakota
Responsible Party:	TransCanada Keystone Pipeline, LP 13710 FNB Parkway Omaha, NE 402.492.7300
Date of Spill:	May 21, 2010

Spill Summary

On May 21, 2010, TransCanada staff discovered evidence of a leaking valve associated with pump station equipment. Upon discovery of the release, the pipeline was shutdown and remained off-line until the cause of the leak was discovered and repaired. TransCanada estimates 5-gallons of crude oil were released impacting surface soil and pooled rainwater.

Contaminant Characterization

The product release was Canadian Sour Crude oil CAS #8002.05.09. Contaminants of concern include BTEX, naphthalene, and TPH-Diesel.

Removal Action and Remaining Contamination

Upon discover, TransCanada mobilized staff and equipment (vac truck, excavator, hydrovac) to the site to begin the removal action. During the release, the site experienced heavy rainfall and there were isolated areas of pooled water with an oily sheen. These areas were contained and collected for disposal using the vac truck. Contaminated water was disposed of with Safety-Kleen.

TransCanada excavated soil on both the vacuum side and pressure side of the leaking valve to ensure removal of all of the contaminated soil. A PID meter was used to determine the limits of the excavation and 13 post-excavation samples were collected for lab analysis (soil sample results are shown below). One hundred eighty-five (185) cubic yards of soil were removed and disposed of at the Spruce Ridge landfill in Glencoe, Minnesota. Post-excavation soil samples indicate no exceedances of South Dakota's Tier 1 Action Levels.

Sample ID	Date	Benzene ppb	Toluene ppb	Ethylbenzene ppb	Xylene ppb	Naphthalene ppb	TPH-D ppm
N-SW-4ft	5/24/10	<20.4	<50.9	<50.9	<153	<204	<10.6
N-SW-10ft	5/24/10	<20.5	<51.3	<51.3	<154	<205	<10.6
E-SW-3ft	5/24/10	<24.5	<61.2	<61.2	<184	<245	<12.6
E-SW-7ft	5/24/10	<25.8	<64.4	<64.4	<193	<258	<13.3
S-SW-4ft	5/25/10	<21.4	<53.4	<53.4	<160	<214	<11.1
S-SW-10ft	5/25/10	<21.1	<52.8	<52.8	<158	<211	<10.6
W-SW-10ft	5/25/10	<25.7	<64.1	<64.1	<192	<257	<12.8
PB-1-14ft	5/25/10	<24.5	<61.2	<61.2	<184	<245	<12.4
N-SW-5ft	5/25/10	<22.4	<55.9	<55.9	<168	<224	<10.7
SE-SW-11ft	5/25/10	<25.9	<64.8	<64.8	<194	<259	<12.7
S-SW-5ft	5/25/10	<22.1	<55.1	<55.1	<165	<221	<10.6
W-SW-8ft	5/25/10	<21.2	<53.0	<53.0	<159	<212	<10.6
PB-2-12ft	5/25/10	<25.8	<64.5	<64.5	<193	<258	<12.8
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Potential Exposure Pathways

Due to the removal action, there are no complete exposure pathways associated with this spill. The site is not within a designated zone A, B, or C source water area.

Recommendations

Based on a review of information provided and an evaluation of potential risks associated with this spill I recommend case closure.

Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]
Sent: Tuesday, July 06, 2010 3:23 PM
To: Walsh, Brian; hubert_huls@urscorp.com
Cc: Robert Baumgartner
Subject: RE: 2010.083 Carpenter Release

Brian, please find attached Safety Kleen receipts for the non-haz oily water that was disposed of from the Carpenter release. Four loads transported on 6/9, 6/10 and 6/16 totaling 9356 gallons were taken to Safety Kleens, Luverne, MN rail transfer facility and then transported to ESI in Indianapolis for treatment/disposal.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Wednesday, June 16, 2010 10:42 AM
To: hubert_huls@urscorp.com
Cc: Brian.Walsh@state.sd.us; Robert Baumgartner
Subject: 2010.083 Carpenter Release

Hubert,

My name is Brian Walsh an I'll be the project officer on TransCanada's recent release at the Carpenter pump station. I reviewed the packet of info you sent to Rick Lancaster and everything looks good. I do have one request. When it's completed, please send me documentation confirming Safety-Kleen has disposed of the oily water. If you have any comments / questions let me know.

Thanks,

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

==========

This electronic message and any attached documents are intended only for the named addressee (s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Safety-Kleen Systems, Inc.

5360 Legacy Drive.
Building 2, Suite 100
Plano, Texas 75024
800-669-5740
605-332-0231

CUSTOMER# 10014347 TRANSCANADA KEYSTONE PIPELINE
19051 415TH AVENUE
CARPENTER SD 57322
PHONE 402-492-7464

REFERENCE NBR. 51083982
SRVC WEEK: 2010-24
SRVC DATE: 06/09/10 11:52

PURCHASE ORDER#

TAX EXEMPTION NBR

PRODUCT/SERVICES

SERVICE/ PRODUCT		QTY	UNIT PRICE	TAX	TOTAL CHARGE
40423593/ 66866	VACUUM SVC LIQ (PQUAL) SERVICE TERM 7 VAC PR TEST: 7	1300.000	0.0000	0.00	0.00
10970	FEE, VAC SVC NO SOLIDS	1300.000	0.9500	0.04	1235.04
	TOTAL SERVICE/PRODUCTS		0.9500	49.40	1284.40

TOTAL CHARGE 1284.40
CREDITS 0.00
TOTAL DUE 1284.40

UNPAID BALANCE THIS RECEIPT 1284.40

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

GENERATOR STATUS
CESQG: Non-vehicle

Customer certifies that (i) the above-named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and (ii) no material change has occurred either in the characteristics of the waste/material or in the process generating the waste/material. Customer agrees to pay the above charges and to be bound by the terms and conditions (1) set forth in (a) the General Terms and Conditions provided separately to Customer or (b) any SK agreement signed by Customer and SK, and (2) incorporated herein by reference. Unless otherwise indicated in the payment received section, SK is authorized to charge Customer's account for this transaction. Customer certifies that the individual signing this Service Acknowledgement is duly authorized to sign and bind Customer. The following provision is applicable to Safety-Kleen's parts cleaner and paint gun cleaner services: Customer agrees that it will not introduce any substance into the solvent or aqueous cleaning solution, including without limitation any hazardous waste or hazardous waste constituent, except to the extent such introduction is incidental to the normal use of the machine. Customer further agrees that it will not clean parts/paint guns that have been contaminated with or otherwise introduce polychlorinated biphenyls (PCB's), herbicides, pesticides, dioxins or listed hazardous waste into the solvent or aqueous cleaning solution. Safety-Kleen has the capacity and is permitted to accept, store, and/or reclaim the spent parts washer solvent; paint thinners, solvents and paints generated by customer; or dry cleaning filter cartridges, powder, and still residues containing perchloroethylene, petroleum naphtha, or trifluorotrichloroethane dry cleaning solvents. Safety-Kleen and customer agree that this agreement is intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

X Wayne s Barreth

CUSTOMER / GENERATOR :wayne barreth

X

TRANSPORTER :bgalvin

REFERENCE NBR.
CUSTOMER#/GENERATOR: 10014347 TRANSCANADA KEYSTONE PIPELINE 51083982
19051 415TH AVENUE
CARPENTER SD 57322 SRVC DATE: 06/09/10
PHONE 402-492-7464
GENERATOR USEPA ID. GENERATOR STATE
MANIFEST DOC#: 51083982 FORM CODE: NR SK SHIPMENT NO: 201147031
CARRIER 1 SDD000716696
CARRIER 2

US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID)

NON-REGULATED LIQUID

FEDERAL WASTE CODES NONE
STATE WASTE CODES
TOTAL CONT 1 TYPE TT WT/VOL G SKDOT 202863
CNT#: 100609976300 QTY: 1300 PROFILE: 040423593

DESIGNATED FACILITY NAME/ADDRESS:
SAFETY-KLEEN SYSTEMS, INC.
2000 N WESTPORT AVE
SIOUX FALLS, SD 57107

FACILITY USEPA ID NO SDD000716696
FACILITY STATE ID NO

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

GENERATOR STATUS
CESQG: Non-vehicle

Customer certifies that (i) the above-named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and (ii) no material change has occurred either in the characteristics of the waste/material or in the process generating the waste/material. Customer agrees to pay the above charges and to be bound by the terms and conditions (1) set forth in (a) the General Terms and Conditions provided separately to Customer or (b) any SK agreement signed by Customer and SK, and (2) incorporated herein by reference. Unless otherwise indicated in the payment received section, SK is authorized to charge Customer's account for this transaction. Customer certifies that the individual signing this Service Acknowledgement is duly authorized to sign and bind Customer. The following provision is applicable to Safety-Kleen's parts cleaner and paint gun cleaner services: Customer agrees that it will not introduce any substance into the solvent or aqueous cleaning solution, including without limitation any hazardous waste or hazardous waste constituent, except to the extent such introduction is incidental to the normal use of the machine. Customer further agrees that it will not clean parts/paint guns that have been contaminated with or otherwise introduce polychlorinated biphenyls (PCB's), herbicides, pesticides, dioxins or listed hazardous waste into the solvent or aqueous cleaning solution. Safety-Kleen has the capacity and is permitted to accept, store, and/or reclaim the spent parts washer solvent; paint thinners, solvents and paints generated by customer; or dry cleaning filter cartridges, powder, and still residues containing perchloroethylene, petroleum naphtha, or trifluorotrichloroethane dry cleaning solvents. Safety-Kleen and customer agree that this agreement is intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

X Wayne s Barreth

CUSTOMER / GENERATOR :wayne barreth

X

TRANSPORTER :bgalvin

LAST PAGE

BRANCH 7123 CSG 15 bgalvin, 06/10/10 13:21 PAGE 1

Safety-Kleen Systems, Inc.

5360 Legacy Drive.
Building 2, Suite 100
Plano, Texas 75024
800-669-5740
605-332-0231

CUSTOMER# 10014347 TRANSCANADA KEYSTONE PIPELINE
19051 415TH AVENUE
CARPENTER SD 57322
PHONE 402-492-7464

REFERENCE NBR. 51206942
SRVC WEEK: 2010-24
SRVC DATE: 06/10/10 13:21

PURCHASE ORDER#

TAX EXEMPTION NBR

PRODUCT/SERVICES

SERVICE/ PRODUCT		QTY	UNIT PRICE	TAX	TOTAL CHARGE
40423593/ 66666	VACUUM SVC LIQ (PQUAL) SERVICE TERM 7 VAC PH TEST: 7 PROMO NBR: 0	2500.000	0.0000	0.00	0.00
10970	FEE, VAC SVC NO SOLIDS	2500.000	0.9500	0.04	2375.04
10901	VAC SVS SERVICEFEE 1	1.000	87.0000	3.48	90.48
	TOTAL SERVICE/PRODUCTS		87.9500	98.48	2560.48

TOTAL CHARGE 2560.48
CREDITS 0.00
TOTAL DUE 2560.48

UNPAID BALANCE THIS RECEIPT 2560.48

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

X Wayne S Barreth

CUSTOMER / GENERATOR :wayne barreth

X

TRANSPORTER :bgalvin

015742

REFERENCE NBR.
CUSTOMER#/GENERATOR: 10014347 TRANSCANADA KEYSTONE PIPELINE 51206942
19051 415TH AVENUE
CARPENTER SD 57322 SRVC DATE: 06/10/10
PHONE 402-492-7464
GENERATOR USEPA ID. GENERATOR STATE
MANIFEST DOC#: 51206942 FORM CODE: NR SK SHIPMENT NO: 201154568
CARRIER 1 SDD000716696
CARRIER 2

US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID)

NON-REGULATED LIQUID

FEDERAL WASTE CODES NONE
STATE WASTE CODES
TOTAL CONT 1 TYPE TT WT/VOL G SKDOT 202863
CNT#: 100610994511 QTY: 2500 PROFILE: 040423593

DESIGNATED FACILITY NAME/ADDRESS:
SAFETY-KLEEN SYSTEMS, INC.
2000 N WESTPORT AVE
SIOUX FALLS, SD 57107

FACILITY USEPA ID NO SDD000716696
FACILITY STATE ID NO

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

x Wayne s Barreth

CUSTOMER / GENERATOR :wayne barreth

x

TRANSPORTER :bgalvin

LAST PAGE

Safety-Kleen Systems, Inc.

5360 Legacy Drive.
Building 2, Suite 100
Plano, Texas 75024
800-669-5740
605-332-0231

REFERENCE NBR.
51207143

CUSTOMER# 10014347 TRANSCANADA KEYSTONE PIPELINE
19051 415TH AVENUE
CARPENTER SD 57322
PHONE 402-492-7464

SRVC WEEK: 2010-24
SRVC DATE: 06/10/10 11:55

PURCHASE ORDER#

TAX EXEMPTION NBR

PRODUCT/SERVICES

SERVICE/ PRODUCT		QTY	UNIT PRICE	TAX	TOTAL CHARGE
40423593/ 66656	VACUUM SVC LIQ (PQUAL) SERVICE TERM 7 VAC PM TEST: 7	4556.000	0.0000	0.00	0.00
10901	VAC SVS SERVICEFEE 1	1.000	87.0000	3.48	90.48
10970	FEE, VAC SVC NO SOLIDS	4556.000	0.9500	0.04	4328.24
	TOTAL SERVICE/PRODUCTS		87.9500	176.61	4591.81

TOTAL CHARGE	4591.81
CREDITS	0.00
TOTAL DUE	4591.81

UNPAID BALANCE THIS RECEIPT 4591.81

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

GENERATOR STATUS
SQG/LQG: Non-vehicle

Intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

x Wayne Barnett

CUSTOMER / GENERATOR :wayne

x

TRANSPORTER :JOLSON

REFERENCE NBR.
CUSTOMER#/GENERATOR: 10014347 TRANSCANADA KEYSTONE PIPELINE 51207143
19051 415TH AVENUE
CARPENTER SD 57322 SRVC DATE: 06/10/10
PHONE 402-492-7464
GENERATOR USEPA ID. GENERATOR STATE
MANIFEST DOC#: 51207143 FORM CODE: NR SK SHIPMENT NO: 201153685
CARRIER 1 SDD000716696
CARRIER 2

US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID)

NON-REGULATED LIQUID

FEDERAL WASTE CODES NONE
STATE WASTE CODES
TOTAL CONT 1 TYPE TT WT/VOL G SKDOT 202863
CNT#: 100610992706 QTY: 4556 PROFILE: 040423593

DESIGNATED FACILITY NAME/ADDRESS:
SAFETY-KLEEN SYSTEMS, INC.
2000 N WESTPORT AVE
SIOUX FALLS, SD 57107

FACILITY USEPA ID NO SDD000716696
FACILITY STATE ID NO

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

GENERATOR STATUS
SQG/LQG: Non-vehicle

intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

x Wayne Barnett

CUSTOMER / GENERATOR :wayne

x JD Jolson

TRANSPORTER :JOLSON

LAST PAGE

Safety-Kleen Systems, Inc.

5360 Legacy Drive.
Building 2, Suite 100
Plano, Texas 75024
800-669-5740
605-332-0231

CUSTOMER# 10014347 TRANSCANADA KEYSTONE PIPELINE
19051 415TH AVENUE
CARPENTER SD 57322
PHONE 402-492-7464

REFERENCE NBR. 51260760
SRVC WEEK: 2010-25
SRVC DATE: 06/16/10 08:20

PURCHASE ORDER#

TAX EXEMPTION NBR

PRODUCT/SERVICES

SERVICE/ PRODUCT		QTY	UNIT PRICE	TAX	TOTAL CHARGE
40423593/ 66666	VACUUM SVC LIQ (PQUAL) SERVICE TERM 7 CHANGE TERM 52 VAC PH TEST: 7	1000.000	0.0000	0.00	0.00
10970	FEE, VAC SVC NO SOLIDS	1000.000	0.9500	0.04	950.04
10901	VAC SVS SERVICEFEE 1	1.000	87.0000	3.48	90.48
	TOTAL SERVICE/PRODUCTS		87.9500	41.48	1078.48

TOTAL CHARGE 1078.48
CREDITS 0.00
TOTAL DUE 1078.48

UNPAID BALANCE THIS RECEIPT 1078.48

Per SK BOG M420-001 the halogen detesting instrument has been steroed and validated.

GENERATOR STATUS
DESQG: Non-vehicle

Customer certifies that (i) the above-named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and (ii) no material change has occurred either in the characteristics of the waste/material or in the process generating the waste/material. Customer agrees to pay the above charges and to be bound by the terms and conditions (1) set forth in (a) the General Terms and Conditions provided separately to Customer or (b) any SK agreement signed by Customer and SK, and (2) incorporated herein by reference. Unless otherwise indicated in the payment received section, SK is authorized to charge Customer's account for this transaction. Customer certifies that the individual signing this Service Acknowledgement is duly authorized to sign and bind Customer. The following provision is applicable to Safety-Kleen's parts cleaner and paint gun cleaner services: Customer agrees that it will not introduce any substance into the solvent or aqueous cleaning solution, including without limitation any hazardous waste or hazardous waste constituent, except to the extent such introduction is incidental to the normal use of the machine. Customer further agrees that it will not clean parts/paint guns that have been contaminated with or otherwise introduce polychlorinated biphenyls (PCB's), herbicides, pesticides, dioxins or listed hazardous waste into the solvent or aqueous cleaning solution. Safety-Kleen has the capacity and is permitted to accept, store, and/or reclaim the spent parts washer solvent; paint thinners, solvents and paints generated by customer; or dry cleaning filter cartridges, powder, and still residues containing perchloroethylene, petroleum naphtha, or trifluorotrichloroethane dry cleaning solvents. Safety-Kleen and customer agree that this agreement is intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

X _____

CUSTOMER / GENERATOR :doug jensen

X _____

TRANSPORTER :bgalvin

REFERENCE NBR.
CUSTOMER#/GENERATOR: 10014347 TRANSCANADA KEYSTONE PIPELINE 51260760
19051 415TH AVENUE
CARPENTER SD 57322 SRVC DATE: 06/16/10
PHONE 402-492-7464
GENERATOR USEPA ID. GENERATOR STATE
MANIFEST DOC#: 51260760 FORM CODE: NR SK SHIPMENT NO: 201210424
CARRIER 1 SDD000716696
CARRIER 2

US DOT DESCRIPTION (INCLUDING PROPER SHIPPING NAME, HAZARD CLASS, AND ID)

NON-REGULATED LIQUID

FEDERAL WASTE CODES NONE
STATE WASTE CODES
TOTAL CONT 1 TYPE TT WT/VOL G SKDOT 202863
CNT#: 100616132288 QTY: 1000 PROFILE: 040423593

DESIGNATED FACILITY NAME/ADDRESS:
SAFETY-KLEEN SYSTEMS, INC.
2000 N WESTPORT AVE
SIOUX FALLS, SD 57107

FACILITY USEPA ID NO SDD000716696
FACILITY STATE ID NO

Per SK BOG M420-001 the halogen detesting instrument has been zeroed and validated.

GENERATOR STATUS
CESQG: Non-vehicle

Customer certifies that (i) the above-named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and (ii) no material change has occurred either in the characteristics of the waste/material or in the process generating the waste/material. Customer agrees to pay the above charges and to be bound by the terms and conditions (1) set forth in (a) the General Terms and Conditions provided separately to Customer or (b) any SK agreement signed by Customer and SK, and (2) incorporated herein by reference. Unless otherwise indicated in the payment received section, SK is authorized to charge Customer's account for this transaction. Customer certifies that the individual signing this Service Acknowledgement is duly authorized to sign and bind Customer. The following provision is applicable to Safety-Kleen's parts cleaner and paint gun cleaner services: Customer agrees that it will not introduce any substance into the solvent or aqueous cleaning solution, including without limitation any hazardous waste or hazardous waste constituent, except to the extent such introduction is incidental to the normal use of the machine. Customer further agrees that it will not clean parts/paint guns that have been contaminated with or otherwise introduce polychlorinated biphenyls (PCB's), herbicides, pesticides, dioxins or listed hazardous waste into the solvent or aqueous cleaning solution. Safety-Kleen has the capacity and is permitted to accept, store, and/or reclaim the spent parts washer solvent; paint thinners, solvents and paints generated by customer; or dry cleaning filter cartridges, powder, and still residues containing perchloroethylene, petroleum naphtha, or triflurotrichloroethane dry cleaning solvents. Safety-Kleen and customer agree that this agreement is intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

X

CUSTOMER / GENERATOR :doug jensen

X

TRANSPORTER :bgalvin

LAST PAGE

Lancaster, Rick

From: Hubert_Huls@URSCorp.com

Sent: Tuesday, June 15, 2010 5:37 PM

To: Lancaster, Rick

Cc: Robert Baumgartner; Bruce_Galer@URSCorp.com; Steve_McManamon@URSCorp.com

Subject: Contamination Incident Follow Up Report-TransCanada/ Keystone Pipeline (Carpenter, SD site) e-mail 1 of 2

Rick,

Attached files are the Contamination Incident Follow Up Report and all attachments except for the landfill tickets and manifests will be sent in the second email to minimize size. This report submitted on behalf of TransCanada/ Keystone Pipeline for the release incident along the pipeline in Carpenter, SD. As we discussed today, Bob McDonald is out this week so we are sending it to your attention. If you have any questions, feel free to contact us. Thanks.

(See attached file: TCLP Carpenter Pump Station Incident Follow Up Report final.pdf)

(See attached file: Immediation Corrective Action Section Text rev 1 final.pdf)(See attached file: Figure2.pdf)(See attached file: Figure1.pdf)(See attached file: Analytical Summary Tables 1 &2 .pdf)

Hubert H. Huls, PE
Principal Environmental Engineer
URS Corporation
100 South Fifth Street, Suite 1500
Minneapolis, MN 55402
Tel: 612-370-0700
Direct: 612-373-6805
Fax: 612-370-1378
hubert_huls@urscorp.com

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DENR FILE #: 2010.083

WRITTEN CONTAMINATION INCIDENT FOLLOW-UP REPORT
(Page 1 of 2)

RECEIVED
JUN 16 2010
DEPT. OF ENVIRONMENT & NATURAL RESOURCES, GROUND WATER PROGRAM

RETURN COMPLETED FORM TO

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GROUND WATER QUALITY PROGRAM
JOE FOSS BUILDING
523 EAST CAPITOL AVENUE
PIERRE SD 57501-3182

SITE NAME: TransCanada Keystone Pipeline - Carpenter Pump Station

SPILL LOCATION: 19051 415th Avenue, Carpenter, SD 57322

LATITUDE: 44 37' 24.650" LONGITUDE : -97 55' 17.734"

LEGAL LOCATION (TOWNSHIP/RANGE): T113N R059W Sec. 04

RESPONSIBLE PARTY: TransCanada Keystone Pipeline, LP

MAILING ADDRESS: 13710 FNB Parkway

CITY: Omaha STATE : NE ZIP: 68154

TELEPHONE: _____ (HOME) (402) 492-7300 (WORK)

DATE OF SPILL OR WHEN DETECTED: May 21, 2010 TIME: 13:45 CDT

WHAT WAS THE DURATION OF THE RELEASE? May 21, 2010 (observed) to May 25, 2010

SUBSTANCE(S) RELEASED: Crude oil

QUANTITY RELEASED: ~5 gallons

CHEMICAL NAME: Canadian Sour Crude CAS #: _____
CAS #8002.05.09

IS SUBSTANCE ON THE "SARA 302 LIST"? YES ____ NO ✓ DON'T KNOW ____
"CERCLA HAZARDOUS SUBSTANCE LIST"? YES ____ NO ✓ DON'T KNOW ____
"SOUTH DAKOTA REGULATED SUBSTANCE"? YES ✓ NO ____ DON'T KNOW ____

CONSULTANT: URS Corporation

IDENTIFY KNOWN HEALTH RISKS: None known.

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED? None required.

LAND USE (RESIDENTIAL, INDUSTRIAL, RURAL, OTHER): Rural

UTILITIES INVESTIGATED (WATER, SEWER, TELEPHONE, CATV, STORM WATER, OTHER):

Release occurred in rural setting. No utilities were present.

015749

FOLLOW-UP REPORT CONTINUED
(Page 2 of 2)

DENR FILE #: 2010.083

ENVIRONMENTAL MEDIA IMPACTED (SURFACE SOIL, SUBSURFACE SOIL > 3' BELOW GROUND, GROUND WATER, SURFACE WATER, INDOOR AIR, OUTDOOR AIR, ETC.):

Surface soil; subsurface soil > 3 feet below ground

DISTANCE TO AND NAME OF CLOSEST SURFACE WATER OR DRAINAGE:

Unnamed Tributary to Shue Creek; 0.1 mile to the west

DEPTH/DISTANCE TO AND NAME OF CLOSEST AQUIFER: 50'/0' to Tulare Aquifer

DEPTH/DISTANCE TO NEAREST DRINKING WATERWELL: 72-80' deep; 0.75 mile NE (multiple)

CUBIC YARDS OF SOIL EXCAVATED/TREATED: 185

WAS FREE PHASE OR POOLED PRODUCT PRESENT? Yes

DIMENSIONS OF EXCAVATION: 47 ft by 29 ft

CONTAMINATED MATERIALS DISPOSAL SITE: Waste Management - Spruce Ridge LF

DATE MATERIAL WAS DISPOSED OF: June 9-10, 2010

IMMEDIATE CORRECTIVE ACTION TAKEN AND ADDITIONAL WORK PLANNED:

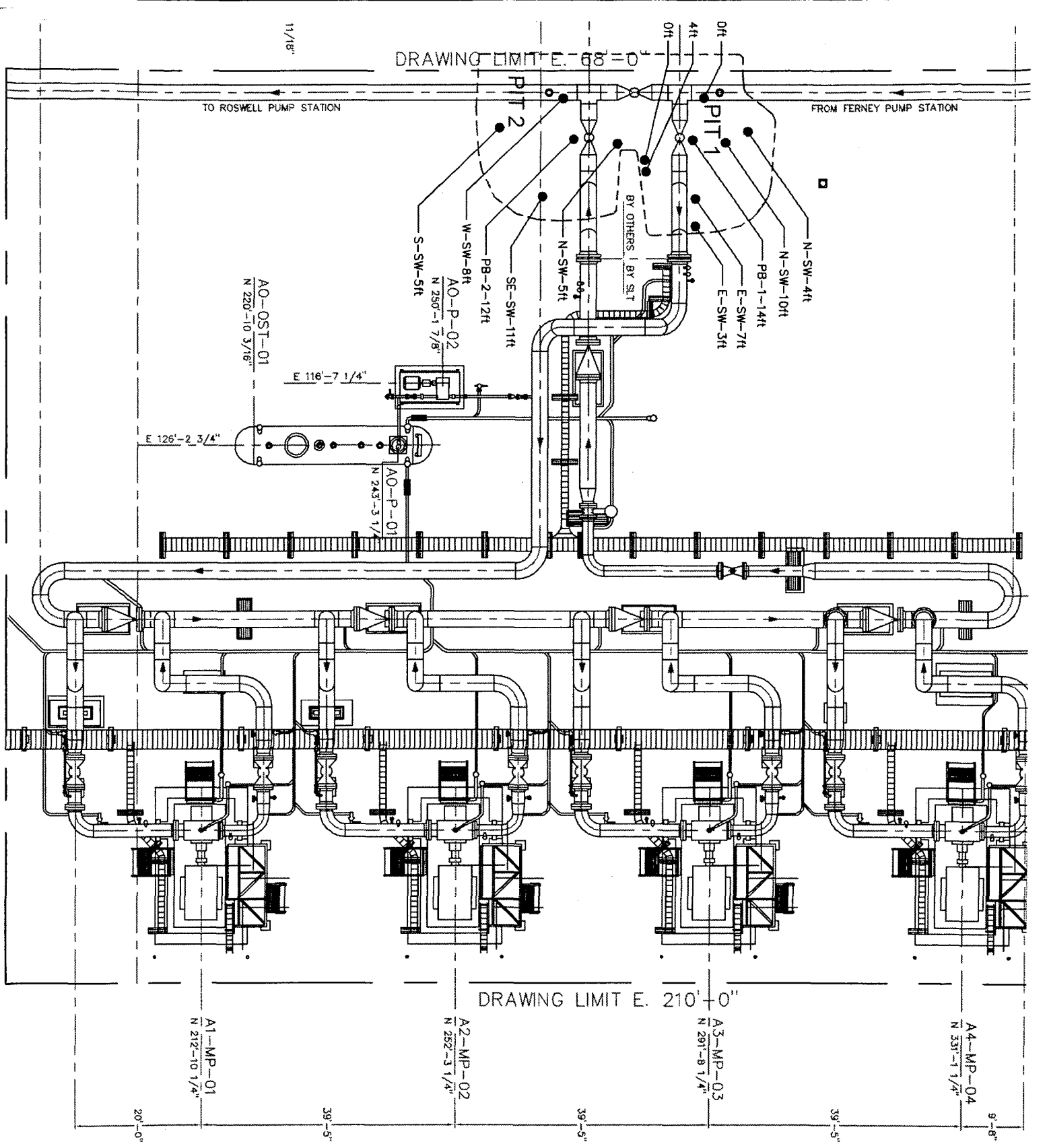
See attached text.

FORM COMPLETED BY: Bruce Galer, URS DATE: June 10, 2010

The site is located one half mile south of SD Highway 28 on 415th Avenue (Figure 1). A TransCanada emergency response team mobilized to site upon notification of a release on May 21, 2010. The site is a pump station owned and operated by TransCanada Keystone Pipeline, LP (TransCanada). The release occurred from a suspected leaking valve associated with pump station equipment. Vac truck, excavator, hydrovac, and other equipment were mobilized to site. The site had been exposed to heavy rainfall and was de-watered prior to and during excavation activities. A small isolated (by absorbent boom) area, adjacent to the suction riser pipe, of the surface water had a sheen or free product droplets. Water with sheen or oil was collected in a vac truck and stored on-site in a portable storage tank pending analysis and disposal. Surface water with no sheen observed was discharged to right-of-way through filter bags and straw bales per the approval of South Dakota Department of Environment and Natural Resources (SD DENR). The suspected leaking valve (vacuum side of pump station) was excavated to expose and stop the flow of oil from a threaded valve union. TransCanada also excavated additional soil to expose the valve union on the pressure side and main line valves. Residual oil was also encountered in the excavation of the pressure side valve.

Soil was screened with a photoionization detector (PID) with 10.6 eV lamp to segregate contaminated soil and determine limits of excavation. Confirmation soil samples were collected in the excavation for the vacuum side valve (Pit #1) and in the excavation for the pressure side valve (Pit #2) (Figure 2) to ensure the excavation had removed impacted soil to within regulatory requirements. Analytical results for benzene, toluene, ethylbenzene and xylenes (BTEX), naphthalene, and Total Petroleum Hydrocarbons as Diesel (TPH-Diesel) are summarized on Table 1 and Table 2. A total of 185 cubic yards of contaminated soil was transferred to the Waste Management-Spruce Ridge Landfill in Glencoe, MN on June 9 and 10, 2010. Waste manifests and landfill tickets are included with this report. Disposal of oily water is pending with Safety-Kleen.

Based on field observations, measurements, and analytical data, response excavation efforts have mitigated impacts to the subsurface to below SD DENR Tier 1 action levels for BTEX, naphthalene, and TPH-Diesel.



LEGEN

015752

2,000
Feet

Source:
USGS Carpenter, SD.
Quad dated 1978
USGS Staum Dam, SD.
Quad dated 1978

URS

SITE LOCATION MAP
TRANSCANADA KEYSTONE PIPELINE
SOUTH DAKOTA

Fifth Street Towers
100 South Fifth Street
Suite 1500
Minneapolis, MN 55402
612.370.0700 Tel
612.370.1378 Fax

DRN BY: TS	DATE: 6/9/10	PROJECT NO. 31810800	FIG. NO. 1
CHK'D BY: BG	DATE: 6/9/10		

Table 1 - Laboratory Analysis (Pit 1)
TransCanada Keystone Pipeline
Carpenter Pump Station; Carpenter, South Dakota

Location	Units	N-SW-4ft	N-SW-10ft	E-SW-3ft	E-SW-7ft	S-SW-4ft	S-SW-10ft	W-SW-10ft	PB-1-14ft	Tier 1 Action Level
Sample Date		5/24/10	5/24/10	5/24/10	5/24/10	5/25/10	5/25/10	5/25/10	5/25/10	
Lithology		Sand	Sand	Clay	Sand	Sand	Sand	Sand	Clay	
Depth	(feet)	4	10	3	7	4	10	10	14	
PID	(ppm)*	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	
Chemical of Concern										
Benzene	µg/kg	<20.4	<20.5	<24.5	<25.8	<21.4	<21.1	<25.7	<24.5	200
Ethylbenzene	µg/kg	<50.9	<51.3	<61.2	<64.4	<53.4	<52.8	<64.1	<61.2	1,500
Toluene	µg/kg	<50.9	<51.3	<61.2	<64.4	<53.4	<52.8	<64.1	<61.2	1,000
Xylene (Total)	µg/kg	<153	<154	<184	<193	<160	<158	<192	<184	300,000
Naphthalene	µg/kg	<204	<205	<245	<258	<214	<211	<257	<245	25,000
Diesel Components	mg/kg	<10.6	<10.6	<12.6	<13.3	<11.1	<10.6	<12.8	<12.4	500**

NOTES: mg/kg = Milligrams per kilogram, equivalent to parts per million (ppm)
µg/kg= Micrograms per kilogram
<x = Not detected to reporting limits of x
* = Total organic vapors (ppm as benzene)
** = Tier 1 "Trigger Level" for total petroleum hydrocarbons
PB = Pit Bottom
SW = Sidewall

Table 2 - Laboratory Analysis (Pit 2)
TransCanada Keystone Pipeline
Carpenter Pump Station; Carpenter, South Dakota

Location	Units	N-SW-5ft	SE-SW-11ft	S-SW-5ft	W-SW-8ft	PB-2-12ft	Tier 1 Action Level
Sample Date		5/25/10	5/25/10	5/25/10	5/25/10	5/25/10	
Lithology		Sand	Clay	Sand	Sand	Clay	
Depth	(feet)	5	11	5	8	12	
PID	(ppm)*	0.5	0.2	0.3	0.4	0.3	
Chemical of Concern							
Benzene	µg/kg	<22.4	<25.9	<22.1	<21.2	<25.8	200
Ethylbenzene	µg/kg	<55.9	<64.8	<55.1	<53.0	<64.5	1,500
Toluene	µg/kg	<55.9	<64.8	<55.1	<53.0	<64.5	1,000
Xylene (Total)	µg/kg	<168	<194	<165	<159	<193	300,000
Naphthalene	µg/kg	<224	<259	<221	<212	<258	25,000
Diesel Components	mg/kg	<10.7	<12.7	<10.6	<10.6	<12.8	500**

NOTES: mg/kg = Milligrams per kilogram, equivalent to parts per million (ppm)
µg/kg= Micrograms per kilogram
<x = Not detected to reporting limits of x
* = Total organic vapors (ppm as benzene)
** = Tier 1 "Trigger Level" for total petroleum hydrocarbons
PB = Pit Bottom
SW = Sidewall

Lancaster, Rick

From: Hubert_Huls@URSCorp.com
Sent: Tuesday, June 15, 2010 5:37 PM
To: Lancaster, Rick
Cc: Robert Baumgartner; Bruce_Galer@URSCorp.com; Steve_McManamon@URSCorp.com
Subject: Contamination Incident Follow Up Report-TransCanada/ Keystone Pipeline (Carpenter, SD site) e-mail 2 of 2

Rick,

Here is the second email with the landfill tickets and manifests. Thanks

(See attached file: Soil Manifests.pdf)(See attached file: Keystone Pipeline_LF tickets.pdf)

Hubert H. Huls, PE
Principal Environmental Engineer
URS Corporation
100 South Fifth Street, Suite 1500
Minneapolis, MN 55402
Tel: 612-370-0700
Direct: 612-373-6805
Fax: 612-370-1378
hubert_huls@urscorp.com

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WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47074

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada / Keystone Pipeline

b) Generator's Address: 17051 415th Ave Carpenter, SD 57322

c) Generator's Representative: Rob Lindisch

d) Telephone Number: 888-239-6205

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: Industrial

g) Description of Waste: oily cont. soil

h) Disposal Volume: _____

____Tons ____Cubic Yards ____Other____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:.

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

Generator's Authorized Agent Name (print/type) | Signature of Generator's Authorized Agent | Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Clouses Trucking

b) Transporter's Address: 32167 550th Ave Crow City, MN 56215

c) Telephone Number: 612-357-3514

d) Vehicle License No./State: B47809 / Minnesota

e) Trailer or Container No.: 10

f) Name of Driver (print/type) Doug Kalkbrenner

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver | Date of Receipt 6-9-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver | Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Transfer Facility's Authorized Agent (print/type) _____

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent | Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent | Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:

b) Transporter's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Driver (print/type) _____

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver | Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver | Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SWF)

b) Physical Address: 12755 137th St Glenville, MN 56036

c) Telephone Number: 320-894-5509

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type) _____

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent | Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent | Date of Rejection

Signature of Driver | Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____ c) Telephone Number: _____

b) Operator's Address: _____

d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) | Signature of Operator's Authorized Agent | Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015756

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47075

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada/Keystone Pipeline
b) Generator's Address: 19051 415th Ave Carpenter, SD 57322
c) Generator's Representative: Rob Lindisch
d) Telephone Number: 888-239-6205
e) WASTE MANAGEMENT APPROVAL CODE 101682MN
f) Common Name of Waste: Industrial
g) Description of Waste: City Sch. Soil
h) Disposal Volume: _____ Tons _____ Cubic Yards _____ Other _____
i) Number of Containers: _____

j) Generating Location (Name):
k) Address:
d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ☐ N/A; _____ % friable _____ % non-friable

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Wayne Barrett — Generator's Authorized Agent Name (print/type)
X Wayne Barrett — Signature of Generator's Authorized Agent
X 9-JUN-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers Truck
b) Transporter's Address: 37167 520th Ave Crow Lake MN 56437
c) Telephone Number: 612 817 3044
d) Vehicle License No./State: PAK 9407
e) Trailer or Container No.: C1805
f) Name of Driver (print/type): Melvin Fellenstad

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-9-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SW-5)
b) Physical Address: 12755 137th St Glencoe, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____
c) Telephone Number: _____
b) Operator's Address: _____
d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015757

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47076

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada/Keystone Pipeline

b) Generator's Address: 19151 415th Ave
Carpenter, SD 57322

c) Generator's Representative: Rob Lindisch

d) Telephone Number: 388-239-6705

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: Industrial

g) Description of Waste: City Fill Soil

h) Disposal Volume: _____

_____Tons _____Cubic Yards _____Other_____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; _____ % friable _____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Wayne Boutt — Generator's Authorized Agent Name (print/type)

X Wayne Boutt — Signature of Generator's Authorized Agent

X 9-Jun-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers Trucking

b) Transporter's Address: Grove City, MN

c) Telephone Number: 612-817-3594

d) Vehicle License No./State: PA3956

e) Trailer or Container No.: 01

f) Name of Driver (print/type) Bruce A Johnson

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-9-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Transfer Facility's Authorized Agent (print/type) _____

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:

b) Transporter's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Driver (print/type) _____

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SVMS)

b) Physical Address: 12755 137th St Glencoe MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type) _____

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____

c) Telephone Number: _____

b) Operator's Address: _____

d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015758

WM WASTE MANAGEMENT

RUC

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

27.5+24 - 25.54

Manifest No. 47077

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canda / Keystone Pipeline

b) Generator's Address: 19051 415th Ave Carpenter, SD 57322

c) Generator's Representative: Rob Lindsch

d) Telephone Number: 888-239-6205

e) WASTE MANAGEMENT APPROVAL CODE 10168 2MN

f) Common Name of Waste: Industrial

g) Description of Waste: Oily cont. soil

h) Disposal Volume: 25.54

☑ Tons ☐ Cubic Yards ☐ Other

i) Number of Containers:

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable ☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Wayne Barth — Generator's Authorized Agent Name (print/type)

X Wayne Barth — Signature of Generator's Authorized Agent

X 9-Jun-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers Trucking

b) Transporter's Address: 39167 560th Ave Gaylord MN 55343

c) Telephone Number: 320-693-3229

d) Vehicle License No./State: DAT9523 MN

e) Trailer or Container No.: 392137A MN

f) Name of Driver (print/type) Barry Arnold

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt 6-9-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery 6-9-10

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:

b) Transporter's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SWI-8)

b) Physical Address: 12755 137th St Glencoe MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt 6-9-10

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:

c) Telephone Number:

b) Operator's Address:

d) Recommended special handling instructions and additional information:

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015759

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47078

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada Keystone Pipeline

b) Generator's Address: 41051 415th Ave
Parmelee, SD 57322

c) Generator's Representative: Rod Hindrich

d) Telephone Number: 888-239-6205

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: Industrial

g) Description of Waste: Oily Dirt Soil

h) Disposal Volume: _____
_____ Tons _____ Cubic Yards _____ Other _____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; _____ % friable _____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

x Wayne Barrett — Generator's Authorized Agent Name (print/type)

x Wayne Barrett — Signature of Generator's Authorized Agent

x 7-JUN-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: CHASER'S TRUCK

b) Transporter's Address: 34675 Granite City Rd

c) Telephone Number:

d) Vehicle License No./State: #A 60015

e) Trailer or Container No.: 70537

f) Name of Driver (print/type) Dan Liesse

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:

b) Transporter's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SWF)

b) Physical Address: 12755 137th St Glencoe, MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____

c) Telephone Number: _____

b) Operator's Address: _____

d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015760

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47079

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada / Keystone Pipeline
Generating Location (Name):

b) Generator's Address: 19051 415th Ave
Carpenter, SD 57522
k) Address:

c) Generator's Representative: Rob Lindisch
d) Telephone Number:

d) Telephone Number: 828-239-6206

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: Imusnick

g) Description of Waste: Oily Cont. Soil

m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ☐ N/A; ____ % friable ____ % non-friable

h) Disposal Volume: ____ Tons ____ Cubic Yards ____ Other ____

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

i) Number of Containers: ____

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X ____ X ____ X ____
Generator's Authorized Agent Name (print/type) | Signature of Generator's Authorized Agent | Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasens / Rock-On
b) Transporter's Address: 32167 580th Ave Grove City
c) Telephone Number: 612-817 3594
d) Vehicle License No./State: PAG1604
e) Trailer or Container No.: EDZK
f) Name of Driver (print/type) ____

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

____ 6-9-10
Signature of Driver | Date of Receipt

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

____ ____
Signature of Driver | Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State: ____
e) Trailer or Container No.: ____
f) Name of Transfer Facility's Authorized Agent (print/type) ____

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

____ ____
Signature of Transfer Facility's Authorized Agent | Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

____ ____
Signature of Transfer Facility's Authorized Agent | Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State: ____
e) Trailer or Container No.: ____
f) Name of Driver (print/type) ____

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

____ ____
Signature of Driver | Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

____ ____
Signature of Driver | Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SVV-8)
b) Physical Address: 12755 137th St Glencoe, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) ____

f) The material delivered by the Transporter has been received at the Disposal Facility.

____ ____
Signature of Disposal Facility's Authorized Agent | Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

____ ____
Signature of Disposal Facility's Authorized Agent | Date of Rejection

____ ____
Signature of Driver | Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: ____
c) Telephone Number: ____
b) Operator's Address: ____
d) Recommended special handling instructions and additional information: ____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

____ ____ ____
Operator's Name (print/type) | Signature of Operator's Authorized Agent | Date

f) Responsible Agency Name and Address: ____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015761

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47091

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada / Keystone Pipeline

b) Generator's Address: 41851 415th Ave
Carpenter, SD 57322

c) Generator's Representative: Rob Lindsey

d) Telephone Number: 888-239-6205

e) WASTE MANAGEMENT APPROVAL CODE 161682 MN

f) Common Name of Waste: Industrial

g) Description of Waste: Oily cont. soil

h) Disposal Volume: _____

____Tons ____Cubic Yards ____Other____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Wayne Barrett — Generator's Authorized Agent Name (print/type)
X Wayne Barrett — Signature of Generator's Authorized Agent
X 10-JUN-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Cypress Trucking
b) Transporter's Address: 32167 550th Ave Grove City, MN 56243
c) Telephone Number: 612-317-3554
d) Vehicle License No./State: B4789 / Minnesota
e) Trailer or Container No.: 10
f) Name of Driver (print/type) Doug Kolkhorst

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-10-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SWI-8)
b) Physical Address: 12765 137th St Glencoe, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____ c) Telephone Number: _____

b) Operator's Address: _____

d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015762

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47092

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada / Keystone Pipeline
b) Generator's Address: 19061 46th Ave Alexander, ND 58522
c) Generator's Representative: Rob Landsem
d) Telephone Number: 555-237-6265
e) WASTE MANAGEMENT APPROVAL CODE 10652 MN
f) Common Name of Waste: Industrial
g) Description of Waste: Only Oil Soil
h) Disposal Volume: _____ Tons _____ Cubic Yards _____ Other _____
i) Number of Containers: _____

j) Generating Location (Name):
k) Address:
d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable ☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Wayne Barth — Generator's Authorized Agent Name (print/type)
X Wayne Barth — Signature of Generator's Authorized Agent
X 10-Jun-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Charles Trucking
b) Transporter's Address: 32167 580th Ave
c) Telephone Number: 612-817-3594
d) Vehicle License No./State: PA3933 MN
e) Trailer or Container No.: 3231 STA MN
f) Name of Driver (print/type) Barry Arnold

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-10-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery: 6-10-10

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SMM)
b) Physical Address: 12765 137th St Glencoe, MN 55336
c) Telephone Number: 320-864-5502
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____
c) Telephone Number: _____
b) Operator's Address: _____
d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015763

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47093

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada / Keystone Pipeline

b) Generator's Address: 19651 415th Ave Carpenter, SD 57322

c) Generator's Representative: Ron Lamisch

d) Telephone Number: 888-239-6205

e) WASTE MANAGEMENT APPROVAL CODE 10K62MN

f) Common Name of Waste: Industrial

g) Description of Waste: Dry Cont. Soil

h) Disposal Volume: _____ Tons _____ Cubic Yards _____ Other _____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ☐ N/A; _____ % friable _____ % non-friable

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

x Robyn Barrett — Generator's Authorized Agent Name (print/type)
x Robyn Barrett — Signature of Generator's Authorized Agent
x 10-Jun-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers Trucking
b) Transporter's Address: 32167 580th St. Grove City, MN 56243
c) Telephone Number: 612-817-3594
d) Vehicle License No./State: PAK 2427
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-10-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery: 6-10-10

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SW-6)
b) Physical Address: 12755 137th St Glencoe, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type)

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015764

WM
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47094

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Canada Keystone Pipeline

b) Generator's Address: 6051 48th Ave
Carpenter, SD 57322

c) Generator's Representative: Rob Lyttlich

d) Telephone Number: 605-234-6205

e) WASTE MANAGEMENT APPROVAL CODE 1016S2MN

f) Common Name of Waste: Industrial

g) Description of Waste: Oily Sand Soil

h) Disposal Volume: _____

____ Tons ____ Cubic Yards ____ Other ____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

x Wayne Barrett — Generator's Authorized Agent Name (print/type)

x Wayne Barrett — Signature of Generator's Authorized Agent

x 10-Jun-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers Trucking

b) Transporter's Address: 37167 588th Ave Grove City MN

c) Telephone Number: 612-817-3594

d) Vehicle License No./State: PAK 3956 MN

e) Trailer or Container No.: 1

f) Name of Driver (print/type) Bruce N Johnson

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — Date of Receipt: 6-10-10

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — Date of Delivery: 6-10-10

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Transfer Facility's Authorized Agent (print/type) _____

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name: Chasers Trucking

b) Transporter's Address: Grove City

c) Telephone Number: 612-817-3594

d) Vehicle License No./State: PAK 3956

e) Trailer or Container No.: 1

f) Name of Driver (print/type) Bruce N Johnson

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SPMA)

b) Physical Address: 12750 137th St Glenooe, MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type) _____

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: _____

b) Operator's Address: _____

c) Telephone Number: _____

d) Recommended special handling instructions and additional information: _____

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015765

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 47095

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: Trans Pecos Pipeline

b) Generator's Address: 19051 411th Ave

c) Generator's Representative: Ryan Hinrichs

d) Telephone Number: 605-239-6205

e) WASTE MANAGEMENT APPROVAL CODE: 101623MN

f) Common Name of Waste: Industrial

g) Description of Waste: Dry Cuttings

h) Disposal Volume: _____

_____ Tons _____ Cubic Yards _____ Other _____

i) Number of Containers: _____

j) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; _____ % friable _____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many _____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

Wayne Barnett — Generator's Authorized Agent Name (print/type)

Wayne Barnett — Signature of Generator's Authorized Agent

10-Jan-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Chasers

b) Transporter's Address: 32167 580th Ave Groves SD

c) Telephone Number: 612-617-3594

d) Vehicle License No./State: 6015

e) Trailer or Container No.: _____

f) Name of Driver (print/type) _____

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

Signature of Driver — 6-10-10 Date of Receipt

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

Signature of Driver — 6-10-10 Date of Delivery

SECTION 3 TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State: _____

e) Trailer or Container No.: _____

f) Name of Transfer Facility's Authorized Agent (print/type) _____

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

Transporter's Name:

Transporter's Address:

Telephone Number:

Vehicle License No./State: _____

Trailer or Container No.: _____

Name of Driver (print/type) _____

I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: Spruce Ridge Landfill (SWM)

b) Physical Address: 12755 137th St Glencoe, MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type) _____

f) The material delivered by the Transporter has been received at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

Operator's Name: _____ c) Telephone Number: _____

Operator's Address: _____

Recommended special handling instructions and additional information: _____

Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

Responsible Agency Name and Address: _____

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015766

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275709

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47079
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 228 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAF1604/6X

	Time	Scale	Operator		
In	06/09/2010 13:47:45	Scale	Kel	Gross	68220 lb*
Out	06/09/2010 14:13:09	Scale	Kel	Tare	34320 lb*
			* Manual Weight	Net	33900 lb
				Tons	16.95

Comments trans canada-keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	16.95	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275711

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47075
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-DILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 98 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAK2437/6X

	Time	Scale	Operator		
In	06/09/2010 13:55:11	Scale	Kel	Gross	85800 lb
Out	06/09/2010 14:13:49	Scale	Kel	Tare	32620 lb
				Net	53180 lb
				Tons	26.59

Comments trans canada -keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	26.59	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature Mindy Fallwell

402WM

6

015768

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275712

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47078
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 19 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAH6015/6X

	Time	Scale	Operator		
In	06/09/2010 13:56:13	Scale	Kel	Gross	81240 lb
Out	06/09/2010 14:15:37	Scale	Kel	Tare	32800 lb
				Net	48440 lb
				Tons	24.22

Comments trans canada-keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	24.22	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature Don Lucas

402WM

015769

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275723

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47074
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 196 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAB4789/6X

	Time	Scale	Operator
In	06/09/2010 14:38:43	Scale	Kel
Out	06/09/2010 15:38:21	Scale	Kel

Gross	84820 lb
Tare	31560 lb
Net	53260 lb
Tons	26.63

Comments trans canada keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	26.63	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature _____

402WM

015770

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275724

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47077
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# BLUE Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAJ9523/6X

	Time	Scale	Operator		
In	06/09/2010 14:40:11	Scale	Kel	Gross	80100 lb
Out	06/09/2010 15:32:32	Scale	Kel	Tare	29020 lb
				Net	51080 lb
				Tons	25.54

Comments trans canada keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	25.54	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015771

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275725

Customer Name WM-UPSTREAM
Ticket Date 06/09/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47076
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# SP5 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAK3956/6X

	Time	Scale	Operator		
In	06/09/2010 14:41:40	Scale	Kel	Gross	84880 lb
Out	06/09/2010 15:34:00	Scale	Kel	Tare	32400 lb
				Net	52480 lb
				Tons	26.24

Comments trans canada keystone pipeline

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	26.24	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature B. A. Johnson

402WM

015772

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275802

Customer Name WM-UPSTREAM
Ticket Date 06/10/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47094
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# SP5 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAK3956/6X

	Time	Scale	Operator
In	06/10/2010 13:26:01	Scale	faye
Out	06/10/2010 14:27:47	Scale	faye

Gross	74900 lb
Tare	32260 lb
Net	42640 lb
Tons	21.32

Comments CONT SOIL

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	21.32	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015773

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275800

Customer Name WM-UPSTREAM
Ticket Date 06/10/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47091
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 196 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAB4789/6X

	Time	Scale	Operator
In	06/10/2010 13:21:06	Scale	faye
Out	06/10/2010 14:26:16	Scale	faye

Gross	78860 lb
Tare	31520 lb
Net	47340 lb
Tons	23.67

Comments CONT SOIL

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	23.67	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature _____

402WM

015774

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275801

Customer Name WM-UPSTREAM
Ticket Date 06/10/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47092
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# BLUE Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAJ9523/6X

	Time	Scale	Operator
In	06/10/2010 13:22:57	Scale	faye
Out	06/10/2010 14:24:30	Scale	faye

Comments CONT SOIL

Gross	84200 lb
Tare	28860 lb
Net	55340 lb
Tons	27.67

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	27.67	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275798

Customer Name WM-UPSTREAM
Ticket Date 06/10/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47095
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 17 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PA6015/6X

	Time	Scale	Operator
In	06/10/2010 13:16:33	Scale	faye
Out	06/10/2010 14:08:42	Scale	faye

Comments CONT SOIL

Gross	74460 lb
Tare	32840 lb
Net	41620 lb
Tons	20.81

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	20.81	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature Don Lucas

402WM

015776

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 275797

Customer Name WM-UPSTREAM
Ticket Date 06/10/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 47093
Destination 6 PHASE
PO
Profile 101682MN (TRANSCANADA/KEYSTONE PIPELINE-OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier CHASERS CHASERS TRUCKING
Vehicle# 98 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PAK2437/6X

	Time	Scale	Operator
In	06/10/2010 13:13:48	Scale	faye
Out	06/10/2010 14:07:07	Scale	faye

Gross	70780 lb
Tare	32600 lb
Net	38180 lb
Tons	19.09

Comments cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	19.09	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK
4	TRANSCHARGEL-TRANS	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature Mike Falkum

402WM

015777

Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]
Sent: Monday, June 07, 2010 3:50 PM
To: Walsh, Brian
Subject: RE: TransCanada Keystone Pipeline - Carpenter Pump Station

Hi Brian,
The leak was discovered by visual inspection on May 21. We concluded soil excavation activities on May 25, I felt pretty confident that we removed the extent of impacted soil. I had URS collect sidewall and bottom samples per the sampling plan we discussed on May 24 and submitted the samples to Pace Analytical for BTEX, THC-Diesel, and naphthalene per your guidance. The lab results indicate that all the samples are non-detect for all parameters.

Contaminated soil, which has been stockpiled onsite on/covered with plastic, is scheduled for transportation & disposal to Waste Management's Spruce Ridge Landfill in Minnesota this Wednesday June 9.

We have fluids onsite in a frac tank that I'm coordinating with Safety Kleen for disposal.

I received a SD DENR File Number and request for Written Confirmation Incident Follow-up Report letter from Bob McDonald dated May 24 and will prepare the Follow-up Report for submittal by June 25, 2010 as requested in the letter. I'll have the soil disposal manifests for inclusion in the report, but will likely submit the liquid disposal paperwork separately, if necessary.

Let me know if you have any questions.

Thank you,
Bob

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Monday, June 07, 2010 11:54 AM
To: Robert Baumgartner
Cc: Brian.Walsh@state.sd.us
Subject: TransCanada Keystone Pipeline - Carpenter Pump Station

Hi Bob,

Could you give me a quick update on the status of the pipeline leak at the Carpenter Pump Station (an short email update is fine)? Also, out of curiosity, was the leak discovered via the automated leak detection system or by visual inspection?

Thanks,

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

Walsh, Brian

From: McDonald, Robert
Sent: Tuesday, May 25, 2010 9:27 AM
To: Walsh, Brian
Subject: FW: TransCanada Oil Spill

-----Original Message-----
From: Lancaster, Rick
Sent: Tuesday, May 25, 2010 9:25 AM
To: McDonald, Robert
Subject: TransCanada Oil Spill

Spoke w/ Hubert, URS, 612-373-6805. He was wondering about analyticals. Told him TPH as waste oil from an acceptable EPA approved method would be appropriate. He asked about disposal of impacted water. Told him to visit with the area wastewater treatment facilities, he thought they would just let Safety Kleen handle it. Impacted soils will go to either Brown Co or Brookings. They are digging today. Let him know if you want other analysis. Thanks

Walsh, Brian

From: Kropp, Steve
Sent: Monday, May 24, 2010 10:02 AM
To: Walsh, Brian
Subject: FW: TransCanada Keystone Pipeline - Carpenter Pump Station

-----Original Message-----
From: Jacobson, Carrie
Sent: Monday, May 24, 2010 9:42 AM
To: Kropp, Steve; Babcock, Chad
Subject: RE: TransCanada Keystone Pipeline - Carpenter Pump Station

Thanks Steve and Chad. I called and spoke with Hubert Huls with URS about the contaminated soil that will be generated. He indicated he didn't have reason to believe there'd be any heavy metals in the crude oil, but didn't know the benzene level. I said with no heavy metal issues, the only hazardous waste concern would be from benzene, and that the landfill will likely want to know at least how that stands before the soil is accepted for disposal.

Hubert also asked about discharge of some water and whether there were any POTWs nearby. He said he'd consider "nearby" to include the cities of Aberdeen, Watertown and Brookings. I suggested he contact the wastewater treatment folks with each of those cities, and to call us again if he had questions regarding solid or hazardous waste concerns.

I'm sure there will be more to come.

Carrie

> -----Original Message-----
> **From:** Kropp, Steve
> **Sent:** Monday, May 24, 2010 8:39 AM
> **To:** Jacobson, Carrie
> **Subject:** FW: TransCanada Keystone Pipeline - Carpenter Pump Station
>
> -----Original Message-----
> **From:** Walsh, Brian
> **Sent:** Monday, May 24, 2010 8:28 AM
> **To:** 'Robert Baumgartner'
> **Cc:** Walsh, Brian; Kropp, Steve
> **Subject:** RE: TransCanada Keystone Pipeline - Carpenter Pump Station
>
> The nearest Regional Landfill is the Watertown Landfill. The website below has contact and other info about the landfill. Please call if you have any disposal questions.
>
> http://denr.sd.gov/des/wm/landfillmaps/lfwater.aspx
>
> Thanks,
>
> ==========
> Brian J. Walsh
> Hydrology Specialist
> SD DENR
> 523 E. Capitol Ave.
> Pierre SD 57501
> 605.773.6477
> (fax) 605.773.6035

Brian.Walsh@state.sd.us

-----Original Message-----
From: Robert Baumgartner [mailto:robert_baumgartner@transcanada.com]
Sent: Sunday, May 23, 2010 10:51 PM
To: Walsh, Brian
Subject: RE: TransCanada Keystone Pipeline - Carpenter Pump Station

Brian, we made good progress onsite today, repaired the leaking component. Our updated approximation is that 5 gallons may have been released. I'll give you a call Monday morning to discuss our proposed soil confirmation sampling plan.

Thank you,
Bob

From: Robert Baumgartner
Sent: Saturday, May 22, 2010 10:03 PM
To: Brian.Walsh@state.sd.us
Subject: TransCanada Keystone Pipeline - Carpenter Pump Station

Brian, wanted to give you an update on today's activities. The site was hit with an estimated 2 ½ inches of rain overnight Friday night which resulted in significant ponding on site in the area we're targeting for excavation. We ended up pumping water nearly all day and used the rest of the day to prepare to for soil hydrovac activities tomorrow morning. Weather permitting we should make progress tomorrow on daylighting the piping and valve stems.

I'll provide you with an update tomorrow when we learn more.

Thank you,
Bob

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
13710 FNB Parkway
Omaha, NE 68154
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Walsh, Brian

From: Walsh, Brian

Sent: Monday, May 24, 2010 9:23 AM

To: Walsh, Brian

Subject: 5/24/10 Robert Baumgartner Call

Bob Baumgartner called at 8:10 on 5/24/10 to update me on the release at the Carpenter pump station. On Sunday they exposed the pipe and determined a suction valve had been dripping. The valve has been repaired. They are planning to collect side wall and bottom of excavation samples to confirm all of the contaminated soil has been removed. Contaminated soil and water have been segregated and will be properly disposed of. Bob asked for information about the nearest regional landfill so I told him I would get it to him. Bob will continue to keep me posted on their progress as the site.

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

==========

Walsh, Brian

From: Walsh, Brian
Sent: Monday, May 24, 2010 8:28 AM
To: 'Robert Baumgartner'
Cc: Walsh, Brian; Kropp, Steve
Subject: RE: TransCanada Keystone Pipeline - Carpenter Pump Station

The nearest Regional Landfill is the Watertown Landfill. The website below has contact and other info about the landfill. Please call if you have any disposal questions.

http://denr.sd.gov/des/wm/landfillmaps/lfwater.aspx

Thanks,

==========

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I'll provide you with an update tomorrow when we learn more.

Thank you,
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Sent: Sunday, May 23, 2010 10:51 PM
To: Walsh, Brian
Subject: RE: TransCanada Keystone Pipeline - Carpenter Pump Station

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Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]

Sent: Saturday, May 22, 2010 10:21 PM

To: Walsh, Brian

Subject: TransCanada Keystone Pipeline - Carpenter Pump Station

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Walsh, Brian

From: Walsh, Brian
Sent: Saturday, May 22, 2010 8:58 AM
To: Markley, Bill; McIntosh, Kim
Cc: Walsh, Brian; Tollefsrud, Tim; Pirner, Steve
Subject: FW: TransCanada Keystone - Pipeline Leak (small)

Good morning,

Bob called this morning with an update. Due to heavy rain at the site there are areas of pooled water where they were planning to do cleanup and expose the pipe to look for leaks. Some of the areas of pooled water had a sheen on them. The areas with a sheen have been isolated and covered with absorbent pads. Other, unimpacted pools have to be pumped off so they can expose the pipe. This is the latest. I keep you posted if I hear more.

Thanks,
Brian

From: Walsh, Brian
Sent: Fri 5/21/2010 6:58 PM
To: Markley, Bill; McIntosh, Kim
Cc: Walsh, Brian; Tollefsrud, Tim; Pirner, Steve
Subject: TransCanada Keystone - Pipeline Leak (small)

Bob Baumgartner with TransCanada called me at 6:40 PM on Friday 5/21 to report a small (one - two gallon) oil leak at thier Carpenter pump station. They believe it is a valve leak. The entire pipeline has been shutdown and will remain down until they determine the exact cause of the leak and repair it. The pipeline is holding pressure so they do not think it is an ongoing leak. They are mobilizing a vac truck and excavator to the site and will begin cleanup and their effort to determine the cause of the leak first thing tomorrow morning. Bob will be onsite tomorrow - his cell number is 402-960-0483. Bob said he would keep me updated on their progress. I will pass along addition info as I have it.

Thanks
Brian
220-2747

Walsh, Brian

From: Walsh, Brian

Sent: Friday, May 21, 2010 6:58 PM

To: Markley, Bill; McIntosh, Kim

Cc: Walsh, Brian; Tollefsrud, Tim; Pirner, Steve

Subject: TransCanada Keystone - Pipeline Leak (small)

Bob Baumgartner with TransCanada called me at 6:40 PM on Friday 5/21 to report a small (one - two gallon) oil leak at thier Carpenter pump station. They believe it is a valve leak. The entire pipeline has been shutdown and will remain down until they determine the exact cause of the leak and repair it. The pipeline is holding pressure so they do not think it is an ongoing leak. They are mobilizing a vac truck and excavator to the site and will begin cleanup and their effort to determine the cause of the leak first thing tomorrow morning. Bob will be onsite tomorrow - his cell number is 402-960-0483. Bob said he would keep me updated on their progress. I will pass along addition info as I have it.

Thanks
Brian
220-2747

NATIONAL RESPONSE CENTER 1-800-424-8802
GOVERNMENT USE ONLYGOVERNMENT USE ONLY***
Information released to a third party shall comply with any
applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 941193

INCIDENT DESCRIPTION

*Report taken by: CIV TIMOTHY SMITH at 19:42 on 21-MAY-10
Incident Type: PIPELINE
Incident Cause: EQUIPMENT FAILURE
Affected Area:
Incident was discovered on 21-MAY-10 at 13:45 local incident time.
Affected Medium: SOIL GROUND

REPORTING PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE
OMAHA, NE
KEYSTONE PIPELINE reported for the responsible party.
PRIMARY Phone: (701)2901176
Type of Organization: PRIVATE ENTERPRISE

SUSPECTED RESPONSIBLE PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE

OMAHA, NE
PRIMARY Phone: (701)2901176

INCIDENT LOCATION

97.216 N County: CLARK
44.62351 W
City: CARPENTER State: SD
CARPENTER PUMP STATION

RELEASED MATERIAL(S)

CHRIS Code: OIL Official Material Name: OIL: CRUDE
Also Known As:
Qty Released: 2 GALLON(S)

DESCRIPTION OF INCIDENT

CALLER IS REPORTING A DISCHARGE OF OIL FROM A PIPELINE AT A PUMP STATION. THE SUSPECTED SOURCE IS A LEAKING VALVE BODY.

SENSITIVE INFORMATION

INCIDENT DETAILS

Pipeline Type: TRANSMISSION
DOT Regulated: YES
Pipeline Above/Below Ground: BELOW
Exposed or Under Water: NO
Pipeline Covered: UNKNOWN

IMPACT

FATALITIES: NO Empl/Crew: Passenger: Occupant:
EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

Closure Type	Description of Closure	Hours Closed	Direction of Closure
Air:	N		
Road:	N		Major Artery: N
Waterway:	N		
Track:			

Environmental Impact: UNKNOWN
Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

CONTRACTOR EN-ROUTE TO EXCAVATE SOIL
Release Secured: YES
Release Rate:
Estimated Release Duration:

WEATHER

Weather: PARTLY CLOUDY, 75||F

ADDITIONAL AGENCIES NOTIFIED

Federal: NONE
State/Local: SD DEC
State/Local On Scene: NONE
State Agency Number: NONE

NOTIFICATIONS BY NRC

USCG ICC (ICC ONI)
21-MAY-10 19:49 (301)6693363
DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
21-MAY-10 19:49 (202)3661863
U.S. EPA VIII (MAIN OFFICE)
(303)2931788
IA U.S. ATTORNEY'S OFFICE (INTELLIGENCE OFFICER)
21-MAY-10 19:49 (515)4739345
NE INFORMATION ANALYSIS CENTER (MAIN OFFICE)
21-MAY-10 19:49
NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
21-MAY-10 19:49 (202)2829201
NOAA RPTS FOR SD (MAIN OFFICE)
21-MAY-10 19:49 (206)5264911
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
21-MAY-10 19:49 (202)3660568
SOUTH DAKOTA DENR (MAIN OFFICE)
21-MAY-10 19:49 (605)7733296
DOI/OEPC DENVER (MAIN OFFICE)
21-MAY-10 19:49 (303)4452500

ADDITIONAL INFORMATION

NO ADDITIONAL INFORMATION TO REPORT.

*** END INCIDENT REPORT #941193 ***
Report any problems by calling 1-800-424-8802

Patch II
10-0133

2010.126

015791

South Dakota Spill Report Form

BM

Dept. of Ag. Case No. _____ State Case No.: 2010.126

Reported: (mm/dd/yy) 6/24/10 Time: Recorded By: Bob MacPhail

A. REPORTER

Reported By: NRC Incident Report via fax

Organization Name:

Organization: ☐ discharger ☐ public ☐ state ☐ local ☐ federal

Address:

City: County: State:

Zip: Phone:

B. DISCHARGER (Responsible Party)

Name: Bob Baumgartner - Keystone Pipeline

Address: 13710 FNB Parkway

City: Omaha County: State:

Zip: 68154 Phone: (402) 492-7464

(402) 960-0483 (cell)

C. INCIDENT LOCATION

As Above in B Street or Approx. Location: Roswell pump station 42592 236 St.

Survey Description: _____ Sec _____ T _____ R _____

City: ~~Howard~~ Roswell County: Miner State:

D. DATE

Spill Date: (mm/dd/yy) 6/23/10 Spill Time:

E. MATERIAL

Material Type (Code/Name): ☐ hazardous substance ☐ material unknown ☐ oil ☐ other	Quantity Spilled	Spilled in Water	Units (Check 1)
Crude Oil	100		☐ lb. ☐ bbl. ☒ gal. ☐ oth.
			☐ lb. ☐ bbl. ☐ gal. ☐ oth.
			☐ lb. ☐ bbl. ☐ gal. ☐ oth.

F. SOURCE

Source of Spill: ☐ AST ☐ UST ☐ railway ☐ vessel ☐ fixed facility ☐ pipeline ☐ highway ☐ air transport

Description: leaking pump station

G. MED.

Medium Affected: ☐ air ☐ land ☐ water ☐ groundwater ☐ within facility only

Waterway Affected:

H. CAUSE

Reported Cause: ☐ transportation accident ☐ operational error ☐ dumping ☐ Other ☐ equipment failure ☐ natural phenomenon ☐ unknown

Description:

I. DAM.

Damages: No. of injuries _____ No. of deaths _____ Property damage > $50,000 _____

J. ACTIONS

☐ Evacuation Response Action Taken:

Appr. 80 gallons already recovered

K. NOTI-FIED

Responding Agency: ☐ DENR ☐ DOA ☐ discharger ☐ federal ☐ EPA ☐ local

Agencies Notified:

L. COMMENTS

Comments: Contaminated gravel / soil / will be excavated & disposed of. Post excavation sampling to be done

Department of Environment and Natural Resources
Ground Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57501-3182

43.965346
-97.694305

Business Hours M thru F 8:00 – 5:00pm
Normal business hours – (605) 773-3296
After business hours – (605) 773-3231

2010. 126

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

June 25, 2010

Robert Baumgartner
TransCanada Keystone
13710 FNB Parkway
Omaha, NE 68154

Subject: Department of Environment and Natural Resources File Number – 2010.126 – Oil Spill @ Roswell Pump Station

Dear Mr. Baumgartner:

The Department of Environment and Natural Resources is contacting you regarding the above referenced event. This office has recorded the information provided about this event on an initial spill report form (enclosed for your review). The procedures for assessment and remediation of a release such as this were developed to prevent pollution of the waters of the State. In this situation, the following steps must be taken:

- By July 23, 2010, please complete and return the attached Written Contamination Incident Follow Up Report form (this is a standard form so some questions will not apply to this situation, just skip those questions.
- Please also provide this office with a narrative of actions taken in response to this event, to include: waste disposal receipts & sample analyses.

I have been assigned as the project manager of this case. Once I have reviewed all of the information on this case I will contact you to discuss any further actions that may be needed. If you have any questions or need additional information, please do not hesitate to contact me. If you have questions regarding the appropriate disposal of impacted substances contact our Waste Management Program at (605) 773-3153.

Thank you for your environmental stewardship and willingness to document the response efforts.

Sincerely,

Bob McDonald
Ground Water Quality Program
Phone: (605) 773-3296

Enclosures

cc: Bob Calmus, Miner County Emergency Management, Howard, SD

015793

DENR FILE #: 2010.126

WRITTEN CONTAMINATION INCIDENT FOLLOW-UP REPORT
(Page 1 of 2)

RECEIVED
JUL 23 2010
DEPT. OF ENVIRONMENT & NATURAL RESOURCES, GROUND WATER PROGRAM

RETURN COMPLETED FORM TO

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GROUND WATER QUALITY PROGRAM
JOE FOSS BUILDING
523 EAST CAPITOL AVENUE
PIERRE SD 57501-3182

SITE NAME: TransCanada Keystone Pipeline-Roswell Pump Station

SPILL LOCATION: 42592 236th Street, Roswell, SD

LATITUDE: 43.965346 LONGITUDE : -97.694305

LEGAL LOCATION (TOWNSHIP/RANGE): SE 1/4 SEC.20, T106N, R57W

RESPONSIBLE PARTY: TransCanada Keystone Pipeline, LP

MAILING ADDRESS: 13710 FNB Parkway

CITY: Omaha STATE : NE ZIP: 68154

TELEPHONE: _____ (HOME) (402) 492-7300 (WORK)

DATE OF SPILL OR WHEN DETECTED: 6/23/2010 TIME: 12 noon, CDT

WHAT WAS THE DURATION OF THE RELEASE? Approx. 3 seconds of oil spray on 6/23/2010

SUBSTANCE(S) RELEASED: Crude Oil

QUANTITY RELEASED: Approximately 100 gallons

CHEMICAL NAME: Canadian Sour Crude CAS #: _____
CAS # 8002.05.09

IS SUBSTANCE ON THE "SARA 302 LIST"? YES ____ NO ✓ DON'T KNOW ____
"CERCLA HAZARDOUS SUBSTANCE LIST"? YES ____ NO ✓ DON'T KNOW ____
"SOUTH DAKOTA REGULATED SUBSTANCE"? YES ✓ NO ____ DON'T KNOW ____

CONSULTANT: URS Corporation

IDENTIFY KNOWN HEALTH RISKS: None known

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED? None required

LAND USE (RESIDENTIAL, INDUSTRIAL, RURAL, OTHER): Rural

UTILITIES INVESTIGATED (WATER, SEWER, TELEPHONE, CATV, STORM WATER, OTHER):

Release occurred in rural setting. No utilities.

015794

RECEIVED

JUL 23 2010

DEPT. OF ENVIRONMENT &
NATURAL RESOURCES,
GROUND WATER PROGRAM

FOLLOW-UP REPORT CONTINUED
(Page 2 of 2)

DENR FILE #: 2010.126

ENVIRONMENTAL MEDIA IMPACTED (SURFACE SOIL, SUBSURFACE SOIL > 3' BELOW GROUND, GROUND WATER, SURFACE WATER, INDOOR AIR, OUTDOOR AIR, ETC.):

Surface soil and surface rain water only.

DISTANCE TO AND NAME OF CLOSEST SURFACE WATER OR DRAINAGE:

Road ditch along 236th Street with Twin Lakes 1 mile west of site.

DEPTH/DISTANCE TO AND NAME OF CLOSEST AQUIFER: 25-50 feet/0 feet to Floyd Aquifer

DEPTH/DISTANCE TO NEAREST DRINKING WATERWELL: Suspect farm 2 miles south

CUBIC YARDS OF SOIL EXCAVATED/TREATED: Approximately 200

WAS FREE PHASE OR POOLED PRODUCT PRESENT? Yes

DIMENSIONS OF EXCAVATION: 60 ft. by 110 ft.

CONTAMINATED MATERIALS DISPOSAL SITE: Waste Management-Spruce Ridge LF

DATE MATERIAL WAS DISPOSED OF: To be determined. Scheduled for late July, 2010.

IMMEDIATE CORRECTIVE ACTION TAKEN AND ADDITIONAL WORK PLANNED:

See attached text.

FORM COMPLETED BY: Hubert Huls, URS Corporation DATE: July 20, 2010

Closure 2010.126

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov

September 8, 2010

Bob Baumgartner
TransCanada Keystone Pipeline
13710 FNB Parkway
Omaha, NE 68154

Subject: Closure of Department of Environment and Natural Resources File Number 2010.126 – Oil Spill at Roswell Pump Station.

Dear Mr. Baumgartner:

The Department of Environment and Natural Resources has conducted a review of the information that has been provided concerning this site. Based upon that information, the department has determined that the file can be closed.

The information provided to date indicates that the release was cleaned up immediately and the contaminated materials were disposed of properly. DENR does not anticipate any additional remediation to be performed at this site. Please be aware that if future environmental problems arise as a result of this event, TransCanada Keystone Pipeline may be required to conduct additional assessment and cleanup. Should you have any questions concerning this letter, please contact Bob McDonald of my staff.

Sincerely,

Bill Markley, Administrator
Ground Water Quality Program
(605) 773-3296

cc: Bob Calmus, Miner County Emergency Management, Howard, SD

McDonald, Robert

From: Robert Baumgartner [robert_baumgartner@transcanada.com]
Sent: Saturday, August 28, 2010 12:21 PM
To: McDonald, Robert
Cc: Robert Baumgartner
Subject: RE: Roswell - SD DENR Incident Follow-Up Report File # 2010.126

Bob, find attached the soil disposal receipts and manifests related to the Roswell Pump Station Incident #2010.126. Fourteen roll-off boxes of soil totaling 161.28 tons were transported for disposal at the Waste Management Spruce Ridge Landfill in Glencoe, MN. Because of transportation availability limitations the trans/disposal occurred from July 23 through August 23, 2010.

Also find attached a copy of the Safety Kleen receipt for disposal of 2,500 gallons of oily water on July 9, 2010. Please note the entry on the receipt under the Purchase Order field showing "rswl ps", this represents Roswell Pump Station as the liquids origin.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

From: Hubert_Huls@URSCorp.com [mailto:Hubert_Huls@URSCorp.com]
Sent: Friday, July 23, 2010 12:44 PM
To: robert.mcdonald@state.SD.US
Cc: Steve_McManamon@URSCorp.com; Robert Baumgartner
Subject: Roswell - SD DENR Incident Follow-Up Report File # 2010.126

Bob McDonald,

Attached files are the Contamination Incident Follow-Up Report and all attachments except for the landfill tickets and manifests which will be sent later when soil disposal is completed. This report is submitted on behalf of TransCanada/ Keystone Pipeline for the release incident along the pipeline in the Roswell, SD pump station. If you have any questions, feel free to contact us. Thanks.

(See attached file: Roswell-SpillsFollowUpReport 072010.pdf)(See attached file: Analytical Summary Table Roswell 071410.pdf)(See attached file: Figure1.pdf)(See attached file: Figure2.pdf)(See attached file: Figure3.pdf)(See attached file: Remediation Corrective Action Section Text Final 072310.pdf)(See attached file: Roswell oily water disposal receipt.pdf)

Hubert H. Huls, PE
Principal Environmental Engineer
URS Corporation
100 South Fifth Street, Suite 1500
Minneapolis, MN 55402
Tel: 612-370-0700
Direct: 612-373-6805
Fax: 612-370-1378
hubert_huls@urscorp.com

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This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Safety-Kleen Systems, Inc.

5360 Legacy Drive,
Building 2, Suite 100
Plano, Texas 75024
800-669-5740
605-332-0231

REFERENCE NBR 51385840

CUSTOMER# 10014347 TRANSCANADA KEYSTONE PIPELINE
19051 415TH AVENUE
CARPENTER SD 57322
PHONE 402-492-7464

SRVC WEEK: 2010-28
SRVC DATE: 07/09/10 16:56

PURCHASE ORDER# rswl ps TAX EXEMPTION NBR

PRODUCT/SERVICES

SERVICE/ PRODUCT		QTY	UNIT PRICE	TAX	TOTAL CHARGE
40423593/ 66666	VACUUM SVC LIQ (PQUAL)	2500.000	0.0000	0.00	0.00
	SERVICE TERM 52				
	VAC PM TEST: 8				
10901	VAC SVS SERVICEFEE 1	1.000	87.0000	3.48	90.48
10970	FEE, VAC SVC NO SOLIDS	2500.000	0.9500	0.04	2375.00
	TOTAL SERVICE/PRODUCTS		87.9500	98.48	2560.48

TOTAL CHARGE	2560.48
CREDITS	0.00
TOTAL DUE	2560.48

UNPAID BALANCE THIS RECEIPT 2560.48

Per SK BOG M420-001 the halogen detecting instrument has been zeroed and validated.

GENERATOR STATUS
CESQG: Non-vehicle

Customer certifies that (i) the above-named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and (ii) no material change has occurred either in the characteristics of the waste/material or in the process generating the waste/material. Customer agrees to pay the above charges and to be bound by the terms and conditions (1) set forth in (a) the General Terms and Conditions provided separately to Customer or (b) any SK agreement signed by Customer and SK, and (2) incorporated herein by reference. Unless otherwise indicated in the payment received section, SK is authorized to charge Customer's account for this transaction. Customer certifies that the individual signing this Service Acknowledgement is duly authorized to sign and bind Customer. The following provision is applicable to Safety-Kleen's parts cleaner and paint gun cleaner services: Customer agrees that it will not introduce any substance into the solvent or aqueous cleaning solution, including without limitation any hazardous waste or hazardous waste constituent, except to the extent such introduction is incidental to the normal use of the machine. Customer further agrees that it will not clean parts/paint guns that have been contaminated with or otherwise introduce polychlorinated biphenyls (PCB's), herbicides, pesticides, dioxins or listed hazardous waste into the solvent or aqueous cleaning solution. Safety-Kleen has the capacity and is permitted to accept, store, and/or reclaim the spent parts washer solvent; paint thinners, solvents and paints generated by customer; or dry cleaning filter cartridges, powder, and still residues containing perchloroethylene, petroleum naphtha, or trifluorotrichloroethane dry cleaning solvents. Safety-Kleen and customer agree that this agreement is intended to satisfy the requirements of 40 CFR 262.20(e). IN THE EVENT OF AN EMERGENCY CALL 1-800-468-1760 (24 hours)

X Robert M. Baumgartner

CUSTOMER / GENERATOR :bob baumgartner

X

TRANSPORTER :bgalvin

www.safety-kleen.com // Safety-Kleen. // www.safety-kleen.com // Safety-Kleen. // www.safety-kleen.com // Safety-Kleen. // www.safety-kleen.com

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5

279129- 6.09T
279131- 6.27T

Manifest No. 56068

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA/KEYSTONE PIPELINE
42592 236th STREET

b) Generator's Address: HOWARD, SD 57349

c) Generator's Representative: WAYNE BARRETH

d) Telephone Number: (701) 770-6540

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: INDUSTRIAL

g) Description of Waste: OILY CONT. SOIL

h) Disposal Volume: 6.09

✓ Tons ___ Cubic Yards ___ Other ___

i) Number of Containers: 2

i) Generating Location (Name):

k) Address:

d) Telephone Number:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ___ % friable ___ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ___

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL PLASTIC BAG
BC - 12 MIL PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X RODRICK McGILLIVRAY — Generator's Authorized Agent Name (print/type)

X [signature] — Signature of Generator's Authorized Agent

7-26-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Waste Management

b) Transporter's Address: Worster

c) Telephone Number:

d) Vehicle License No./State: A9398

e) Trailer or Container No.:

f) Name of Driver (print/type) Adam Jaskm

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.

[signature] — Signature of Driver — 7-26-10 — Date of Receipt

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.

[signature] — Signature of Driver — 7-26-10 — Date of Delivery

SECTION 3 TRANSFER FACILITY (Complete if applicable)

a) Transfer Facility's Name:

b) Transfer Facility's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.

Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.

Signature of Transfer Facility's Authorized Agent — Date of [illegible]

SECTION 4 TRANSPORTER 2 (Complete if applicable)

a) Transporter's Name:

b) Transporter's Address:

c) Telephone Number:

d) Vehicle License No./State:

e) Trailer or Container No.:

f) Name of Driver (print/type)

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.

Signature of Driver — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.

Signature of Driver — Date of Delivery

SECTION 5 DISPOSAL FACILITY

a) Disposal Facility's Name: SPRUCE RIDGE LF

b) Physical Address: 12755 137th AVE GLENCOE, MN 55336

c) Telephone Number: 320-864-5503

d) Mailing Address: SAME

e) Name of Disposal Facility's Authorized Agent (print/type) Kelly Harrington

f) The material delivered by the Transporter has been received at the Disposal Facility.

[signature] — Signature of Disposal Facility's Authorized Agent — 7.26.10 — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.

Signature of Disposal Facility's Authorized Agent — Date of Rejection

Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:

c) Telephone Number:

b) Operator's Address:

d) Recommended special handling instructions and additional information:

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CAN[illegible]

015800

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279129

Customer Name WM-UPSTREAM
Ticket Date 07/26/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 56068
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMWINSTED WM-WINSTED
Vehicle# 486 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License YBA9398/X

	Time	Scale	Operator
In	07/26/2010 17:00:42	Scale	Kel
Out	07/26/2010 17:11:52	Scale	Kel

Gross	43540 lb
Tare	31360 lb
Net	12180 lb
Tons	6.09

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	6.09	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015801

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279131

Customer Name WM-UPSTREAM
Ticket Date 07/26/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 56068
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMWINSTED WM-WINSTED
Vehicle# 486 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License YBA9398/X

	Time	Scale	Operator		
In	07/26/2010 17:20:09	Scale	Kel	Gross	57680 lb
Out	07/26/2010 17:20:45	Scale	Kel	Tare	33140 lb
				Net	24540 lb
				Tons	12.27

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	12.27	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015802

279229-14.11T

279232-10.88T

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 59555

SECTION 1 — GENERATOR INFORMATION (generator to complete)

a) Generator's Name: RANSOM HILL/KEYSTONE PIPELINE
j) Generating Location (Name):
b) Generator's Address: 42592 236TH ST HOWARD SD 57349
k) Address:
c) Generator's Representative: [illegible]
d) Telephone Number:
d) Telephone Number: [illegible]
e) WASTE MANAGEMENT APPROVAL CODE 101682MN
f) Common Name of Waste: [illegible]
m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ____ % friable ____ % non-friable; ☐ N/A
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: ✓ Tons 14.11 / 10.88 Cubic Yards ____ Other ____
n) Type of Containers: ☐☐ How many ____
i) Number of Containers: 2

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Rodrick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7-27-10 — Shipment Date

SECTION 2 — TRANSPORTER 1

a) Transporter's Name: Waste Management 10.45
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State: A9398
e) Trailer or Container No.:
f) Name of Driver (print/type) Adam Sasken
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
Signature of Driver — Date of Receipt 7-27-10
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
Signature of Driver — Date of Delivery 7-27-10

SECTION 3 — TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Signature of Driver — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Signature of Driver — Date of Delivery

SECTION 5 — DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF SW6
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) Kelly Lutzjohn
f) The material delivered by the Transporter has been received at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Receipt 7-27-10
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015803

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279232

Customer Name	WM-UPSTREAM	Carrier	WMWINSTED WM-WINSTED
Ticket Date	07/27/2010	Vehicle#	486 Volume
Payment Type	Credit Account	Container	
Manual Ticket#		Driver	
Hauling Ticket#		Check#	
Route		Billing #	0000502
State Waste Code		Gen EPA ID	
Manifest	59555	License	YBA9398/X
Destination	6 PHASE		
PO			

Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

	Time	Scale	Operator		
In	07/27/2010 16:41:27	Scale	Kel	Gross	54780 lb
Out	07/27/2010 16:52:51	Scale	Kel	Tare	33020 lb
				Net	21760 lb
				Tons	10.88

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	10.88	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature _____

402WM

015804

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279229

Customer Name WM-UPSTREAM
Ticket Date 07/27/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 59555
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMWINSTED WM-WINSTED
Vehicle# 486 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License YBA9398/X

	Time	Scale	Operator		
In	07/27/2010 16:16:28	Scale	Kel	Gross	61620 lb
Out	07/27/2010 16:28:47	Scale	Kel	Tare	33400 lb
				Net	28220 lb
				Tons	14.11

Comments Driver Name: adam, Route: wmupstream-industrial waste, hauling from South Dak

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	14.11	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015805

279461 - 14.64 tn

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 59556

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA / KEYSTONE PIPELINE
42592 236th STREET
b) Generator's Address: HOWARD, SD 57349

j) Generating Location (Name):
k) Address:

c) Generator's Representative: WAYNE BARRETH
d) Telephone Number:
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN
f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: _____ Tons _____ Cubic Yards _____ Other
i) Number of Containers:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Roderick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7-29-10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Waste Management Marshall
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State: RRY-6903
e) Trailer or Container No.: CGT-3033
f) Name of Driver (print/type) Pat Maxwell
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
[signature] — Signature of Driver
7-29-10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
Signature of Driver — Date of Delivery

SECTION 3 TRANSFER FACILITY (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name: Waste Management Marshall MN
b) Transporter's Address: 105 Channel Pkwy Marshall MN
c) Telephone Number: (507) 923-3770
d) Vehicle License No./State: DRY 6903 / MN
e) Trailer or Container No.: 29-611
f) Name of Driver (print/type) Bill Bloedow
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Bill Bloedow — Signature of Driver
7/30/10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Bill Bloedow — Signature of Driver
7/30/10 — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF SW-6
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number:
d) Mailing Address:
e) Name of Disposal Facility's Authorized Agent (print/type) Faye Bruckschen
f) The material delivered by the Transporter has been received at the Disposal Facility.
Faye Bruckschen — Signature of Disposal Facility's Authorized Agent
7-30-10 — Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015806

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279461

Customer Name	WM-MARSHALL	Carrier	WMMarshall WMMARSHALL
Ticket Date	07/30/2010	Vehicle#	243 Volume
Payment Type	Credit Account	Container	
Manual Ticket#		Driver	
Hauling Ticket#		Check#	
Route		Billing #	0000390
State Waste Code		Gen EPA ID	
Manifest	59556	License	PRY6903/4X
Destination	6 PHASE		
PO			
Profile	101682MN (OILY CONTAMINATED SOIL)		
Generator	148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE		

	Time	Scale	Operator		
In	07/30/2010 11:36:33	Scale	faye	Gross	63720 lb
Out	07/30/2010 11:52:03	Scale	faye	Tare	34440 lb
				Net	29280 lb
				Tons	14.64

Comments cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	14.64	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature Brett Blanton

402WM

015807

2-142355-19241

59557

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No.

GENERATOR INFORMATION (generator to complete)

1

a) Generator's Name: TRANSCANADA | KEYSTONE
b) Generator's Address: 42592 236th ST HOWARD, SD 57349
c) Generator's Representative:
d) Telephone Number:
e) WASTE MANAGEMENT APPROVAL CODE: 101682MN
f) Common Name of Waste:
g) Description of Waste: SOIL CONT. SOIL 14.50
h) Disposal Volume: Tons 10 Cubic Yards Other
i) Generating Location (Name):
k) Address:
d) Telephone Number:
m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ☐ N/A; % friable % non-friable
n) Type of Containers: ☐☐ How many

TYPE OF CONTAINERS:
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

i) Number of Containers:

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Roderick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 2-26-2010 — Shipment Date

1 — 3

a) Transporter's Name: Waste Management Sioux Falls SD.
b) Transporter's Address: 2221 E. Rice St Sioux Falls SD.
c) Telephone Number:
d) Vehicle License No./State: AR16767
e) Trailer or Container No.: 20-960
f) Name of Driver (print/type): Bill Sowell
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
[signature] — Signature of Driver — 2-26-10 Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
[signature] — of Driver — 2-27-2010 Date of Delivery

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Signature of Driver — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
of Driver — Date of Delivery

5

a) Disposal Facility's Name: SPRUCE RIDGE LF SW-6
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type): Kelly Hutchison
f) The material delivered by the Transporter has been received at the Disposal Facility.
[signature] — Signature of Disposal Facility's Authorized Agent — 2.27.10 Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
b) Operator's Address:
c) Telephone Number:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.
Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date
f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015808

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279233

Customer Name WM-UPSTREAM
Ticket Date 07/27/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 59557
Destination 6 PHASE
PO

Carrier WMSOUTHDAKOTA WM-SOUTH DAKOTA
Vehicle# 498 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PRY6767/4X-SD

Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

	Time	Scale	Operator		
In	07/27/2010 16:52:21	Scale	Kel	Gross	72760 lb*
Out	07/27/2010 17:27:17	Scale	Kel	Tare	33760 lb
			* Manual Weight	Net	39000 lb
				Tons	19.50

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	19.50	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015809

278951 - 10.06T

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 59560

SECTION 1 — GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA / KEYSTONE PIPELINE
b) Generator's Address: 42592 236th STREET HOWARD, SD 57349
c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN
f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 10.06 ☑ Tons ☐ Cubic Yards ☐ Other
i) Number of Containers:
i) Generating Location (Name):
k) Address:
d) Telephone Number:
m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable ☐ Non-friable; ☐ N/A
n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X CODRICK McGILLIVRAY — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7/22/10 — Shipment Date

SECTION 2 — TRANSPORTER 1

a) Transporter's Name: Waste Management
b) Transporter's Address: 905 channel Pkway Marshall
c) Telephone Number: 507 929-5770
d) Vehicle License No./State: MN/ PRY6903 (409243)
e) Trailer or Container No.: 205
f) Name of Driver (print/type) Bill Bloedow
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
Bill Bloedow — Signature of Driver; 7/22/10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
Bill Bloedow — Signature of Driver; 7/23/10 — Date of Delivery

SECTION 3 — TRANSFER FACILITY (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Signature of Driver — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Signature of Driver — Date of Delivery

SECTION 5 — DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF SW6
b) Physical Address: 12756 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) Kelly Lutsgarten
f) The material delivered by the Transporter has been received at the Disposal Facility.
[signature] — Signature of Disposal Facility's Authorized Agent; 7.23.10 — Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

25

015810

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 278951

Customer Name WM-UPSTREAM
Ticket Date 07/23/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest ~~56067~~ 59560
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMMarshall WMMARSHALL
Vehicle# 243 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PRY6903/4X

	Time	Scale	Operator		
In	07/23/2010 09:45:33	Scale	Kel	Gross	56880 lb
Out	07/23/2010 09:59:43	Scale	Kel	Tare	36760 lb
				Net	20120 lb
				Tons	10.06

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	10.06	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015811

28082-8089

NON-HAZARDOUS WASTE MANIFEST

WASTE MANAGEMENT

If waste is asbestos waste, complete all Sections. If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

28084-8.17

Manifest No. 59554

SECTION 1 — GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA / KEYSTONE PIPELINE
b) Generator's Address: 42592 236th Street Howard, SD 57349

i) Generating Location (Name):
k) Address:

c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 8.83 / 8.17
☑ Tons ☐ Cubic Yards ☐ Other
i) Number of Containers: 2 loads

m) Asbestos ONLY - ☐ Friable; ☐ Non-friable; ☐ Both; ☐ N/A; ____ % friable ____ % non-friable

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Rodrick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 8-10-2010 — Shipment Date

SECTION 2 — TRANSPORTER 1

a) Transporter's Name: Waste Management
b) Transporter's Address: 2221 E. Rice St Sioux Falls SD.
c) Telephone Number:
d) Vehicle License No./State: AR96267 S.D.
e) Trailer or Container No.: 20-625
f) Name of Driver (print/type) Bill Sowell

g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
Bill Sowell — Signature of Driver
8-10-2010 — Date of Receipt

h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
Bill Sowell — Signature of Driver
8-10-2010 — Date of Delivery

SECTION 3 — TRANSFER FACILITY (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name: Waste Management
b) Transporter's Address: Marshall, MN
c) Telephone Number:
d) Vehicle License No./State: PRY-6903
e) Trailer or Container No.: CZT-3033
f) Name of Driver (print/type) Pat Maxwell

g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Pat Maxwell — Signature of Driver
8-20-10 — Date of Receipt

h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Pat Maxwell — Signature of Driver
8-23-10 — Date of Delivery

SECTION 5 — DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) Faye Bruckscher

f) The material delivered by the Transporter has been received at the Disposal Facility.
Faye Bruckscher — Signature of Disposal Facility's Authorized Agent
8-23-10 — Date of Receipt

g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information: 101682MN

e) Operator's Certification: I hereby warrant, and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015812

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 280814

Customer Name WM-MARSHALL
Ticket Date 08/23/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 59554
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMMarshall WMMARSHALL
Vehicle# 243 Volume
Container
Driver
Check#
Billing # 0000390
Gen EPA ID
License PRY6903/4X

	Time	Scale	Operator
In	08/23/2010 08:23:14	Scale	Kel
Out	08/23/2010 08:35:48	Scale	Kel

Gross	52920 lb
Tare	36580 lb
Net	16340 lb
Tons	8.17

Comments transcanada-cont soil

Product		LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	8.17	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015813

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 280812

Customer Name	WM-MARSHALL	Carrier	WMMarshall WMMARSHALL
Ticket Date	08/23/2010	Vehicle#	243
Payment Type	Credit Account	Container	
Manual Ticket#		Driver	
Hauling Ticket#		Check#	
Route		Billing #	0000390
State Waste Code		Gen EPA ID	
Manifest	59554	License	PRY6903/4X
Destination	6 PHASE		
PO			
Profile	101682MN (OILY CONTAMINATED SOIL)		
Generator	148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE		

	Time	Scale	Operator		
In	08/23/2010 07:58:25	Scale	faye	Gross	51980 lb
Out	08/23/2010 08:12:04	Scale	Kel	Tare	34200 lb
				Net	17780 lb
				Tons	8.89

Comments cont soil- transcanada/keystone pipeline

Product		LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	8.89	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015814

279432 - 13.27 T
279439 - 11.81 T

WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 56062

SECTION 1 — GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA / KEYSTONE PIPELINE
42592 236TH STREET
b) Generator's Address: HOWARD, SD 57349

i) Generating Location (Name):
k) Address:

c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540

d) Telephone Number:

e) WASTE MANAGEMENT APPROVAL CODE 101682MN

f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 13.27 / 11.81
✓ Tons ____ Cubic Yards ____ Other
i) Number of Containers: 2

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Robert McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7-30-10 — Shipment Date

SECTION 2 — TRANSPORTER 1

a) Transporter's Name: WM PCW
b) Transporter's Address: Winsted
c) Telephone Number:
d) Vehicle License No./State: 563316
e) Trailer or Container No.:
f) Name of Driver (print/type) BRETT SCHMIDT
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
[signature] — Signature of Driver — 7-30-10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
[signature] — Signature of Driver — 7-30-10 — Date of Delivery

SECTION 3 — TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Signature of Driver — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Signature of Driver — Date of Delivery

SECTION 5 — DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) Faye Bruckscher
f) The material delivered by the Transporter has been received at the Disposal Facility
Faye Bruckscher — Signature of Disposal Facility's Authorized Agent — 7-30-10 — Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or recovered, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:

e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE - SECTION 1 (except Section 6) / CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015815

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279432

Customer Name	WM-WINSTED	Carrier	WMWINSTED WM-WINSTED
Ticket Date	07/30/2010	Vehicle#	756 Volume
Payment Type	Credit Account	Container	
Manual Ticket#		Driver	Brett
Hauling Ticket#		Check#	
Route		Billing #	0000040
State Waste Code		Gen EPA ID	
Manifest	56062	License	YAS6336/3X
Destination	6 PHASE		
PO			
Profile	101682MN (OILY CONTAMINATED SOIL)		
Generator	148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE		

	Time	Scale	Operator
In	07/30/2010 09:22:09	Scale	faye
Out	07/30/2010 09:32:43	Scale	faye

Comments oily cont soil

Gross	60940 lb
Tare	34400 lb
Net	26540 lb
Tons	13.27

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	13.27	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

015816

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279439

Customer Name WM-WINSTED
Ticket Date 07/30/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 56062
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMWINSTED WM-WINSTED
Vehicle# 756 Volume
Container
Driver Brett
Check#
Billing # 0000040
Gen EPA ID
License YAS6336/3X

	Time	Scale	Operator
In	07/30/2010 09:41:46	Scale	faye
Out	07/30/2010 09:55:17	Scale	faye

Comments cont soil- south dakota

Gross	58560 lb
Tare	34940 lb
Net	23620 lb
Tons	11.81

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	11.81	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature

402WM

279470 ~ 10.18

WM Trailer
WASTE MANAGEMENT

NON-HAZARDOUS WASTE MANIFEST
If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 56064

SECTION 1 — GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA/KEYSTONE PIPELINE
b) Generator's Address: 42592 236th STREET HOWARD, SD 57349
c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN
f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 10.18
☑ Tons ☐ Cubic Yards ☐ Other
i) Number of Containers:
j) Generating Location (Name):
k) Address:
m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable ☐ Non-friable; ☐ N/A
n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Bob Rick McClilliveray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7-29-10 — Shipment Date

SECTION 2 — TRANSPORTER 1

a) Transporter's Name: waste Management
b) Transporter's Address: marshall, mn
c) Telephone Number:
d) Vehicle License No./State: PRY-6903
e) Trailer or Container No.: 20-611
f) Name of Driver (print/type) Pat Maxwell
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
[signature] — Signature of Driver — 7-29-10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
Signature of Driver — Date of Delivery

SECTION 3 — TRANSFER FACILITY - (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — TRANSPORTER 2 - (Complete if applicable)

a) Transporter's Name: Waste Management
b) Transporter's Address: 905 channel Pkw Marshall MN
c) Telephone Number: (507) 929-3770
d) Vehicle License No./State: PRY 6903 MN
e) Trailer or Container No.: 3011
f) Name of Driver (print/type) Bill Bloedow
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Bill Bloedow — Signature of Driver — 7/30/10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Bill Bloedow — Signature of Driver — 7/30/10 — Date of Delivery

SECTION 5 — DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF SW-6
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) Faye Bruckschen
f) The material delivered by the Transporter has been received at the Disposal Facility.
Faye Bruckschen — Signature of Disposal Facility's Authorized Agent — 7-30-10 — Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
b) Operator's Address:
c) Telephone Number:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.

Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date

f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015818

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279470

Customer Name	WM-MARSHALL	Carrier	WMMarshall WMMARSHALL
Ticket Date	07/30/2010	Vehicle#	243 Volume
Payment Type	Credit Account	Container	
Manual Ticket#		Driver	
Hauling Ticket#		Check#	
Route		Billing #	0000390
State Waste Code		Gen EPA ID	
Manifest	56064	License	PRY6903/4X
Destination	6 PHASE		
PO			
Profile	101682MN (OILY CONTAMINATED SOIL)		
Generator	148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE		

	Time	Scale	Operator
In	07/30/2010 12:01:03	Scale	faye
Out	07/30/2010 12:28:44	Scale	faye

Comments cont soil

Gross	56880 lb
Tare	36520 lb
Net	20360 lb
Tons	10.18

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	10.18	Tons				SDAK

Total Tax
Total Ticket

Driver's Signature Brian Bladow

402WM

WASTE MANAGEMENT

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

Manifest No. 00000

SECTION 1 — **GENERATOR INFORMATION (generator to complete)**

a) Generator's Name: TRANSCANADA/KEYSTONE PIPELINE
42592 236th STREET
b) Generator's Address: HOWARD, SD 57349
c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN

i) Generating Location (Name): #56066
k) Address:
d) Telephone Number:

f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 10.53
☑ Tons ☐ Cubic Yards ☐ Other
i) Number of Containers:

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A
n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.

X Roderick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7-28-10 — Shipment Date

SECTION 2 — **TRANSPORTER 1**

a) Transporter's Name: Waste Management
b) Transporter's Address: Wasted
c) Telephone Number:
d) Vehicle License No./State: A9398
e) Trailer or Container No.:
f) Name of Driver (print/type) Adam Sasken
g) I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.
[signature] — Signature of Driver — 7-28-10 — Date of Receipt
h) I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.
[signature] — Signature of Driver — 7-28-10 — Date of Delivery

SECTION 3 — **TRANSFER FACILITY - (Complete if applicable)**

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)
g) I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Receipt
h) I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 — **TRANSPORTER 2 - (Complete if applicable)**

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)
g) I hereby warrant that the above named and described material was received on the date of receipt referenced below.
Signature of Driver — Date of Receipt
h) I hereby warrant that the above named and described material was delivered on the delivery date referenced below.
Signature of Driver — Date of Delivery

SECTION 5 — **DESTINATION (Disposal Facility)**

a) Disposal Facility's Name: SPRUCE RIDGE LF SW-6
b) Physical Address: 12755 137th AVE GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address: SAME
e) Name of Disposal Facility's Authorized Agent (print/type) [signature]
f) The material delivered by the Transporter has been received at the Disposal Facility.
[signature] — Signature of Disposal Facility's Authorized Agent — 7-28-10 — Date of Receipt
g) The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 — **ASBESTOS (operator to complete)**

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name:
c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.
Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date
f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

015820

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 279293

Customer Name WM-UPSTREAM
Ticket Date 07/28/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 56066
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMWINSTED WM-WINSTED
Vehicle# 486
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License YBA9398/X

Volume

	Time	Scale	Operator		
In	07/28/2010 14:19:29	Scale	Kel	Gross	55020 lb
Out	07/28/2010 14:32:41	Scale	Kel	Tare	33960 lb
				Net	21060 lb
				Tons	10.53

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	10.53	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature _____

402WM

015821

WASTE MANAGEMENT XYK

NON-HAZARDOUS WASTE MANIFEST

If waste is asbestos waste, complete all Sections.
If waste is NOT asbestos waste, complete only Sections 1,2,3,4, and 5.

278943-11.42T

Manifest No. 56067

SECTION 1 GENERATOR INFORMATION (generator to complete)

a) Generator's Name: TRANSCANADA/KEYSTONE PIPELINE
42592 236th STREET
b) Generator's Address: HOWARD, SD 57349

i) Generating Location (Name):
k) Address:.

c) Generator's Representative: WAYNE BARRETH
d) Telephone Number: (701) 770-6540
e) WASTE MANAGEMENT APPROVAL CODE 101682MN

d) Telephone Number:

f) Common Name of Waste: INDUSTRIAL
g) Description of Waste: OILY CONT. SOIL
h) Disposal Volume: 11.42 ☐ Tons ☐ Cubic Yards ☐ Other
i) Number of Containers: 1

m) Asbestos ONLY - ☐ Friable; ☐ Both; ____ % friable ____ % non-friable
☐ Non-friable; ☐ N/A

n) Type of Containers: ☐☐ How many ____

TYPE OF CONTAINERS
TR - TRUCK
DM - METAL DRUM
DP - PLASTIC DRUM
BA - BAG
BB - 6 MIL. PLASTIC BAG
BC - 12 MIL. PLASTIC BAG

o) **I hereby warrant that the above named material is the same material as represented on the Special Waste Disposal Application identified by the above Waste Management Code and such material was delivered to the transporter on the shipment date referenced below.**

X Roderick McGillivray — Generator's Authorized Agent Name (print/type)
X [signature] — Signature of Generator's Authorized Agent
X 7/22/10 — Shipment Date

SECTION 2 TRANSPORTER 1

a) Transporter's Name: Waste Management
b) Transporter's Address: 905 channel RKY Mansfield Sen
c) Telephone Number: 507 629-3770
d) Vehicle License No./State: MN RAY 6903 (406243)
e) Trailer or Container No.: 2032
f) Name of Driver (print/type) Bill Bladow

g) **I hereby warrant that the above named and described material was received from the generator on the date of delivery referenced below.**
Bill Bladow — Signature of Driver — 7/22/10 — Date of Receipt

h) **I hereby warrant that the above named and described material was delivered without incident or contamination on the date of delivery referenced below.**
Bill Bladow — Signature of Driver — 7/23/10 — Date of Delivery

SECTION 3 TRANSFER FACILITY (Complete if applicable)

a) Transfer Facility's Name:
b) Transfer Facility's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Transfer Facility's Authorized Agent (print/type)

g) **I hereby warrant that the above named and described material was received from the transporter on the date of receipt referenced below.**
Signature of Transfer Facility's Authorized Agent — Date of Receipt

h) **I hereby warrant that the above named and described material was delivered to the transporter without incident or contamination on the date of delivery referenced below.**
Signature of Transfer Facility's Authorized Agent — Date of Delivery

SECTION 4 TRANSPORTER 2 (Complete if applicable)

a) Transporter's Name:
b) Transporter's Address:
c) Telephone Number:
d) Vehicle License No./State:
e) Trailer or Container No.:
f) Name of Driver (print/type)

g) **I hereby warrant that the above named and described material was received on the date of receipt referenced below.**
Signature of Driver — Date of Receipt

h) **I hereby warrant that the above named and described material was delivered on the delivery date referenced below.**
Signature of Driver — Date of Delivery

SECTION 5 DESTINATION (Disposal Facility)

a) Disposal Facility's Name: SPRUCE RIDGE LF SW-6
b) Physical Address: 12755 137th Ave GLENCOE, MN 55336
c) Telephone Number: 320-864-5503
d) Mailing Address:
e) Name of Disposal Facility's Authorized Agent (print/type) Kelly Hutchinson
f) **The material delivered by the Transporter has been received at the Disposal Facility.**
Kelly Hutchinson — Signature of Disposal Facility's Authorized Agent — 7.23.10 — Date of Receipt

g) **The material delivered by the Transporter has been rejected at the Disposal at the Disposal Facility.**
Signature of Disposal Facility's Authorized Agent — Date of Rejection
Signature of Driver — Date of Rejection

SECTION 6 ASBESTOS (operator to complete)

"Operator" is defined as the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation or both.

a) Operator's Name: — c) Telephone Number:
b) Operator's Address:
d) Recommended special handling instructions and additional information:
e) Operator's Certification: **I hereby warrant and declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and domestic law, regulations, ordinances, orders, rules and/or standards.**
Operator's Name (print/type) — Signature of Operator's Authorized Agent — Date
f) Responsible Agency Name and Address:

WHITE-DESTINATION (Disposal Facility) CANARY-GENERATOR PINK-TRANSPORTER GOLD-GENERATOR

2032

WASTE MANAGEMENT

MN/IA Landfills - Spruce Ridge RMF
12755 137TH ST
GLENCOE, MN, 55336
Ph: (320) 864-5503

Original
Ticket# 278943

Customer Name WM-UPSTREAM
Ticket Date 07/23/2010
Payment Type Credit Account
Manual Ticket#
Hauling Ticket#
Route
State Waste Code
Manifest 56067
Destination 6 PHASE
PO
Profile 101682MN (OILY CONTAMINATED SOIL)
Generator 148-TRANSCANADAKEYSTONE TRANS CANADA/KEYSTONE PIPELINE

Carrier WMMarshall WMMARSHALL
Vehicle# 243 Volume
Container
Driver
Check#
Billing # 0000502
Gen EPA ID
License PRY6903/4X

	Time	Scale	Operator
In	07/23/2010 09:25:05	Scale	Kel
Out	07/23/2010 09:37:51	Scale	Kel

Gross	59280 lb
Tare	36440 lb
Net	22840 lb
Tons	11.42

Comments transcanada-cont soil

	Product	LD%	Qty	UOM	Rate	Tax	Amount	Origin
1	C&D INDUSTRIAL-Ton	100	11.42	Tons				SDAK
2	FUEL-Fuel Surcharg	100		%				SDAK
3	EVF-L-Standard Env	100	1	Load				SDAK

Total Tax
Total Ticket

Driver's Signature Bill Bloedow

402WM

015823

The location of the release is a pump station owned and operated by TransCanada Keystone Pipeline, LP (TransCanada). The pump station is in a rural area located at 42592 236th Street near the intersection with 426th Avenue (Figure 1), approximately three miles south of Roswell, South Dakota. The release of petroleum was entirely contained on TransCanada property.

The release occurred from a loose fitting on an above ground damper system associated with an injection pump. Oil was released from the loose fitting for an approximate 3 second period until the system was manually shut down. An estimated 100 gallons of oil sprayed over an area of approximately 60 feet by 110 feet within the pump station location.

TransCanada personnel were onsite at time of the oil release, the injector pump was immediately shut down and containment and recovery activities initiated. A maintenance team mobilized to the site upon notification of the release on June 23, 2010 at 12 noon CDT. A vac truck, skid-steer loader, hydrovac, and other equipment were mobilized to the site along with qualified response team personnel.

The site had been exposed to heavy rainfall prior to the release event. As such, saturated conditions were encountered below grade in the surface gravel at the site. The area of the spill was de-watered using shallow excavation sumps constructed to prevent the spread of product along the ground surface. Collected free product was pumped from shallow surface sumps and 80 gallons was recovered during initial response operations. Collected product was transferred to the on-site sump tank. Oily water was collected via vacuum truck and transported offsite for storage and proper disposal at a permitted facility.

Residual oil had accumulated around pipelines, cable racks, pump foundations and other structures, and over a portion of the gravel covered pump station yard. Visually stained soils were excavated around the structures using a hydrovac truck and the stained gravel yard area was scraped using an excavator. Impacted soil was placed in roll-off containers for later transfer to an approved landfill facility. All excavations were less than three feet in depth and groundwater was not encountered.

Soils were screened using a photoionization detector (PID) with 10.6 eV lamp after excavation and hydrovac removal activities to determine the required limits of excavation. In addition, the scraped surface yard was screened using the PID. This included four potholes locations dug to confirm clean conditions. Confirmation soil samples were collected at eight locations after excavation was completed. Sampling and PID screening locations and excavation areas are shown in Figures 2 and 3. Confirmation sample ROS-8 is a composite of three discrete samples collected in the south grass mowed area as shown in Figure 2.

The field PID screening and laboratory analytical results for benzene, toluene, ethylbenzene and xylenes (BTEX), naphthalene, and Total Petroleum Hydrocarbons as Diesel (TPH-Diesel) are summarized on Table 1 and Table 2. In addition, two composite

waste soil samples were collected from the soil stockpiles and laboratory analysis results are shown in Table 2.

Based on field observations, measurements, and analytical data, the response excavation efforts have mitigated impacts to the surface and subsurface soils to below SD DENR Tier 1 action levels for BTEX, naphthalene, and TPH-Diesel. The excavated areas have been backfilled with clean material and no additional work is planned.

A total of 2,500 gallons of oily water was transported on July 7, 2010 by Safety-Kleen Systems for disposal at ESI in Indianapolis, IN. A receipt from Safety –Kleen is attached to this submittal. A total of approximately 200 cubic yards of impacted soil was stockpiled in roll-off containers and is waiting transport to the disposal landfill. The soils are planned to be hauled during late July, 2010 to the Waste Management –Spruce Ridge Landfill for disposal. Waste manifests and landfill tickets will be sent to SD DENR when disposal is completed.

Table 1 - Laboratory Analysis Soil Verification
TransCanada Keystone Pipeline
Roswell Pump Station; Roswell, South Dakota

Location	Units	ROS-1	ROS-2	ROS-3	ROS-4	ROS-5	ROS-6	ROS-7	ROS-8-COMP	Tier 1 Action Level
Sample Date		6/27/10	6/27/10	6/27/10	6/27/10	6/27/10	6/27/10	6/27/10	6/28/10	
Lithology		Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Top soil	
Depth	(feet)	<3	<3	<3	<3	<3	<3	<3	<3	
PID	(ppm)*	0.20	0.20	0.35	2.55	36.00	2.35	0.60	0.0	
Chemical of Concern										
Benzene	µg/kg	<23.4	<25.1	<24.2	<22.0	<22.0	<23.4	<22.1	<25.9	200
Ethylbenzene	µg/kg	<58.5	<62.8	<60.4	<55.0	<55.0	<58.4	<55.2	<64.9	1,500
Toluene	µg/kg	<58.5	<62.8	<60.4	<55.0	<55.0	<58.4	<55.2	<64.9	1,000
Xylene (Total)	µg/kg	<176	<189	<181	<165	<165	<175	<165	<195	300,000
Naphthalene	µg/kg	<234	<251	<242	<220	<220	<234	<221	<259	25,000
Diesel Components	mg/kg	<11.5	<12.6	<13.3	<11.2	20	<11.5	<11.0	<13.2	500**

NOTES: mg/kg = Milligrams per kilogram, equivalent to parts per million (ppm) dry weight
µg/kg= Micrograms per kilogram dry weight
<x = Not detected to reporting limits of x
* = Total organic vapors (ppm as benzene)
** = Tier 1 "Trigger Level" for total petroleum hydrocarbons
COMP = Composite of three samples
< 3= less than three feet of excavation

Table 2 - Yard (Pothole) Area PID Screening and Waste Soil Analysis
TransCanada Keystone Pipeline
Roswell Pump Station; Roswell, South Dakota

Location	Units	East-1 Pothole	East-2 Pothole	South-3 Pothole	West-4 Pothole	GS-75	GS-30	ROS-1 Waste Comp	ROS-2 Waste Comp	Tier 1 Action Level
Sample Date		6/26/10	6/26/10	6/26/10	6/26/10	6/25/10	6/25/10	6/30/10	6/30/10	
Lithology		Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	
Depth	(feet)	<3	<3	<3	<3	<3	<3			
PID	(ppm)*	0.00	0.00	0.00	0.00	0.00	0.00			
Chemical of Concern										
Benzene	µg/kg							<22.0	<22.1	200
Ethylbenzene	µg/kg							208	<55.2	1,500
Toluene	µg/kg							104	<55.2	1,000
Xylene (Total)	µg/kg							1280	280	300,000
Diesel Components	mg/kg							895	1510	500**

NOTES: mg/kg = Milligrams per kilogram, equivalent to parts per million (ppm) dry weight
<x = Not detected to reporting limits of x
* = Total organic vapors (ppm as benzene)
** = Tier 1 "Trigger Level" for total petroleum hydrocarbons
COMP = Composite of several samples
< 3= less than three feet of excavation

2,000
Feet

Source:
USGS Bitter Lake, SD.
Quad dated 1973

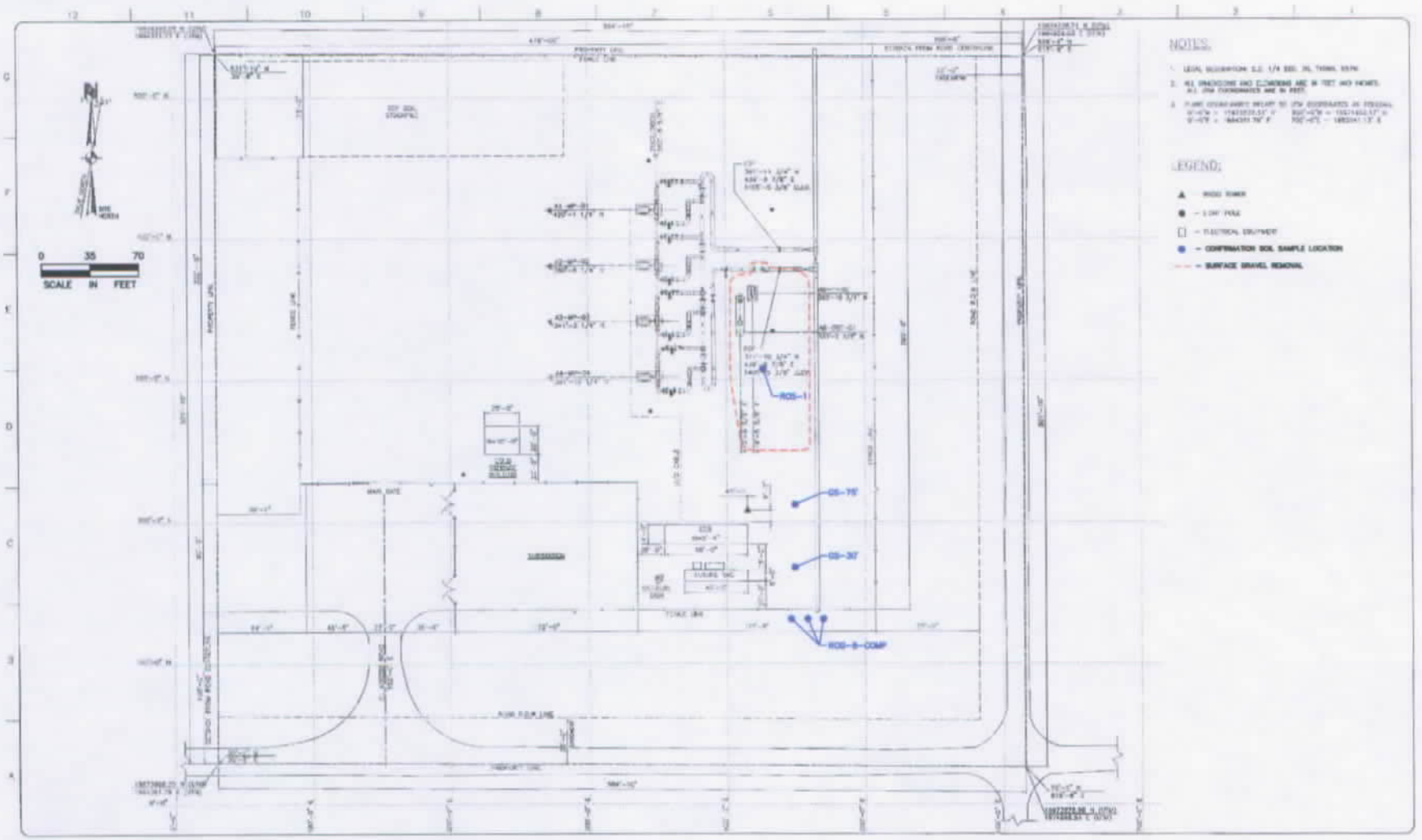
URS

SITE LOCATION MAP
TRANSCANADA KEYSTONE PIPELINE
ROSWELL, SOUTH DAKOTA

Fifth Street Towers
100 South Fifth Street
Suite 1500
Minneapolis, MN 55402
612.370.0700 Tel
612.370.1379 Fax

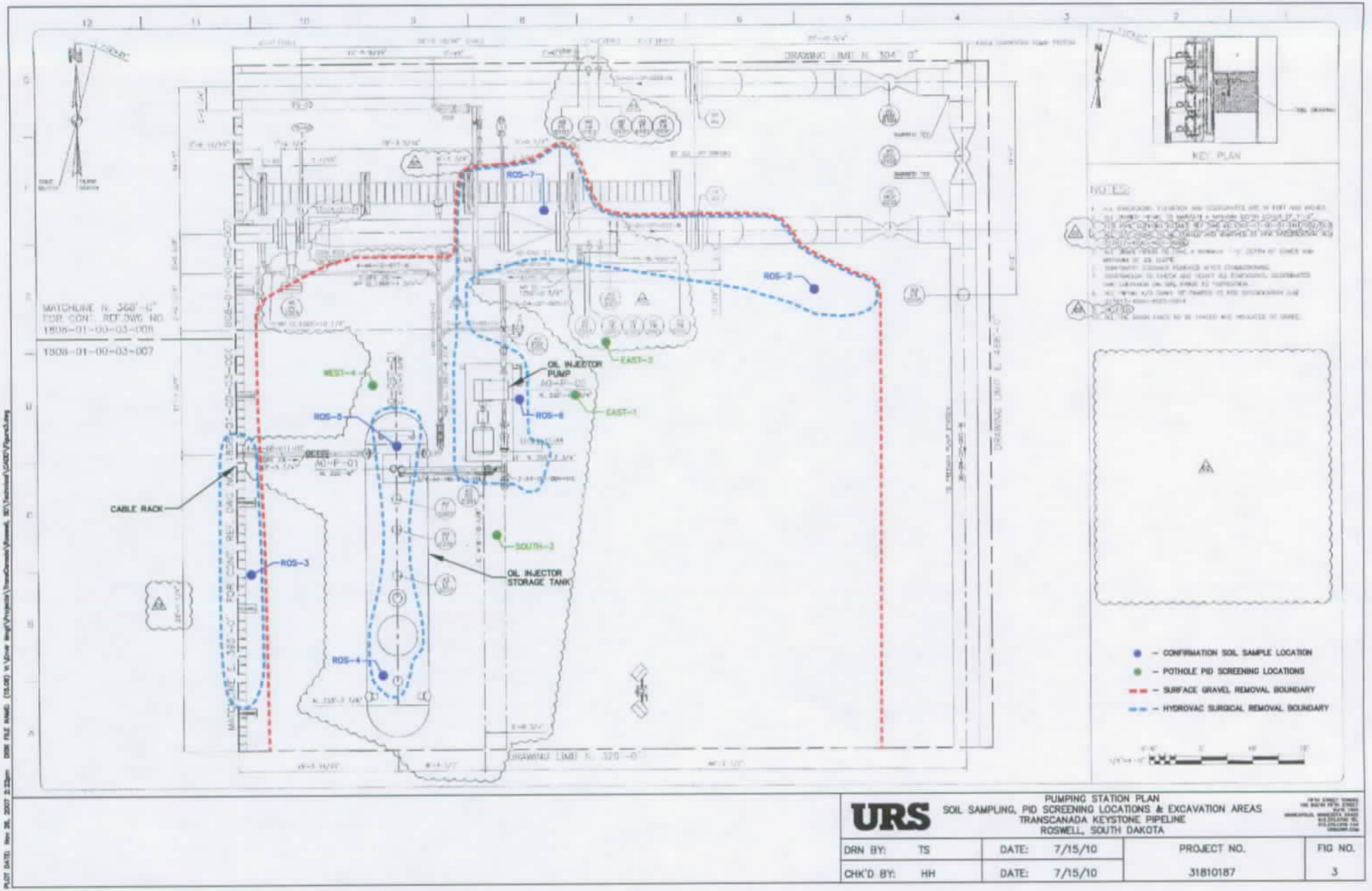
DRN BY:	TS	DATE:	5/17/10	PROJECT NO.	FIG. NO.
CHKD BY:	HH	DATE:	5/17/10	31810187	1

URS Corporation V:\Envir Mngt\Projects\TransCanada\Roswell, SD\Technical\GIS\Figure1.mxd Date: 7/15/2010 10:21:36 AM Name: tim_schutz



URS	PLOT PLAN SOIL SAMPLING LOCATIONS & YARD REMOVAL AREA TRANSCANADA KEYSTONE PIPELINE ROSWELL, SOUTH DAKOTA			
DRN BY: TS	DATE: 7/15/10	PROJECT NO.	FIG NO.
CHK'D BY: HH	DATE: 7/15/10	31810187	2

PLOT DATE: Nov 26, 2007 2:22pm DGN FILE NAME: (15.00) W:\Zone 4\gd\Projects\TransCanada\Roswell, SD\Technical\CADD\Figure2.dwg



URS

PUMPING STATION PLAN
SOIL SAMPLING, PID SCREENING LOCATIONS & EXCAVATION AREAS
TRANSCANADA KEYSTONE PIPELINE
ROSWELL, SOUTH DAKOTA

DRN BY:	TS	DATE:	7/15/10	PROJECT NO.	FIG NO.
CHK'D BY:	HH	DATE:	7/15/10	31810187	3

015829

NATIONAL RESPONSE CENTER 1-800-424-8802
GOVERNMENT USE ONLYGOVERNMENT USE ONLY***
Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 945213

INCIDENT DESCRIPTION

*Report taken by: MST1 RICHARD LAYMAN at 18:03 on 23-JUN-10
Incident Type: FIXED
Incident Cause: EQUIPMENT FAILURE
Affected Area:
Incident was discovered on 23-JUN-10 at 12:00 local incident time.
Affected Medium: LAND GRAVEL

REPORTING PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE
OMAHA, NE
KEYSTONE PIPELINE reported for the responsible party.
PRIMARY Phone: (701)2901176
Type of Organization: PRIVATE ENTERPRISE

SUSPECTED RESPONSIBLE PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE

OMAHA, NE
PRIMARY Phone: (701)2901176

INCIDENT LOCATION

42592 236ST County: MINER
City: HOWARD State: SD
ROSWELL PUMP STATION

RELEASED MATERIAL(S)

CHRIS Code: OIL Official Material Name: OIL: CRUDE
Also Known As:
Qty Released: 20 GALLON(S)

DESCRIPTION OF INCIDENT

THE CALLER REPORTED THAT THERE WAS A LEAK AT A PUMP STATION WHICH RESULTED IN A SPILL OF 20 GALLONS OF CRUDE OIL. NO WATERWAYS WERE IMPACTED.

SENSITIVE INFORMATION

INCIDENT DETAILS

Package: N/A
Building ID:
Type of Fixed Object: OTHER
Power Generating Facility: NO
Generating Capacity:
Type of Fuel:
NPDES:
NPDES Comoliance: UNKNOWN

Dan

Fire Involved: NO Fire Extinguished: UNKNOWN

INJURIES: NO Hospitalized: Empl/Crew: Passenger:
FATALITIES: NO Empl/Crew: Passenger: Occupant:
EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

Closure Type	Description of Closure	Hours Closed	Direction of Closure
Air: N			
Road: N			Major Artery: N
Waterway: N			
Track:			

Environmental Impact: UNKNOWN
Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

IMPACTED GRAVEL WILL BE PLACED INTO CONTAINMENT AND REMOVED
Release Secured: YES
Release Rate:
Estimated Release Duration:

WEATHER

Weather: SUNNY, ||F

ADDITIONAL AGENCIES NOTIFIED

Federal: NONE
State/Local: NONE
State/Local On Scene: NONE
State Agency Number: NONE

NOTIFICATIONS BY NRC

DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
23-JUN-10 18:09 (202)3661863
U.S. EPA VIII (MAIN OFFICE)
(303)2931788
IA U.S. ATTORNEY'S OFFICE (INTELLIGENCE OFFICER)
23-JUN-10 18:09 (515)4739345
NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
23-JUN-10 18:09 (202)2829201
NOAA RPTS FOR SD (MAIN OFFICE)
23-JUN-10 18:09 (206)5264911
NTSB PIPELINE (MAIN OFFICE)
23-JUN-10 18:09 (202)3146293
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
23-JUN-10 18:09 (202)3660568
SOUTH DAKOTA DENR (MAIN OFFICE)
23-JUN-10 18:09 (605)7733296
DOI/OEPC DENVER (MAIN OFFICE)
23-JUN-10 18:09 (303)4452500

ADDITIONAL INFORMATION

NO ADDITIONAL INFORMATION.

*** END INCIDENT REPORT #945213 ***

Patch II
10-0133

2010.169

015832

BW

South Dakota Spill Report Form

Dept. of Ag. Case No. _____ State Case No.: 2010.169

Reported: (mm/dd/yy) 8/10/10 Time: Recorded By: Bob McDonald

A. REPORTER

Reported By: Dan Cerkoney - Keystone

Organization Name:

Organization: ☐ discharger ☐ public ☐ state ☐ local ☐ federal

Address:

City: County: State:

Zip: Phone:

B. DISCHARGER (Responsible Party)

Name: TransCanada Keystone Pipeline-Bob Baumgarther

Address: 13710 FNB PARKWAY

City: OMAHA County: State: NE

Zip: 68154 Phone: 402 960-0483

C. INCIDENT LOCATION

As Above in B Street or Approx. Location: 28245 436th Ave 43.292961 -97.481032

Survey Description: _____ _____ Sec _____ T _____ R _____

City: Freeman County: Hutchinson State: SD

D. DATE

Spill Date: (mm/dd/yy) Spill Time:

E. MATERIAL

Material Type (Code/Name): ☐ hazardous substance ☐ material unknown ☐ oil ☐ other	Quantity Spilled	Spilled in Water	Units (Check 1)	
Crude Oil	25		☐ lb. ☐ bbl.	☒ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.

F. SOURCE

Source of Spill: ☐ AST ☐ UST ☐ railway ☐ vessel ☐ fixed facility ☐ pipeline ☐ highway ☐ air transport

Description: Freeman pump station - threaded fitting at pump station was loose

G. MED.

Medium Affected: ☐ air ☒ land ☐ water ☐ groundwater ☐ within facility only

Waterway Affected:

H. CAUSE

Reported Cause: ☐ transportation accident ☒ equipment failure ☐ operational error ☐ natural phenomenon ☐ dumping ☐ unknown ☐ Other

Description:

I. DAM.

Damages: No. of injuries _____ No. of deaths _____ Property damage > $50,000 _____

J. ACTIONS

☐ Evacuation Response Action Taken: Slight misting on gravel at site

K. NOTIFIED

Responding Agency: ☐ DENR ☐ DOA ☐ discharger ☐ federal ☐ EPA ☐ local

Agencies Notified:

L. COMMENTS

Comments: Cleanup was begun immediately. Contaminated soil/gravel will be removed and post excavation samples will be taken

Department of Environment and Natural Resources
Ground Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57501-3182

Business Hours M thru F 8:00 – 5:00pm
Normal business hours – (605) 773-3296
After business hours – (605) 773-3231

015833

2010.169

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

August 12, 2010

Robert Baumgartner
TransCanada Keystone
13710 FNB Parkway
Omaha, NE 68154

Subject: Department of Environment and Natural Resources File Number – 2010.169 – Oil Spill, Freeman Pump Station

Dear Mr. Baumgartner:

The Department of Environment and Natural Resources is contacting you regarding the above referenced event. This office has recorded the information provided about this event on an initial spill report form (enclosed for your review). The procedures for assessment and remediation of a release such as this were developed to prevent pollution of the waters of the State. In this situation, the following steps must be taken:

- By August 10, 2010, please complete and return the attached Written Contamination Incident Follow Up Report form (this is a standard form so some questions will not apply to this situation, just skip those questions.
- Please also provide this office with a narrative of actions taken in response to this event, to include: waste disposal receipts & sample analyses.

Brian Walsh has been assigned as the project manager of this case. Once Brian has reviewed all of the information on this case he will contact you to discuss any further actions that may be needed. If you have any questions or need additional information, please do not hesitate to contact Brian Walsh or me. If you have questions regarding the appropriate disposal of impacted substances contact our Waste Management Program at (605) 773-3153.

Thank you for your environmental stewardship and willingness to document the response efforts.

Sincerely,

Bob McDonald
Ground Water Quality Program
Phone: (605) 773-3296

Enclosures

cc: Dave Hoffman, Hutchinson County Emergency Management, Parkston, SD

DENR FILE #: 2010.169

WRITTEN CONTAMINATION INCIDENT FOLLOW-UP REPORT
(Page 1 of 2)

RETURN COMPLETED FORM TO

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GROUND WATER QUALITY PROGRAM
JOE FOSS BUILDING
523 EAST CAPITOL AVENUE
PIERRE SD 57501-3182

SITE NAME: TransCanada Keystone Pipeline - Freeman Pump Station

SPILL LOCATION: 28245 436th Ave., Freeman, SD

LATITUDE: 43.29278 LONGITUDE : -97.4804

LEGAL LOCATION (TOWNSHIP/RANGE): T098N R056W S020

RESPONSIBLE PARTY: TransCanada Keystone Pipeline, LP

MAILING ADDRESS: 13710 FNB Parkway, Suite 300

CITY: Omaha STATE : NE ZIP: 68154

TELEPHONE: _____ (HOME) (402) 492-7300 (WORK)

DATE OF SPILL OR WHEN DETECTED: 8-10-2010 TIME: 11:30am

WHAT WAS THE DURATION OF THE RELEASE? <1.5 hours

SUBSTANCE(S) RELEASED: Crude Oil

QUANTITY RELEASED: < 5 gallons

CHEMICAL NAME: Canadian Sour Crude CAS #: _____
CAS # 8002.05.09

IS SUBSTANCE ON THE "SARA 302 LIST"? YES ____ NO ✓ DON'T KNOW ____
"CERCLA HAZARDOUS SUBSTANCE LIST"? YES ____ NO ✓ DON'T KNOW ____
"SOUTH DAKOTA REGULATED SUBSTANCE"? YES ✓ NO ____ DON'T KNOW ____

CONSULTANT: NA

IDENTIFY KNOWN HEALTH RISKS: None Known

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED? None Required

LAND USE (RESIDENTIAL, INDUSTRIAL, RURAL, OTHER): Rural

UTILITIES INVESTIGATED (WATER, SEWER, TELEPHONE, CATV, STORM WATER, OTHER):

Release occurred in a rural setting within the boundaries of the pump station, no utilities.

015835

FOLLOW-UP REPORT CONTINUED
(Page 2 of 2)

DENR FILE #: 2010.169

ENVIRONMENTAL MEDIA IMPACTED (SURFACE SOIL, SUBSURFACE SOIL > 3' BELOW GROUND, GROUND WATER, SURFACE WATER, INDOOR AIR, OUTDOOR AIR, ETC.):

Surface gravel / soil.

DISTANCE TO AND NAME OF CLOSEST SURFACE WATER OR DRAINAGE:

Road ditch along 436th Avenue.

DEPTH/DISTANCE TO AND NAME OF CLOSEST AQUIFER: >100' depth (SD Aquifer Map 25)

DEPTH/DISTANCE TO NEAREST DRINKING WATERWELL: 120' depth - farm 0.5 miles east

CUBIC YARDS OF SOIL EXCAVATED/TREATED: Approximately 20

WAS FREE PHASE OR POOLED PRODUCT PRESENT? Yes

DIMENSIONS OF EXCAVATION: Approximately 24 ft. by 33 ft.

CONTAMINATED MATERIALS DISPOSAL SITE: Waste Management - Spruce Ridge LF

DATE MATERIAL WAS DISPOSED OF: To be determined. Planned for early September, 2010.

IMMEDIATE CORRECTIVE ACTION TAKEN AND ADDITIONAL WORK PLANNED:

At approximately 11:30 am CST on August 10th, 2010, contractor construction staff who were on site noticed a fine mist/spray of oil coming from the pig trap receiver fitting in the station yard. They immediately called local Operations' staff that were dispatched to site. The operations personal arrived within one hour and immediately isolated the leak and began cleaning up the oil which had sprayed onto the gravel within the pump station.

A skid-steer loader and other equipment were mobilized to the site along with qualified spill response personnel. Visually stained gravel/soils were scraped/excavated from the surface around the pig trap structures using the skid-steer loader and hand tools. Impacted gravel/soil was placed in roll-off containers for later transfer to an approved landfill facility. All excavations were less than two feet in depth and groundwater was not encountered. Following gravel/rock removal, the excavated area was screened using a photoionization detector (PID) with 10.6 eV lamp. Confirmation soil samples were collected at two locations after excavation was completed. Soil sample and PID screening locations are shown in Figure 1. The field PID screening and laboratory analytical results for benzene, toluene, ethylbenzene and xylenes (BTEX), naphthalene, and Total Petroleum Hydrocarbons as Diesel (TPH-Diesel) are summarized on Table 1 and Table 2. In addition, one composite waste soil sample was collected from the roll-offs and laboratory analysis results are shown in Table 2.

Based on field observations, measurements, and analytical data, the response excavation efforts have mitigated impacts to the surface and shallow subsurface soils to below SD DENR Tier 1 action levels. The excavated area has been backfilled with clean material and no additional work is planned.

FORM COMPLETED BY: Robert M. Baumgartner DATE: September 9, 2010

Closure 2010-169

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

November 12, 2010

Robert Baumgartner
TransCanada Keystone Pipeline, LP
13710 FNB Parkway
Omaha NE 68154

Subject: Department of Environment and Natural Resources File 2010.169 – TransCanada Keystone Pipeline – Freeman Pump Station

Dear Mr. Baumgartner,

The Department of Environment and Natural Resources reviewed all information submitted regarding the above referenced spill. The department has determined the case is closed.

On August 10, 2010, contractors working at the Freeman pump station noticed a fine mist oil spray coming from the pig trap receiver fitting. In response to the release, TransCanada operations staff isolated and stopped the leak and performed a remedial excavation. Approximately 16.67 tons of potentially contaminated soil were removed from the site and properly disposed of. All post-excavation soil samples were below the department's Tier 1 Action Levels.

The department has concluded based on the clean-up activities TransCanada conducted, this crude oil spill poses no risk at this time. Therefore, the department will not require TransCanada to take any additional action in this matter. If problems arise because of any remaining contamination, TransCanada may be responsible for conducting additional assessment and remediation.

Please contact Brian Walsh of my staff at (605) 773-3296, if you have any questions. Thank you for your efforts and cooperation regarding this spill.

Sincerely,

Bill Markley, Administrator
Ground Water Quality Program
(605) 773-3296

cc: Dave Hoffman, Hutchinson County Emergency Manager, Parkston, SD

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

11/10/10

MEMORANDUM

To: Bill Markley, Administrator, Ground Water Quality Program

From: Brian Walsh, Hydrology Specialist BJW

Date: November 12, 2010

Subject: Closure for DENR Spill Case 2010.169 – Canadian Sour Crude Oil– TransCanada Freeman Pump Station Release

---

Introduction

This memo describes the facts associated with DENR spill case 2010.169. The description covers general spill information, removal actions, and remaining contamination. Finally, case closure is recommended. A closure letter is attached for your review and signature.

General Spill Information

Site Name:	TransCanada Keystone Pipeline – Freeman Pump Station
Location:	43.29278 latitude and -97.4804 longitude TransCanada Keystone Pipeline – Freeman Pump Station Hutchinson County, South Dakota
Responsible Party:	TransCanada Keystone Pipeline, LP 13710 FNB Parkway Omaha, NE 402.492.7300
Date of Spill:	August 10, 2010

Spill Summary

On August 10, 2010, contractors working at the Freeman pump station noticed a fine mist oil spray coming from the pig trap receiver fitting. They notified local operations staff that was dispatched to the site. Upon arrival, operations staff isolated and stopped the leak and began cleaning up the spilled oil. TransCanada estimates less than 5 gallons of oil were released.

Contaminant Characterization

The product release was Canadian Sour Crude oil CAS #8002.05.09. Contaminants of concern include BTEX, naphthalene, and TPH-Diesel.

Removal Action and Remaining Contamination

Upon discover, TransCanada mobilized staff and equipment (skied steer loader and hand tools) to the site to begin the removal action. TransCanada excavated an area approximately 24 ft. by 33 ft. to ensure removal of all of the contaminated soil. Operations staff used a PID meter to determine the limits of the excavation and collected two post-excavation samples for lab analysis (soil sample results are shown below). Approximately 16 tons of soil were removed and disposed of at the Sioux Falls landfill. Post-excavation soil samples indicate no exceedances of South Dakota's Tier 1 Action Levels.

Sample ID	Date	Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	Xylene (ppb)	Naphthalene (ppb)	TPH-D (ppm)
N-1	8/12/10	<20.8	<52	<52	<156	<208	<10.5
S-1	8/12/10	<21.8	<54.4	<54.4	<163	<218	<10.9
Tier 1 AL		200	15000	10000	300000	25000	500

Potential Exposure Pathways

Due to the removal action, there are no complete exposure pathways associated with this spill. The site is not within a designated zone A, B, or C source water area.

Recommendations

Based on a review of information provided and an evaluation of potential risks associated with this spill I recommend case closure.

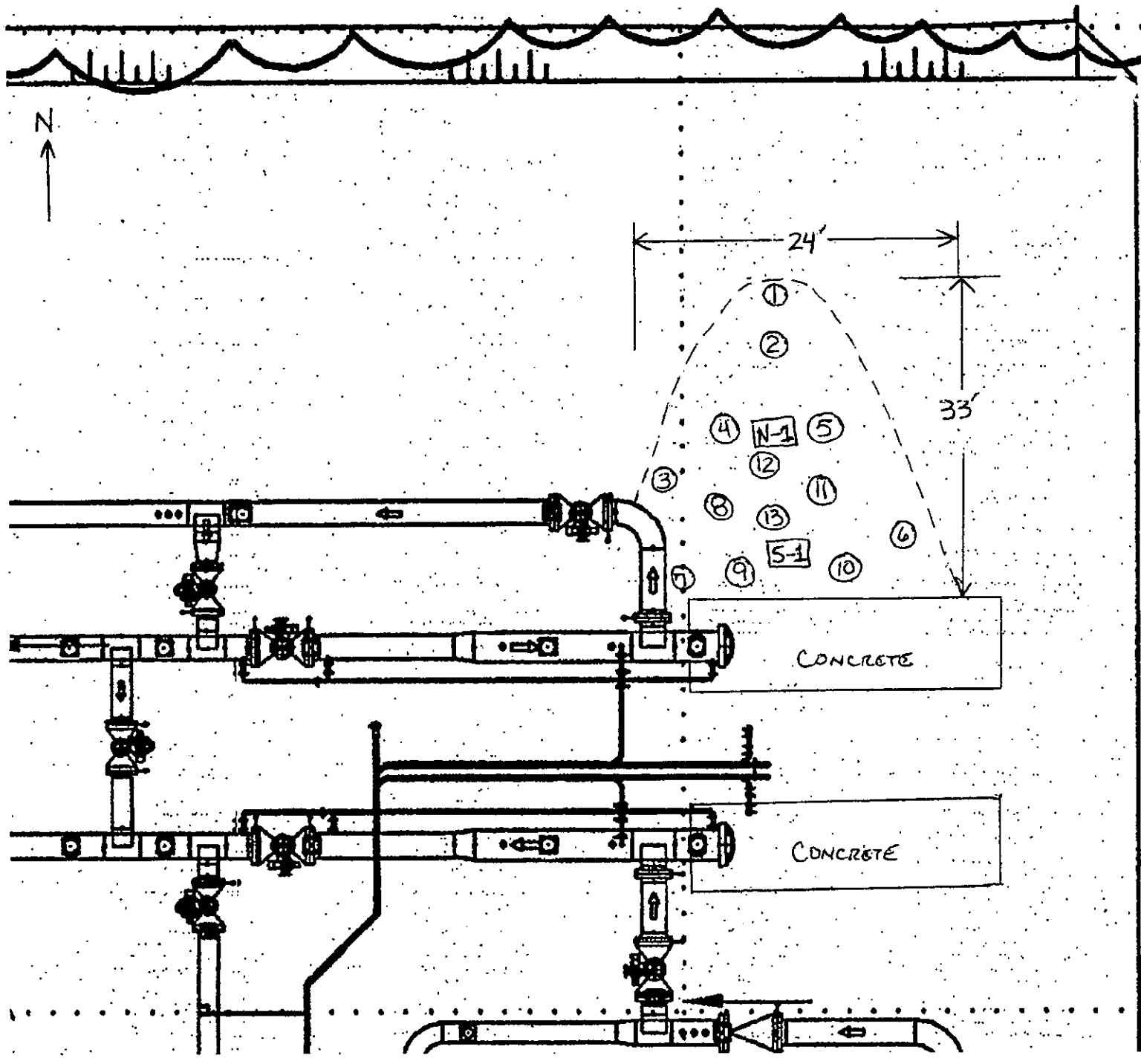
Table 1 - PID Field Screening
TransCanada Keystone Pipeline
Freeman Pump Station; Freeman, South Dakota

Location	Units	1	2	3	4	5	6	7	8	9	10	11	12	13
Sample Date		8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10	8/11/10
Lithology		Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel	Gravel
Depth	(feet)	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<1	<1	<1
PID	(ppm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2 - Laboratory Analysis Soil Verification and Waste Soil Analysis
TransCanada Keystone Pipeline
Freeman Pump Station; Freeman, South Dakota

Location	Units	N-1	S-1	Disp-1 Waste	Tier 1 Action Level
Sample Date		8/12/10	8/12/10	8/12/10	
Lithology		Gravel	Gravel	Gravel	
Depth	(feet)	<2	<2	<2	
Chemical of Concern					
Benzene	µg/kg	<20.8	<21.8	<22.4	200
Ethylbenzene	µg/kg	<52	<54.4	<56.1	1,500
Toluene	µg/kg	<52	<54.4	<56.1	1,000
Xylene (Total)	µg/kg	<156	<163	256	300,000
Naphthalene	µg/kg	<208	<218	<224	25,000
Diesel Components	mg/kg	<10.5	<10.9	582	500**

NOTES: mg/kg = Milligrams per kilogram, equivalent to parts per million (ppm) dry weight
<x = Not detected to reporting limits of x
** = Tier 1 "Trigger Level" for total petroleum hydrocarbons
< 3= less than three feet of excavation



① PID FIELD Screening LOCATION

N-1 SOIL VERIFICATION SAMPLE LOCATION

--- EXCAVATION LIMIT

Figure 1

Freeman Pump Station

Soil Excavation

August 2010

Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]
Sent: Friday, November 05, 2010 10:42 AM
To: Walsh, Brian
Cc: Robert Baumgartner; McDonald, Robert
Subject: RE: DENR File #2010.169 - Contamination Incident Follow Up Report-TransCanada/ Keystone Pipeline, Freeman, SD

Brian, find attached the soil disposal receipts and manifests related to the Freeman Pump Station Incident #2010.169. Two roll-off boxes of soil totaling 16.67 tons were transported for disposal at the Sioux Falls Landfill. The transportation and disposal occurred on October 12, 2010.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Friday, September 10, 2010 9:27 AM
To: Robert Baumgartner; Robert.McDonald@state.sd.us
Cc: Brian.Walsh@state.sd.us
Subject: RE: DENR File #2010.169 - Contamination Incident Follow Up Report-TransCanada/ Keystone Pipeline, Freeman, SD

Bob,

Once I have the landfill tickets and manifests I'll move the closure documents forward for approval.

Thanks,

==========
Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us
==========

-----Original Message-----
From: Robert Baumgartner [mailto:robert_baumgartner@transcanada.com]
Sent: Friday, September 10, 2010 8:08 AM
To: Walsh, Brian; McDonald, Robert
Subject: DENR File #2010.169 - Contamination Incident Follow Up Report-TransCanada/ Keystone Pipeline, Freeman, SD

Bob and Brian,

Find attached the Contamination Incident Follow-Up Report and attachments except for the landfill tickets and manifests, for the two roll-off boxes of excavated material, which will I'll forward at a later date when

soil disposal is completed. This report is submitted for the release incident reported on August 10, 2010 at the Freeman, SD pump station.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Sr. Environmental Specialist
TransCanada Keystone US Operations
13710 FNB Parkway
Omaha, NE 68154
402.492.7464 office
402.492.7491 fax
402.960.0483 cell
robert_baumgartner@transcanada.com

This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

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NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of 1	3. Emergency Response Phone 800 424 9300	4. Waste Tracking Number WM FREEMAN01

GENERATOR

5. Generator's Name and Mailing Address
TransCanada Keystone Pipeline (Freeman)
13710 FNB Parkway-STE 300 (E Baumgartner)
Omaha, NE 68154

Generator's Site Address (if different than mailing address)
26245 436th Ave
Freeman, SD 57029

Generator's Phone: 402 [illegible]

6. Transporter 1 Company Name — U.S. EPA ID Number

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address Sioux Falls Landfill
26750 464th Avenue
Hartford, SD 57033
605 367 8279
Facility's Phone: — U.S. EPA ID Number

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
	1. Non Regulated Natural Gas Contaminated Soil	01	CM	20	Y	
	2.			0		
	3.			0		
	4.			0		

13. Special Handling Instructions and Additional Information
Sioux Falls Disposal # S-3210 (Gas Contaminated Soil)

14. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.
Generator's/Offeror's Printed/Typed Name: Adam Schooley / TransCanada — Signature: A Schooley — Month 10 Day 11 Year 2010

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. — Port of entry/exit:
Transporter Signature (for exports only): — Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name — Signature — Month 10 Day 12 Year 10
Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
17b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator) — Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name: TransCanada A Schooley — Signature: A Schooley — Month 10 Day 11 Year 2010

169-BLC-O 6 10498 (Rev. 8/06)

TRANSPORTER #1

015844

WASTE MANAGEMENT

Ticket: 334900 Driver: ERIC DURNIL
Opened by: RBAUMANN
Customer: 839-468012 TRANSCANADA (T)
28245 436TH AVE
FREEMAN SD 57029
Attn.: MATT MCGILVERY 605-695-0214
Requested by: ROB LINDISCH
Load Type: DO NOT RETURN

Date Requested: 10/08/2010
Date Dispatched: 10/12/2010

Map Code: Map Grid:

Service	Quantity	T/P	Yds	Waste Type	Weight	Job	Special Description
20 YD FLAT SPECIAL WASTE	1.00	T	20	DIRT			

SPECIAL WASTE - 101682MN -
** HAUL TO SIOUX FALLS LANDFILL S-2210 IS THE JOB CONTRACT NUMBER**

Signature: _____ Date: 10-12-10

224 West 9th Street - PO Box 7402
Sioux Falls, SD 57117-7402 605-337-6162

DATE:10/12/10 TICKET #:371895
TIME IN:13:15 ID IN: PB TIME OUT:13:33 ID OUT: MS

CUSTOMER:8015
Waste Management of S
2221 E Rice St
Sioux Falls SD 57103

TRUCK: 10739 TRAILER: 20910 VEHICLE: Not Specified

TRANSACTION:10 - Commercial Customer ORIGIN: 10 - Minnehaha County
MATERIAL: 370 - Contaminated Soils - PAYMENT: 1 - Charge
JOB:

RATE: $70.00/tn

		LBS	TNS
TIP FEE:	660.10		
SPEC FEE:	0.00	GROSS 52860	26.43
LOCAL TAX:	0.00	TARE 34000	17.00
MSW SURCHARGE:	0.00	NET 18860	9.43

TOTAL FEE: $660.10 TENDERED: 0.00 CHANGE: 0.00

NOTE:
SPECIALS:
HOURS: MONDAY thru SATURDAY 7:30 - 5:00pm
ALL LOADS MUST BE TARPED. IF NOT A $25.00 NO-TARP FEE WILL APPLY.

SIGNATURE: _____

NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of 1	3. Emergency Response Phone: 800 424 9300	4. Waste Tracking Number: WH FREEMAN02

5. Generator's Name and Mailing Address

TransCanada Keystone Pipeline (Freeman)
13710 FNB Parkway STE 300 (F. Baumgartner)
Omaha NE 68154

Generator's Site Address (if different than mailing address)

23245 438th Ave
Freeman, SD 57029

Generator's Phone:

6. Transporter 1 Company Name — U.S. EPA ID Number

7. T[illegible]rter 2 Company Name — U.S. EPA ID Number

8. [illegible]ated Facility Name and Site Address — U.S. EPA ID Number

Sioux Falls Landfill
26750 464th Avenue
Hartford, SD 57033

Facility's Phone: 605 367 6279

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
GENERATOR	1. Non Regulated Material (Oily Contaminated Soil)	01	CM	20	Y	
	2.			0		
	3.			0		
	4.			0		

13. Special Handling Instructions and Additional Information

1) Sioux Falls Approval #S-2210 (Oily Contaminated Soil)

14. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Generator's/Offeror's Printed/Typed Name	Signature	Month	Day	Year
Adam Schuhly TransCanada	[signature]	10	11	10

INT'L — 15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:

Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER — 16. Transporter Acknowledgment of Receipt of Materials

	Printed/Typed Name	Signature	Month	Day	Year
Transporter 1	[signature]		10	12	10
Transporter 2					

DESIGNATED FACILITY — 17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator) — Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name	Signature	Month	Day	Year
TransCanada Adam Schuhly	[signature]	10	1[illegible]	2010

169-BLC-O 6 10498 (Rev. 8/06)

TRANSPORTER #2

Ticket: 333502
Opened by: RBAUMANN
Customer: 839-468012 TRANSCANADA (T)
28245 436TH AVE
FREEMAN SD 57029
Attn.: MATT MCGILVERY
Requested by: ROB LINDISCH
Load Type: DO NOT RETURN

Driver: ERIC DURNIL

Date Requested: 10/06/:
Date Dispatched: 10/12/:

605-695-0214

Service	Quantity	T/P	Yds	Waste Type	Weight	Job	Special Descript
20 YD FLAT SPECIAL WASTE	1.00	T	20	DIRT			

Map Code:
Map Grid:

SPECIAL WASTE - 101682MN -
** HAUL TO SIOUX FALLS LANDFILL S-2210 IS THE JOB CONTRACT NUMBER**

Signature: ESD

Date: 10-12

224 West 9th Street - PO Box 2408
Sioux Falls, SD 57117-2408 605-367-8100

DATE: 10/12/06
TIME IN: 10:05 AM PM
TIME OUT: 10:21 AM PM
TICKET #: 371765
ID OUT: NS

CUSTOMER:
Waste Management of S
224 W 9th St
Sioux Falls SD 57104

TRUCK: 10259
TRAILER: 201065
VEHICLE: Not Specified

PROFILE: 370 - Contaminated Soils
ORIGIN: 10 - Minnehaha County
PAYMENT: 1 - Charge

TARE: 72.00 Tons

TIP FEE:	595.00	GROSS	48.60
SPEC FEE:	0.00	TARE	72.00
LOCAL TAX:	0.00	NET	24.60
MSW SURCHARGE:	0.00		

TOTAL FEE: 595.00 TENDERED:

TIE:
SIGNED:

HRS: MONDAY 8:00 - SATURDAY 7:00 - 5:00PM
LOADS MUST BE TARPED, IF NOT A $25.00 NO-TARP FEE WILL APPLY.

NATURE:

CHANGE: 0.00

Freeman Keystone Pipeline Pumping Station Spill Site Inspection Report
August 16, 2010

On August 13, 2010 I stopped at the Freeman Pumping Station site to determine the status of the cleanup following the August 10, 2010 report of a release of approximately 5 gallons of crude oil at the site.

Upon arrival, I spoke with Mr. Steve Hall with TransCanada who was at the site to oversee construction activities of additional pumping units at the site. After presenting my credentials and signing in, he showed me the area where the spill had occurred. The pumping station is within an enclosed fenced area on compacted soil that has been overlaid with approximately 12 inches of gravel/rock. The area around the pumping unit where the spill occurred had already been cleaned up and new gravel backfilled at the spill location (Picture's 1 & 2). Mr. Hall stated that the release was from a fitting on the pumping unit that had leaked and sprayed a fine mist of oil onto nearby surface, affecting an approximately 5' X 15' area on the surface of the gravel. He stated that the visibly contaminated rock was immediately removed and additional excavation was done down to the native soil surface to obtain cleanup confirmation samples. He stated that at the time of the cleanup the oil had penetrated only partially through the gravel surfacing and had not reached the soil underneath the gravel. He estimated the release to be less than 5 gallons based on area and depth of the contamination. I saw no visible evidence of any remaining oil contamination at the site.

Picture 1- Pumping unit where leak occurred (facing west). Area of gravel to the right (north) of the concrete pad was the affected area that was cleaned up.

Picture 2 – Area of gravel where the release occurred (facing west).

All of the excavated contaminated gravel was placed into two Waste Management roll off's lined with polypropylene and then covered with another layer of polypropylene. The containers were still on site awaiting pickup for disposal at the Waste Management disposal facility (Picture 3).

Picture 3- Lined disposal roll off's awaiting final disposal. (facing northwest)

I informed Mr. Hall that the Department would require the post excavation soil sample results and also the disposal receipts for the contaminated gravel as soon as they are available. He stated that those issues would be addressed by Bob Baumgartner. After being signed out by Mr. Hall I left the site.

Bob McDonald

Environmental Program Scientist
South Dakota Department of Environment and Natural Resources

NATIONAL RESPONSE CENTER 1-800-424-8802
GOVERNMENT USE ONLYGOVERNMENT USE ONLY***
Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 950516

INCIDENT DESCRIPTION

*Report taken by: CIV DAVID DEDEAUX at 15:33 on 10-AUG-10
Incident Type: PIPELINE
Incident Cause: UNKNOWN
Affected Area:
Incident occurred on 10-AUG-10 at 12:30 local incident time.
Affected Medium: LAND

REPORTING PARTY

Name: DAN CERKONEY
Organization: KEYSTONE PIPELINE
Address: FNB PARKWAY
OMAHA, NE 68154
292nd
KEYSTONE PIPELINE reported for the responsible party.
PRIMARY Phone: (701)4831434
Type of Organization: PRIVATE ENTERPRISE

SUSPECTED RESPONSIBLE PARTY

Name: DAN CERKONEY
Organization: KEYSTONE PIPELINE
Address: FNB PARKWAY
OMAHA, NE 68154
PRIMARY Phone: (701)4831434

INCIDENT LOCATION

436th
28245 ~~400 30~~TH AVE County: HUTCHINSON
City: FREEMAN State: SD
Latitude: 43 29' 29" N
Longitude: 097 48' 10" W
43.292961
97.481033
NONE

RELEASED MATERIAL(S)

CHRIS Code: OIL Official Material Name: OIL: CRUDE
Also Known As:
Qty Released: 5 GALLON(S)

DESCRIPTION OF INCIDENT

CALLER STATED THAT THERE WAS A RELEASE OF 5 GALLONS OF CRUDE OIL FROM A PIPELINE, THE CAUSE IS UNKNOWN, THERE WERE NO WATERWAYS IMPACTED, THE MATERIAL WAS CONTAINED ON SITE.

SENSITIVE INFORMATION

INCIDENT DETAILS

Pipeline Type: TRANSMISSION
DOT Regulated: YES
Pipeline Above/Below Ground: ABOVE
Exposed or Under Water: NO
Pipeline Covered: UNKNOWN

Fire Involved: NO Fire Extinguished: UNKNOWN

INJURIES: NO Hospitalized: Empl/Crew: Passenger:
FATALITIES: NO Empl/Crew: Passenger: Occupant:
EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

Closure Type	Description of Closure	Hours Closed	Direction of Closure
Air: N			
Road: N			Major Artery: N
Waterway: N			
Track:			

Environmental Impact: UNKNOWN
Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

SHUTDOWN SYSTEM, CLEAN UP UNDERWAY.
Release Secured: YES
Release Rate:
Estimated Release Duration:

WEATHER

Weather: CLEAR, 85‖F

ADDITIONAL AGENCIES NOTIFIED

Federal: NONE
State/Local: NONE
State/Local On Scene: NONE
State Agency Number: NONE

NOTIFICATIONS BY NRC

USCG ICC (ICC ONI)
10-AUG-10 15:40 (301)6693363
DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
10-AUG-10 15:40 (202)3661863
U.S. EPA VIII (MAIN OFFICE)
(303)2931788
IA U.S. ATTORNEY'S OFFICE (INTELLIGENCE OFFICER)
10-AUG-10 15:40 (515)4739345
NE INFORMATION ANALYSIS CENTER (MAIN OFFICE)
10-AUG-10 15:40
NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
10-AUG-10 15:40 (202)2829201
NOAA RPTS FOR SD (MAIN OFFICE)
10-AUG-10 15:40 (206)5264911
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
10-AUG-10 15:40 (202)3660568
SOUTH DAKOTA DENR (MAIN OFFICE)
10-AUG-10 15:40 (605)7733296
DOI/OEPC DENVER (MAIN OFFICE)
10-AUG-10 15:40 (303)4452500

ADDITIONAL INFORMATION

CALLER HAD NO ADDITIONAL INFORMATION.

PLEASE VISIT OUR WEB SITE AT http://www.nrc.uscg.mil

Patch II
10-0133

2011.004

015854

BW

South Dakota Spill Report Form

Dept. of Ag. Case No. _____ State Case No.: 2011,004

Reported: (mm/dd/yy) 01/05/2011 Time: 11:55 AM Recorded By: BW

A. REPORTER

Reported By: Robert Baumgartner
Organization Name: TransCanada
Organization: ☒ discharger ☐ public ☐ state ☐ local ☐ federal
Address: 13710 FNB Parkway
City: Omaha County: State: NE
Zip: 68154 Phone: 402-492-7464

B. DISCHARGER (Responsible Party)

Name: TransCanada
Address: 13710 FNB Parkway
City: Omaha County: State: NE
Zip: 68154 Phone: 402-492-7464

C. INCIDENT LOCATION

As Above in B Street or Approx. Location: Ferney Pump Station 45.2975 -97.9488
41461 104th St. Andover SD 57442 41361 144TH ST
Survey Description: _____ _____ Sec _____ T _____ R _____
City: County: Day State: SD

D. DATE

Spill Date: (mm/dd/yy) 01/05/11 Spill Time: 9:57 AM

E. MATERIAL

Material Type (Code/Name): ☐ hazardous substance ☐ material unknown ☐ oil ☐ other	Quantity Spilled	Spilled in Water	Units (Check 1)	
Crude Oil	10		☐ lb. ☐ bbl.	☒ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.
			☐ lb. ☐ bbl.	☐ gal. ☐ oth.

F. SOURCE

Source of Spill: ☐ AST ☐ UST ☐ railway ☐ vessel ☐ fixed facility ☒ pipeline ☐ highway ☐ air transport
Description: Rotating seal leak on a pump at Ferney Pump Station, oil sprayed on pump, concrete pad and snow.

G. MED.

Medium Affected: ☐ air ☐ land ☐ water ☐ groundwater ☒ within facility only
Waterway Affected:

H. CAUSE

Reported Cause: ☐ transportation accident ☐ operational error ☐ dumping ☐ Other
☒ equipment failure ☐ natural phenomenon ☐ unknown
Description:

I. DAM.

Damages: No. of injuries _____ No. of deaths _____ Property damage > $50,000 _____

J. ACTIONS

☐ Evacuation Response Action Taken: Leak stopped, have begun cleanup. Expect to generate oily rags and snow.

K. NOTIFIED

Responding Agency: ☒ DENR ☐ DOA ☒ discharger ☐ federal ☐ EPA ☐ local
Agencies Notified: DENR, NRC

L. COMMENTS

Comments:

Department of Environment and Natural Resources
Ground Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57501-3182

Business Hours M thru F 8:00 – 5:00pm
Normal business hours – (605) 773-3296
After business hours – (605) 773-3231

015855

2011.004

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

January 5, 2011

Robert Baumgartner
TransCanada Keystone
13710 FNB Parkway
Omaha, NE 68154

Subject: Department of Environment and Natural Resources File Number – 2011.004 – Oil Spill, Ferney Pump Station

Dear Mr. Baumgartner:

The Department of Environment and Natural Resources is contacting you regarding the above referenced event. This office has recorded the information provided about this event on an initial spill report form (enclosed for your review). The procedures for assessment and remediation of a release such as this were developed to prevent pollution of the waters of the State. In this situation, the following steps must be taken:

- By February 4, 2011, please complete and return the attached Written Contamination Incident Follow Up Report form (this is a standard form so some questions will not apply to this situation, just skip those questions.
- Please also provide this office with a narrative of actions taken in response to this event, to include: waste disposal receipts & sample analyses, as applicable.

Brian Walsh has been assigned as the project manager of this case. Once Brian has reviewed all of the information on this case he will contact you to discuss any further actions that may be needed. If you have any questions or need additional information, please do not hesitate to contact Brian Walsh or me. If you have questions regarding the appropriate disposal of impacted substances contact our Waste Management Program at (605) 773-3153.

Thank you for your environmental stewardship and willingness to document the response efforts.

Sincerely,

Bob McDonald
Ground Water Quality Program
Phone: (605) 773-3296

Enclosures

cc: Wes Williams, Day County Emergency Management, Webster, SD

015856

Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]
Sent: Wednesday, February 02, 2011 1:40 PM
To: Walsh, Brian
Subject: DENR File #2011.004 - Contamination Incident Follow Up Report-TransCanada Keystone Pipeline - Ferney SD

Brian,
Find attached the Contamination Incident Follow-Up Report for the release incident reported on January 5, 2011 at our Ferney, SD pump station. Also find attached a photo showing the extent of the leak and equipment that was oiled. Two drums of oily absorbents, rags and snow were generated and are scheduled for disposal the week of February 14, 2011, pending waste characterization results. I'll forward you the disposal manifest upon completion.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Environmental Program Manager
TransCanada Keystone US Operations
717 Texas St.
Houston, Texas 77002
832.320.5538 office
402.960.0483 cell
robert_baumgartner@transcanada.com

This electronic message and any attached documents are intended only for the named addressee (s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

DENR FILE #: 2,011.004

WRITTEN CONTAMINATION INCIDENT FOLLOW-UP REPORT
(Page 1 of 2)

RETURN COMPLETED FORM TO

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GROUND WATER QUALITY PROGRAM
JOE FOSS BUILDING
523 EAST CAPITOL AVENUE
PIERRE SD 57501-3182

SITE NAME: TransCanada Keystone Pipeline - Ferney Pump Station

SPILL LOCATION: 41461 144th Street, Andover, SD 57442

LATITUDE/LONGITUDE: 45.2975 / -97.9488

LEGAL LOCATION (TOWNSHIP/RANGE): T121N R059W S017

RESPONSIBLE PARTY: TransCanada Keystone Pipeline, LP

MAILING ADDRESS: 13710 FNB Parkway, Suite 300

CITY: Omaha, NE 68154

TELEPHONE: _____ (HOME) (402) 492-7300 (WORK)

DATE OF SPILL OR WHEN DETECTED: January 5, 2011 TIME: 8:00 am

WHAT WAS THE DURATION OF THE RELEASE? < 48 hours

SUBSTANCE(S) RELEASED: Crude Oil

QUANTITY RELEASED: ~ 2 gallons

CHEMICAL NAME: Canadian Sour Crude
CAS# 8002.05.09

CAS #: _____

IS SUBSTANCE ON THE "SARA 302 LIST"? YES ____ NO X DON'T KNOW ____
"CERCLA HAZARDOUS SUBSTANCE LIST"? YES ____ NO X DON'T KNOW ____
"SOUTH DAKOTA REGULATED SUBSTANCE"? YES X NO ____ DON'T KNOW ____

CONSULTANT: NA

IDENTIFY KNOWN HEALTH RISKS: None Known

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED? None Required

LAND USE (RESIDENTIAL, INDUSTRIAL, RURAL, OTHER): Rural

UTILITIES INVESTIGATED (WATER, SEWER, TELEPHONE, CATV, STORM WATER, OTHER): _____

Leak occurred in a rural setting within the boundaries of the pump station, no utilities.

FOLLOW-UP REPORT CONTINUED
(Page 2 of 2)

DENR FILE #: 2,011.004

ENVIRONMENTAL MEDIA IMPACTED (SURFACE SOIL, SUBSURFACE SOIL > 3' BELOW GROUND, GROUND WATER, SURFACE WATER, INDOOR AIR, OUTDOOR AIR, ETC.):
Oil sprayed on pump equipment in the immediate area of the seal leak, on concrete pump foundation, and snow adjacent to foundation.

DISTANCE TO AND NAME OF CLOSEST SURFACE WATER OR DRAINAGE:
Road ditch along County Rd. 22

DEPTH/DISTANCE TO AND NAME OF CLOSEST AQUIFER: Unknown

DEPTH/DISTANCE TO NEAREST DRINKING WATERWELL: Suspect >1 mile N on CO Rd 41 (unconfirmed)

CUBIC YARDS OF SOIL EXCAVATED/TREATED: NA

WAS FREE PHASE OR POOLED PRODUCT PRESENT? Yes, limited to surface of pump, concrete pad, snow.

DIMENSIONS OF EXCAVATION: NA

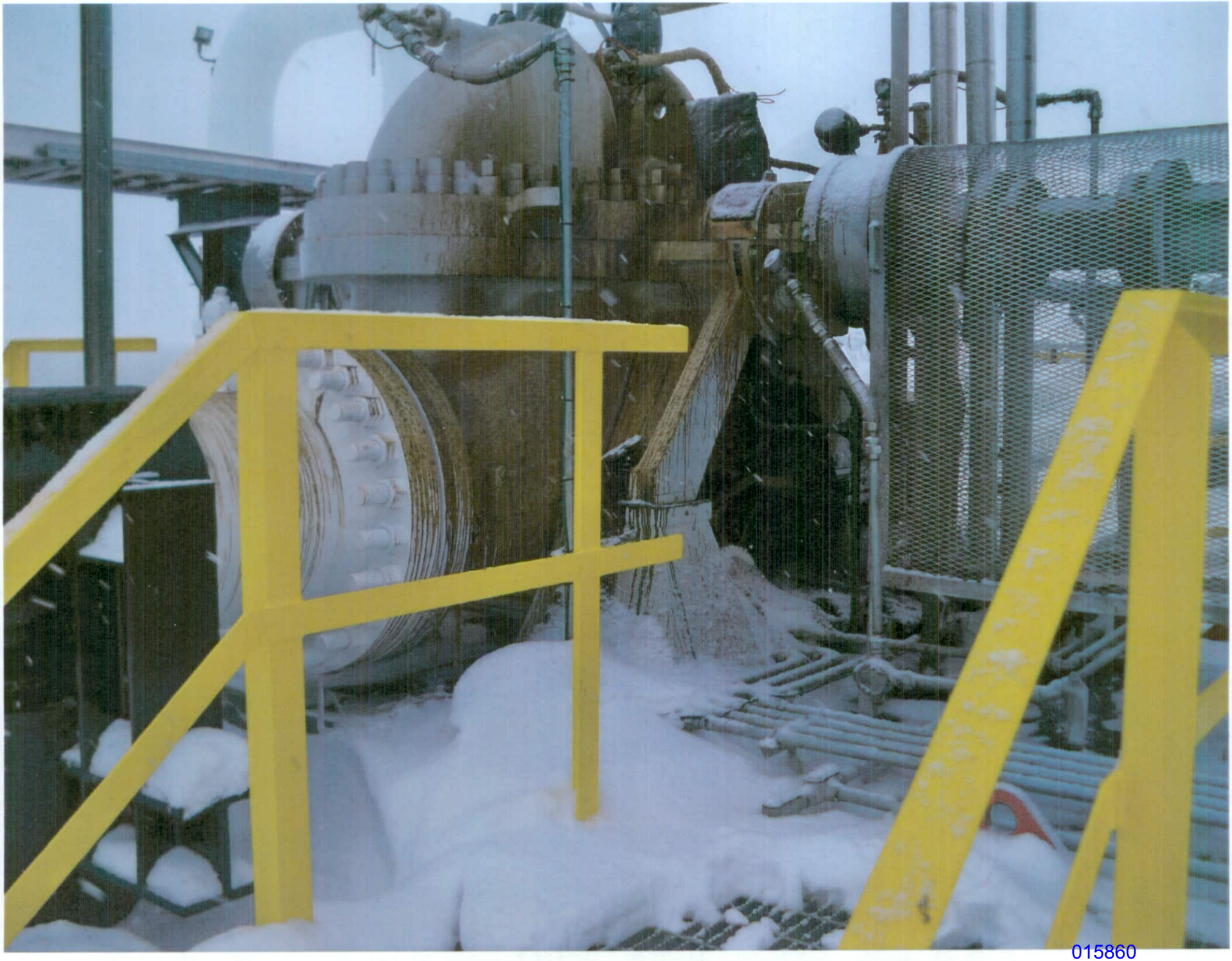
CONTAMINATED MATERIALS DISPOSAL SITE: Two 55-gallon drums of oily absorbent / rags and snow

DATE MATERIAL WAS DISPOSED OF: Pending waste characterization results - scheduled for week of 02-14-2011.

IMMEDIATE CORRECTIVE ACTION TAKEN AND ADDITIONAL WORK PLANNED:
TransCanada technician, upon arrival onsite at 8:00am 01-05-2011, observed the indications of a seal leak. The pump was not operating (was shutdown for no demand at 5:30am 01-05-2011). The technician closed associated suction and discharge valves and immediately initiated remedial activities to contain and clean oil from the pump foundation using absorbent material. Also visually stained snow around the foundation was shoveled up and drummed. A spill cleanup contractor was mobilized to the site to clean off the oiled pump surface and adjacent piping using a non-hazardous citrus based cleaner. Pump and piping cleanup was concluded on 01-06-2011.

Photo 1 is provided as a reference, showing extent of the leak and oil stained equipment.

FORM COMPLETED BY: Robert M. Baumgartner DATE: February 2, 2011



Closure 2011.004

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

March 9, 2011

Robert Baumgartner
TransCanada Keystone Pipeline, LP
13710 FNB Parkway
Omaha NE 68154

Subject: Closure of Department of Environment and Natural Resources File 2011.004 – TransCanada Keystone Pipeline – Ferney Pump Station

Dear Mr. Baumgartner,

The Department of Environment and Natural Resources reviewed all information submitted regarding the above referenced spill. The department has determined the case is closed.

On January 5, 2011, TransCanada staff noticed indications of a leaking seal at the Ferney Pump Station. In response to the two-gallon release, TransCanada staff isolated and stopped the leak and initiated cleanup activities. Six drums of oiled absorbents, rags and snow were collected and properly disposed of. There were no soil or water impacts resulting from the release.

The department has concluded based on the clean-up activities TransCanada conducted, this crude oil spill poses no risk at this time. Therefore, the department will not require TransCanada to take any additional action in this matter. If problems arise because of any remaining contamination, TransCanada may be responsible for conducting additional assessment and remediation.

Please contact Brian Walsh of my staff at (605) 773-3296, if you have any questions. Thank you for your efforts and cooperation regarding this spill.

Sincerely,

Bill Markley

Bill Markley, Administrator
Ground Water Quality Program
(605) 773-3296

cc: Wes Williams, Day County emergency Management, Webster, SD

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

3/8/11

MEMORANDUM

To: Bill Markley, Administrator, Ground Water Quality Program

From: Brian Walsh, Hydrology Specialist BJW

Date: March 8, 2011

Subject: Closure for DENR Spill Case 2011.004 – Canadian Sour Crude Oil– TransCanada Ferney Pump Station Release

---

Introduction

This memo describes the facts associated with DENR spill case 2011.004. The description covers general spill information, removal actions, and remaining contamination. Finally, case closure is recommended. A closure letter is attached for your review and signature.

General Spill Information

Site Name:	TransCanada Keystone Pipeline – Ferney Pump Station
Location:	45.2975 latitude and -97.9488 longitude TransCanada Keystone Pipeline – Ferney Pump Station Day County, South Dakota
Responsible Party:	TransCanada Keystone Pipeline, LP 13710 FNB Parkway Omaha, NE 402.492.7300
Date of Spill:	January 5, 2011

Spill Summary

On January 5, 2011, TransCanada staff noticed indications of a leaking seal at the Ferney Pump Station. TransCanada staff immediately closed associated suction and discharge valves and initiated remedial activities. TransCanada estimates less than 2 gallons of crude oil were released.

Contaminant Characterization

The product release was Canadian Sour Crude oil CAS #8002.05.09. Potential contaminants of concern include BTEX, naphthalene, and TPH-Diesel.

Removal Action and Remaining Contamination

Upon discover, TransCanada immediately closed associated suction and discharge values and initiated remedial activities. Released oil coated pumping equipment, the concrete pump foundation and snow near the foundation. A spill cleanup contractor cleaned the oil off the pump equipment using a non-hazardous, citrus-based cleaner and the oiled snow was collected and drummed. Cleanup actions concluded on January 6, 2011. On February 14, 2011 6 drums of oily absorbent, rags and snow were collected from the site and properly disposed of by Safety-Kleen Systems, Inc. There were no soil or water impacts resulting from the release.

Potential Exposure Pathways

There were no soil or water impacts resulting from the release therefore, there are no complete exposure pathways associated with this spill. The site is not within a designated zone A, B, or C source water area.

Recommendations

Based on a review of information provided and an evaluation of potential risks associated with this spill I recommend case closure.

Walsh, Brian

From: Robert Baumgartner [robert_baumgartner@transcanada.com]

Sent: Thursday, February 17, 2011 10:00 AM

To: Walsh, Brian

Subject: RE: DENR File #2011.004 - Contamination Incident Follow Up Report-TransCanada Keystone Pipeline - Ferney SD

Brian,
Find attached waste manifest #003826920 for the disposal of six drums of oily absorbent, rags, and snow that resulted from the cleanup of Incident #2011.004 at the TransCanada Ferney Pump Station.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Environmental Program Manager
TransCanada Keystone US Operations
832.320.5538 office
402.960.0483 cell
robert_baumgartner@transcanada.com

From: Brian.Walsh@state.sd.us [mailto:Brian.Walsh@state.sd.us]
Sent: Wednesday, February 02, 2011 2:01 PM
To: Robert Baumgartner
Cc: Brian.Walsh@state.sd.us
Subject: RE: DENR File #2011.004 - Contamination Incident Follow Up Report-TransCanada Keystone Pipeline - Ferney SD

Bob,

Thank you for submitting the follow-up report. Once I have the disposal manifests I will complete the closure paperwork.

==========

Brian J. Walsh
Hydrology Specialist
SD DENR
523 E. Capitol Ave.
Pierre SD 57501
605.773.6477
(fax) 605.773.6035
Brian.Walsh@state.sd.us

==========

-----Original Message-----
From: Robert Baumgartner [mailto:robert_baumgartner@transcanada.com]
Sent: Wednesday, February 02, 2011 1:40 PM
To: Walsh, Brian
Subject: DENR File #2011.004 - Contamination Incident Follow Up Report-TransCanada Keystone Pipeline - Ferney SD

Brian,
Find attached the Contamination Incident Follow-Up Report for the release incident reported on January 5, 2011 at our Ferney, SD pump station. Also find attached a photo showing the extent of the leak and equipment that was oiled. Two drums of oily absorbents, rags and snow were generated and are scheduled for disposal the week of February 14, 2011, pending waste characterization results. I'll forward you the disposal manifest upon completion.

Please let me know if you have any questions.

Thank you,

Robert M. Baumgartner
Environmental Program Manager
TransCanada Keystone US Operations
717 Texas St.
Houston, Texas 77002
832.320.5538 office
402.960.0483 cell
robert_baumgartner@transcanada.com

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Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: CESQG | 2. Page 1 of: 1 | 3. Emergency Response Phone: 1-800-468-1760 | 4. Manifest Tracking Number: 003826920 FLE

GENERATOR

5. Generator's Name and Mailing Address
TRANSCANADA KEYSTONE PIPELINE
91451 144TH ST
ANDOVER SD 57442
Generator's Phone: 403-492-7464

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: SAFETY-KLEEN SYSTEMS, INC. | U.S. EPA ID Number: SDD000716696

7. Transporter 2 Company Name: SAFETY-KLEEN SYSTEMS, INC. | U.S. EPA ID Number: TXR000050930

8. Designated Facility Name and Site Address: SAFETY-KLEEN SYSTEMS, INC.
633 E 130TH ST
DOLTON, IL 60419
Facility's Phone: 708-225-8100 | U.S. EPA ID Number: ILD980613913

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1. NON-RCRA/NON-DOT REGULATED LIQUID MATERIAL	3	DM	165	G	NONE
	2. NON-RCRA/NON-DOT REGULATED LIQUID MATERIAL	3	DM	165	G	NONE
	3.					
	4.					

14. Special Handling Instructions and Additional Information: SK SHIP#203205645 SS273316 10014341 CSG:

24 HR EMERGENCY #1-800-468-1760 (SAFETY-KLEEN - CONTRACT #94136)
SK AUTHORIZED TO RETAIN LICENSED SUBSEQUENT CARRIERS AS NECESSARY

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name | Signature | Month 3 | Day 14 | Year 11

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Jesse Stanek | Signature | Month 3 | Day 14 | Year 11

Transporter 2 Printed/Typed Name | Signature | Month | Day | Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) | U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) | Month | Day | Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name | Signature | Month | Day | Year

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.
1)202863/40465775 2)202863/40465776

GENERATOR'S INITIAL COPY

015866

NATIONAL RESPONSE CENTER 1-800-424-8802
GOVERNMENT USE ONLYGOVERNMENT USE ONLY***
Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 963799

INCIDENT DESCRIPTION

*Report taken by: CIV DAVID DEDEAUX at 12:56 on 05-JAN-11
Incident Type: FIXED
Incident Cause: EQUIPMENT FAILURE
Affected Area:
Incident occurred on 05-JAN-11 at 09:57 local incident time.
Affected Medium: OTHER SUMP AREA

REPORTING PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE
Address: 13710 F&B PKWY
OMAHA, NE 68154
KEYSTONE PIPELINE reported for the responsible party.
PRIMARY Phone: (701)2901176
Type of Organization: PRIVATE ENTERPRISE

SUSPECTED RESPONSIBLE PARTY

Name: DANIEL CERKONEY
Organization: KEYSTONE PIPELINE
Address: 13710 F&B PKWY
OMAHA, NE 68154
PRIMARY Phone: (701)2901176

INCIDENT LOCATION

41461 144TH STREET County: DAY
City: ANDOVER State: SD
PUMP STATION 20. MILEPOST FOR THE LOCATION IS 263.5

RELEASED MATERIAL(S)

CHRIS Code: OIL Official Material Name: OIL: CRUDE
Also Known As:
Qty Released: 10 GALLON(S)

DESCRIPTION OF INCIDENT

CALLER STATED THAT THERE WAS A RELEASE OF 10 GALLONS OF CRUDE OIL FROM THE NUMBER TWO PUMP ON THE PUMP STATION. DUE TO A FAULTY SEAL. THE OIL WAS CONTAINED ONSITE.

SENSITIVE INFORMATION

INCIDENT DETAILS

Package: NO
Building ID:
Type of Fixed Object: OTHER
Power Generating Facility: UNKNOWN
Generating Capacity:
Type of Fuel:
NPDES:

IMPACT

Fire Involved: NO Fire Extinguished: UNKNOWN

INJURIES: NO Hospitalized: Empl/Crew: Passenger:
FATALITIES: NO Empl/Crew: Passenger: Occupant:
EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

Closure Type	Description of Closure	Hours Closed	Direction of Closure
Air: N			
Road: N			Major Artery: N
Waterway: N			
Track:			

Environmental Impact: UNKNOWN
Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

SHUTDOWN SYSTEM, CLEAN UP UNDERWAY, SEAL IS BEING REPLACED.
Release Secured: YES
Release Rate:
Estimated Release Duration:

WEATHER

Weather: OVERCAST, 10‖F

ADDITIONAL AGENCIES NOTIFIED

Federal: NONE
State/Local: NONE
State/Local On Scene: NONE
State Agency Number: NONE

NOTIFICATIONS BY NRC

CGIS RAO ST. LOUIS (COMMAND CENTER)
05-JAN-11 13:04 (314)2692420
DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
05-JAN-11 13:04 (202)3661863
U.S. EPA VIII (MAIN OFFICE)
(303)2931788
IA U.S. ATTORNEY'S OFFICE (INTELLIGENCE OFFICER)
05-JAN-11 13:04 (515)4739345
NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
05-JAN-11 13:04 (202)2829201
NOAA RPTS FOR SD (MAIN OFFICE)
05-JAN-11 13:04 (206)5264911
NTSB PIPELINE (MAIN OFFICE)
05-JAN-11 13:04 (202)3146293
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
05-JAN-11 13:04 (202)3660568
SOUTH DAKOTA DENR (MAIN OFFICE)
05-JAN-11 13:04 (605)7733296
DOI/OEPC DENVER (MAIN OFFICE)
05-JAN-11 13:04 (303)4452500

ADDITIONAL INFORMATION

Report any problems by calling 1-800-424-8802
PLEASE VISIT OUR WEB SITE AT http://www.nrc.uscg.mil

U.S. Department
of Transportation
**Pipeline and
Hazardous Materials Safety
Administration**

901 Locust Street, Suite 462
Kansas City, MO 64106-2641

WARNING LETTER

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

March 21, 2011

Mr. Vern Meier
Vice President, US Pipeline Operations
TransCanada
717 Texas Avenue
Houston, TX, 77002-2761

CPF 3-2011-1002W

Dear Mr. Meier:

During the second half of 2010, a representative of the Pipeline and Hazardous Materials Safety Administration (PHMSA) pursuant to Chapter 601 of 49 United States Code inspected your activities related to the TransCanada - Bison Project near Dickinson, North Dakota.

During the course of our construction inspections, the need for improvements in the quality assurance plan, including personnel qualification, were identified. While no construction activities affecting safety appeared to have gone uncorrected prior to placing the Bison pipeline in service, it was apparent that an improved quality management system, if properly implemented, would reduce the need for remedial work and improve overall quality during construction.

Therefore, as a result of the inspection, it appears that you have committed probable violations of the Pipeline Safety Regulations, Title 49, Code of Federal Regulations. The items inspected and the probable violation(s) are:

1. **§ 192.328 Additional construction requirements for steel pipe using alternative maximum allowable operating pressure. For a new or existing pipeline segment to be eligible for operation at the alternative maximum**

allowable operating pressure calculated under § 192.620, a segment must meet the following additional construction requirements. Records must be maintained, for the useful life of the pipeline, demonstrating compliance with these requirements:

(a)(1) Quality assurance. The construction of the pipeline segment must be done under a quality assurance plan addressing pipe inspection, hauling and stringing, field bending, welding, non-destructive examination of girth welds, applying and testing field applied coating, lowering of the pipeline into the ditch, padding and backfilling, and hydrostatic testing.

The document management procedures established for the project were not followed completely. Various inspection procedures were modified throughout the project, but not all construction inspectors received these documents. Assuring all personnel are working with the most current procedures is an important aspect of quality assurance to maintain consistency and repeatability.

The quality assurance plan in place for project was basically limited to inspection. In addition to inspection activities the plan should have included elements whereby "non-conformances", when identified, would be analyzed to understand the root causes so that improvements could be made to processes or procedures to prevent recurrence. Additionally, lessons learned from previous TransCanada construction projects should be considered when developing a quality assurance plan.

The quality assurance plan did not include specific numerical acceptance criteria for defect/repair rates. When unacceptable rates are noted this should initiate a re-evaluation of processes and procedures and necessary modifications to maintain consistent quality. In addition to acceptance criteria, the quality assurance plan should include controls to reduce the variations in working conditions on a larger scale construction project to maintain consistency and repeatability.

2. **§ 192.328 Additional construction requirements for steel pipe using alternative maximum allowable operating pressure.**

(a)(2) The quality assurance plan for applying and testing field applied coating to girth welds must be:

(i) Equivalent to that required under § 192.112(f)(3) for pipe; and

(ii) Performed by an individual with the knowledge, skills, and ability to assure effective coating application.

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§ 192.112(f)(3) A quality assurance inspection and testing program for the coating must cover the surface quality of the bare pipe, surface cleanliness and chlorides, blast cleaning, application temperature control, adhesion, cathodic disbondment, moisture permeation, bending, coating thickness, holiday detection, and repair.

The construction project did not have an adequate quality inspection and testing procedure for holiday detection of coatings during field construction. PHMSA communicated expectations regarding holiday detection for Alternate Maximum Operating Pressure pipelines on the publicly accessible website, *"Standards for Implementing Alternative MAOP for Gas Transmission Pipelines"* at http://primis.phmsa.dot.gov/maop/index.htm. The website included holiday detection testing (revised June 11, 2010) to verify the quality of pipe coating. TransCanada was aware of these expectations, yet continued to perform holiday detection at lower than recommended voltages until September 9, 2010.

3. **§ 192.807 Recordkeeping. Each operator shall maintain records that demonstrate compliance with this subpart.**

(a) Qualification records shall include:
(1) Identification of qualified individual(s);
(2) Identification of the covered tasks the individual is qualified to perform;
(3) Date(s) of current qualification; and
(4) Qualification method(s).requirements for steel pipe using alternative maximum allowable operating pressure.

The quality and accuracy of qualification records for individuals performing covered tasks during the construction of an alternate MAOP pipeline were deficient. During the field operator qualification (OQ) inspection, performed by a PHMSA inspector on September 28, 2010, records of individuals provided by representatives of Price Gregory, Pegasus and TransCanada personnel were reviewed at the time of the inspection. During the review of OQ records, there were discrepancies between those individuals who may have performed covered tasks to those individuals qualified to perform covered tasks. A comprehensive program began September 29, 2010 to correct these deficiencies.

Under 49 United States Code, § 60122, you are subject to a civil penalty not to exceed $100,000 for each violation for each day the violation persists up to a maximum of $1,000,000 for any related series of violations. We have reviewed the circumstances and supporting documents involved in this case, and have decided not to conduct additional

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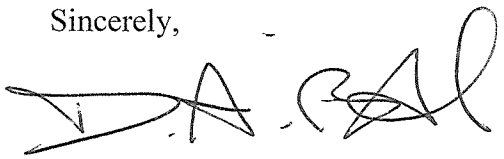
enforcement action or penalty assessment proceedings at this time. We advise you to correct the item(s) identified in this letter. Failure to do so will result in TransCanada Bison Pipeline being subject to additional enforcement action.

No reply to this letter is required. If you choose to reply, in your correspondence please refer to **CPF 3-2011-1002W.** Be advised that all material you submit in response to this enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b).

Sincerely,



David Barrett
Director, Central Region
Pipeline and Hazardous Materials Safety Administration

015873

TransCanada

Materials, Engineering Governance and Quality Management

Ph: (248) 205-4596 FAX: (248) 205-4696 4250 Corporate Drive, Troy, MI 48098

SERVICE: Keystone Spread 3B Coating Audit

REQUESTOR: Meera Kothari (meera_kothari@transcanada.com) **REPORT DATE:** 7-7-09

REPORT BY: Neil Pittman (neil_pittman@transcanada.com)

INTRODUCTION

Meera Kothari, Keystone Project Engineer, requested that Neil Pittman travel to the Keystone 3B Spread and audit Michels Pipeline's application and UEI's inspection for adherence to the Keystone coating specification, KPP-01 "Specification for liquid epoxy/urethane system." Dana Green, UEI RCS, Racer Hutchens,UEI Chief, Chuck Otwell, UEI Coating Auditor and various Michels Foremen and Straws participated in the audit.

CONCLUSIONS

Several items of concern were identified during the four day audit. As each item was identified it was corrected with the participation of Michels and UEI. After the audit there were no items that were not addressed and corrected to the minimum requirement of the specification.

1. Mainline Coating

1.1. Abrasive Blasting – The Michels mainline coating crew was using Black Beauty "medium" grit which has a 16-40 sieve size. According to the mainline coating foreman and NACE coating inspector this grit, combined with their equipment, was causing high anchor profiles when the specified coating cleanliness was met. The audit revealed seven girth welds on the right of way that were blasted to only a NACE #3, Commercial Blast prior to coating. The specification KPP-01 requires a NACE #2 Near White Blast. The entire girth weld area on all seven did not meet the cleanliness specification with the bottom having the lowest quality. The blast on the welds was rejected and they were re-blasted (some twice), resulting in a Near White Blast with an anchor profile within specification. The blast operators changed their technique which resulted in acceptable cleanliness and profile. High anchor profiles were not observed when a Near White Blast was achieved. The Michels foreman was informed that switching to a finer grit, Black Beauty 20-40, may result in the required cleanliness without the danger of high profiles. The foreman switched to the finer grit and a spot check of the mainline coating crew two days later reveal the anchor profile and cleanliness were being met on the entire circumference of the girth welds.

1.1.1. Coating Inspection – The UEI NACE coating inspector on the mainline had two deficiencies in her reporting.

1.1.1.1. The seven girth welds that the audit rejected should have been rejected by her. Upon inspection of the welds with the SSPC vis. 1 standards she agreed that none of the seven met spec. She stated that they had been having the problem of not being

able to meet the Near White Blast, due to high anchor profiles, for two weeks. She reported the problem but later said the problem was resolved. The cleanliness on the previous two weeks mainline coating is not known. All blast cleanliness on form C11A for the previous two weeks was recorded as being Near White when that may not be the case. The inspector was instructed by her management to record the actual blast cleanliness on form C11A and reject anything that did not meet specification. A spot check in the field two days later found her correctly recording the cleanliness.

1.1.1.2. The UEI mainline coating inspector had "20 – 35" recorded as the WFT on all audited C11A forms. Eight instances were found where the lowering in inspector found low DFT, especially on the bottoms of the girth welds. The mainline coating inspector was instructed by her management to record the actual of all three measurements on form C11A.

1.1.2. Hydrogen Outgassing – The girth weld coatings show evidence of pinholes from hydrogen outgassing of the welds. The welds were being coated within 24 hours of weld completion. Jeeping was catching all holidays and they were being repaired. The UEI RCS was informed that moving the mainline coating crew back to >24 hours after welding would reduce the number of pinholes.

1.1.3. Coating Application – There were brush hairs found in the coating and stalactites on the bottom of the weld. The mainline coating crew was asked to not "work" the coating until it was curing, causing the coating to pull bristles from the brushes. The avoidance of stalactites by technique was also reviewed. The prejeeping crew was advised on how to adequately repair stalactites.

1.1.4. Welding – PHMSA noted in their exit report from Spread 3B that the welding clamps were disbonding dime sized pieces of parent FBE from the mainline. The mainline coating crew is now abrasive blasting and repairing the disbonded areas with SPC-2888.

1.1.5. Safety – In the Michels safety orientation it was presented that "if it doesn't have a seat belt, don't ride it." The abrasive blasting truck was being ridden by the laborer adding abrasive to the pots. The Michels safety representative was informed of this and will make corrections.

2. **Prejeeping**

2.1. Unrepaired Holidays – At lowering in many holidays were found marked and not repaired. In addition, an audit of approximately one mile of pipe between prejeeping and lowering in found 29 unmarked visible holidays on the working side of the pipe alone. An audit of the prejeeping crew found that the addition of a prejeeping inspector and Michels voluntarily increasing prejeeping voltage to 2,500 volts and grounding directly to the pipe has eliminated this problem. The majority of holidays found now at lowering in are believed to have occurred by mechanical damage between prejeeping and lowering in. The prejeeping inspector is keeping meticulous records, performing cure and adhesion tests and rejecting inadequate and missed repairs. The quality of the prejeeping inspector's work was reviewed with him.

2.2. Holiday repair – Michels believes that they were instructed not to use brushes on holiday repairs. They were instructed not to apply the coating directly to the brush but to mix on a clean palette. Without brushes, the Michels prejeeping crew was using tongue depressors to apply coating to repairs. This resulted in many repairs that were visibly inadequate due to high and low milage. Michels was informed that they may use brushes and the quality of repairs improved.

2.3. Brush Cleaning – Michels is cleaning their brushes of excess coating on the pipe which is acceptable. However, it creates a spot that looks like a holiday repair and is often messy and low in milage. The Michels prejeeping crew were advised that if they wipe their brushes in a "plus" pattern next to the repair that inspection would recognize it as not being a repair.

2.4. Milage – The prejeeping inspector is filling out form C11B now. On the form he has been recording the average of 5+ readings and rejecting if the DFT is outside of specification. He was informed that the spec requires recording five readings on form C11B and started doing that immediately.

2.5. Holiday Marking – It was unclear who was marking holidays and writing "jeep" next to them. The PHMSA auditor noticed several of these markings after prejeeping in his exit report. The UEI RCS announced in a morning foreman and inspectors meetings that the word "jeep" should not be written next to marked holidays or potential holidays. The RCS will address who should be marking on the pipe.

2.6. Jeep Spring – The prejeeping crew had two springs for their holiday detector. Both were loose and "tented" at the weld and at the arm connecting the spring to the holiday detector. It was recommended that a new spring may provide more complete holiday detection.

3. Lowering In

3.1. Accelerated Cure – Three defects were found during lowering in that were burned coating at and around repairs. One of the defects was already in the ditch. Lowering in was stopped and a bell hole dug so the defect in the ditch could be repaired. A hand-held propane torch was observed on the right of way and the lowering in foreman was informed that torches may not be used to post-heat coatings. The foreman had a heat gun in his truck and will use that on subsequent repairs that need accelerated curing. The UEI RCS, Chief, lowering in inspector and the Michels foremen from lowering in and backfill reviewed the rejected burned repair to ensure consistency of accepting accelerated cured repairs.

4. Tie In – Several tie in crews were visited with all quality measurements and processes meeting specification.

4.1. Safety – Two personnel were observed standing on the pipe. In one instance, a laborer was observed running on the pipe, jumping to another pipe and then standing on the pipe while it was lifted by heavy equipment to line it up for a tie in. She and her foreman were informed that TransCanada does not allow personnel on the pipe. Michel's safety representative was informed of the issue.

Respectfully submitted,

Neil Pittman
NACE Certified Coating Inspector #9975
Consultant – Coatings
USPC
TransCanada

From:	Ken Crowl
To:	Barrett, David (PHMSA); Daniel Cerkoney; Ochs, Gregory (PHMSA); Butler, Karen (PHMSA); Bunn, James (PHMSA); Miller, Warren (PHMSA); McLaughlin, Mike (PHMSA); Hodill, Gabe (PHMSA)
Cc:	Vern Meier; Bruce Dupuis
Subject:	FW: Restart Authorization
Date:	Monday, October 22, 2012 3:57:23 PM
Attachments:	NPS 30 Keystone Pipeline - Salisbury to Patoka Repair Dec - Technical Memo - 10-22-12.pdf Keystone Pipeline Restart Operations Plan 2012 10 21.doc

David,

We have commenced the restart of the Keystone Pipeline. Attached is the restart plan and Vern's approval of the technical memorandum. The Media talking points discussed this morning will be provided as soon as I receive them.

Regards,

Ken Crowl

From: Vern Meier
Sent: Monday, October 22, 2012 2:12 PM

Subject: Restart Authorization

Based on the attached Engineering documentation and field verification of the completion of the final repair please accept this as authorization from Field Operations to commence the restarting of the Keystone Pipeline in accordance with the attached Restart Plan.

Regards,

Vern Meier

From: Tirso Gonzalez
Sent: Monday, October 22, 2012 12:12 PM
To: Tirso Gonzalez; James Baggs; Vern Meier; Bruce Dupuis; Erik Tatarchuk; Dale Wascherol; Richard Prior; Kevin Maloney; Trae Miller III; Dan King; Daniel Cerkoney; James Card; Jim Krause; David Chittick; James Card; Paul MacGregor; Tracy Schultz
Subject: RE: 1 Min update from site

Plidco clamp is torqued to specifications and complete. Sites 1-4 are complete.

Regards,

Tirso D. Gonzalez
TransCanada Pipelines
Project Manager
U.S. Integrity, Maintenance & Construction
Office: (832) 320-5127
Mobile: (219) 929-7119

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2013-0174_000028

message. Thank you.

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2013-0174_000029 015878

Technical Memorandum

TransCanada
In business to deliver

Date: October 22, 2012
To: Vern Meier
From: Gabriela Rosca
Cc: Tirso Gonzales, Richard Kania, David Coker, David Chittick, Richard McGregor, Bruce Dupuis
Re: NPS 30Keystone Pipeline – Salisbury to Patoka
Subject: Repair Decision

Background

Based on the preliminary MFL inspection report of NPS 30 Salisbury to Patoka received from Baker Hughes on October 18, 2012 there were 4 immediate metal loss anomalies with a Peak depth greater than or equal to 70% W.T.

Baker ILI Immediate Feature summary

Valve	Feature	Peak Depth (%)	FPR	Length (in)
SNTPL+0.4_8-A0-MLV-001	DMA 204496	95	1.19	0.63
SNTPL+0.4_8-A0-MLV-001	DMA 205022	78	1.19	1.54
SNTPL+0.4_8-A0-MLV-001	CLS 30000	79	1.39	2.22
SNTPL+0.4_8-A0-MLV-001	DMA 210611	83	1.38	0.51

ILI versus Actual Data and Associated Mitigation Summary

Feature	ILI Peak Depth (%)	ILI Length (in)	WT (in)	Actual Peak Depth (%)	Actual Length (in)	AWT (in)	Repair Required	Repair Implemented	FPR
DMA 204496	95	0.63	0.386	96.9	1.0	0.386	pressure containing sleeve (Type B)	Plidco Clamp (temporary)	n/a
DMA 205022	78	1.54	0.386	73.8	2.01	0.393	recoat	Armor Plate	1.27
CLS 30000	79	2.22	0.386	59.9	1.01	0.397	recoat	Armor Plate	1.45
DMA 210611	83	0.51	0.386	61	1.01	0.393	recoat	Armor Plate	1.44

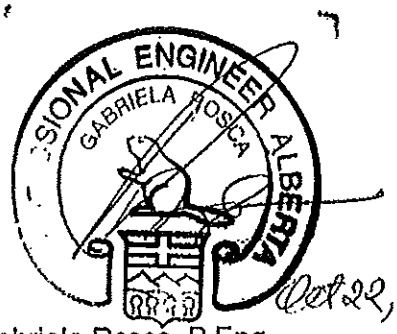
Prepared for Release in PHMSA FOIA
2013-0174_000030 015879

Technical Memorandum

TransCanada
In business to deliver

All the immediate features have been mitigated to ensure the integrity of the pipeline (design MOP of 1440 psi).

Prepared by:



Oct 22, 2012

Gabriela Rosca, P.Eng
Pipe Integrity, Program Support

Reviewed by:

Oct 22, 2012

Bruce Dupuis, P.Eng
Program Manager, Liquid Pipeline Integrity

TC Permit to Practice: 7100

Approved By:

10/22/12

Vern Meier
Vice President

Prepared for Release in PHMSA FOIA
2013-0174_000031 015880

Keystone Pipeline Restart Operations Plan

Following shutdown of the Keystone pipeline on October 17, 2012, repair of the identified anomalies downstream of Saint Paul pump station commenced under the direction of TransCanada's Integrity Management and Construction group. During this time period the Oil Control Center staff in Calgary continued to monitor pipeline pressures and confirm that no loss of pressure was observed due to a loss of oil from the pipeline.

The prerequisite to commence with pipeline restart operations will be formal confirmation from the Vice President of US Pipeline Operations that the all anomalies have been satisfactorily addressed and it is safe to proceed with remote operation of the pipeline.

In preparation for restarting the pipeline, voluntary pressure restrictions have been placed on the pipeline to ensure the pipeline operating pressure at the anomaly locations downstream of Saint Paul pump station cannot exceed a maximum of 80% of the 60 day high historical operating pressure. These line pressure control (LPC) settings have been engineered to account for transient operating conditions and have been installed at the Centralia, Middletown, Saint Paul, Hartford and Pierron pump stations on October 20, 2012.

Upon receipt of confirmation to safely restart the pipeline, the Oil Control Center will proceed to open all remote sectionalizing valves and proceed with pre start up system checks in accordance with established Oil Control Center procedures. These procedures for restarting the pipeline are the same procedures that are used for all pipeline restart operations.

Since the pipeline will have been shutdown for approximately 4.5 days on the Steele City to Patoka segment and approximately 3 days on the Hardisty to Steele City segment, approximately 2,000 m^3 (12,600 bbls) of column separation has been calculated on the pipeline. The regions of column separation have been distinctly identified by pressure transmitters located at each of Keystone's pump stations and Remote Mainline Valves.

During initial start up operations of the pipeline, the pipeline will be operated at a nominal operating flowrate of 2,200 to 2,500 m^3/hr (13,900 to 15,700 bbls/hr). The pipeline will be operated with select pump stations such that column is reconstituted in a predictable and safe fashion. This will be accomplished by closely monitoring all pressure locations on the pipeline to ensure the rate of pressure increase in the areas where the column is being reformed is commensurate with the pipeline injection rate at Hardisty, AB. If at any time during the column reconstitution process a pressure anomaly is discovered, the Oil Control Center operators will investigate the anomaly immediately and if necessary shut down pipeline operations until the anomaly has been reconciled and it is safe to resume restart operations.

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In addition to the diligence given to pipeline restart operations in the Oil Control Center, each anomaly that has been addressed will be visually observed to confirm the integrity of the repairs during restart operations. In addition, Keystone will complete an aerial surveillance of the pipeline via airplane during restart operations.

After the column has been reconstituted and the integrity of each repair has been confirmed, the pipeline flow rate will be increased in an orderly manner to continue regular scheduled operations.

Keystone is confident that all operational risks have been identified and mitigated through the restart operations plan.

October 21, 2012

Prepared for Release in PHMSA FOIA
2013-0174_000033
015882

From:	Ken Crowl
To:	Barrett, David (PHMSA); Ochs, Gregory (PHMSA); Butler, Karen (PHMSA); Bunn, James (PHMSA); Miller, Warren (PHMSA); McLaughlin, Mike (PHMSA); Hodill, Gabe (PHMSA)
Cc:	Vern Meier; Bruce Dupuis; Daniel Cerkoney
Subject:	Keystone Restart
Date:	Monday, October 22, 2012 5:17:27 PM

The pipeline has completed the restart process as of 14:00 MST (16:00 Central). The liquid column has been reconstituted to Patoka and the flow rate has been increased to 2900 m3/h (438 KBPD).

Regards,

Ken Crowl

This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

Prepared for Release in PHMSA FOIA
2013-0174_000034

From:	Barrett, David (PHMSA)
To:	Hess, John (PHMSA); Seeley, Rodrick M. (PHMSA)
Cc:	PHMSA PHP300 CENTRAL
Subject:	Update on TC Oil (Keystone) shutdown
Date:	Thursday, October 18, 2012 6:27:59 AM
Attachments:	Spatial overview of sites.png

Late yesterday, October 17, 2012, TC Oil (Keystone) reported shutting down the pipeline in response to an anomaly indication preliminarily reported by an ILI vendor.

On September 28, 2012 a high resolution MFL tool run was completed from Salisbury, MO to Patoka, IL on the Keystone Pipeline. Yesterday, the ILI vendor contacted Keystone to report an external metal loss anomaly located in St. Charles County, MO (northwest of the St. Louis metro area). The anomaly is short and deep (95% deep). In response, TC Oil shut down and isolated the pipeline by closing valves. Personnel were sent to the location of the anomaly, and hydrocarbons have not been detected thus far at the site. As of last night, plans were to begin excavation this morning.

Subsequent to the originally reported 95% deep anomaly, three more similar anomalies have been identified within 4 miles downstream of the 95% deep ILI feature and will be investigated. These anomalies are also reported to be external metal loss ranging from 78% to 83% deep. The attached map shows the location of the anomalies (DMA 204496 is the 95% deep feature) in a rural area. The pipeline flows from west to east, and is approx. ½ to 1 mile south of the Mississippi River as shown on the map.

A PHMSA engineer will be en route to the site today from Kansas City.

TC Oil (Keystone) is one of the TransCanada companies, and transports crude oil from Canada to the US market. The pipe is 30-inch diameter, 0.386" w.t., X-70 at the location of the anomalies. The Keystone pipeline is subject to a PHMSA issued Special Permit that allows operation up to 80% SMYS. However, the pipeline has not operated at the 80% SMYS level, and has been operating no higher than 72% SMYS per Part 195 regulations.

OPS Central Region will provide further updates as more information becomes available.

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EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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If an item is marked U, N/A, or N/C, an explanation must be included in this report.

A completed **Standard Inspection Report** is to be submitted to the Director within 60 days from completion of the inspection. A **Post Inspection Memorandum (PIM)** is to be completed and submitted to the Director within 30 days from the completion of the inspection, or series of inspections, and is to be filed as part of the **Standard Inspection Report.**

Inspection Report		**Post Inspection Memorandum**	
Inspector/Submit Date: Southwest Region		**Inspector/Submit Date:**	
		Peer Review/Date:	
		Director Approval/Date:	

POST INSPECTION MEMORANDUM (PIM)			
Name of Operator:	TransCanada Oil Pipeline Operations Inc.	**OPID #:**	32334
Name of Unit(s):	Keystone Gulf Coast Pipeline North / Keystone Gulf Coast Pipeline South	**Unit #(s):**	74979,83245
Records Location:	Transcanada Sharepoint site, Contractor offices, Transcanada Office	**Activity #**	135840 & 140666
Unit Type & Commodity:	Interstate Liquids (Crude)		
Inspection Type:	Construction	**Inspection Date(s):**	2011-2014
PHMSA Representative(s):	Clint Stephens /Jon Manning /James Arnold / Noah Matthews/Barry Small/ Bill Lowry/ Basim Bacenty/ Joseph Elmer/ David Eng/ John Pepper	**AFO Days:**	165.9

Summary:

The final report consists of three parts:

1. **Form 7**
2. **Appendix A: Construction Summary**
3. **Appendix B: Review of 57 Conditions**

Transcanada Keystone Pipeline LP, notified PHMSA in a letter dated September 30, 2011 of the construction of the Keystone Gulf Coast Pipeline starting in Q1 of 2012. The construction of the Keystone began in 2011 and was commissioned in 2014. Since 2011 until the commissioning of the pipeline on January 22, 2014, PHMSA, Southwest Region conducted onsite inspections and reviewed documents which include construction specifications, construction inspection reports, welding qualifications,etc.,, submitted by Transcanada. A total of 165.9 AFO days and 53.35 non-AFO days were spent on the Transcanada construction project.

In addition, Transcanada ran an in-line inspection caliper/deformation tool and conducted a DCVG survey of their entire Keystone Gulf Coast Pipeline to access any pipeline or coating damage during construction and backfilling activities. Transcanada completed the tool run and DCVG survey and found anomalies which were repaired. PHMSA witnessed part of the tool run and DCVG survey and reviewed the repair methods and records.

Transcanada submitted their Commissioning Plan to PHMSA for review before commencing commissioning/line fill activities. Line fill began in December 2014 and commenced on January 21, 2014. PHMSA engineers/inspectors were onsite to verify commissioning plan was being followed and to witness the testing of pump station alarms, valve operation and SCADA operations. On January 22, 2014 Transcanada commissioned the pipeline.

Daily reports were submitted by each engineer/inspector to document the daily construction activities observed during the inspections. The engineers/inspectors moved around the various construction activities throughout the day depending on the logistics and activities being performed. The primary focus for the engineer/inspector is to observe construction activities and gather and compile all pertinent documentation to assure regulatory compliance with 49 CFR Part 195.

All daily reports, specifications, maps, and any other information gathered by PHMSA is located in the PHMSA “P” drive Construction Folder under “Transcanada Keystone Gulf Coast Pipeline North Final Construction Report”.

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2013-0174_000001

015885

EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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Findings:
There were two Warning Letters, 4-2013-5017W and 4-2013-5021W, sent to Transcanada for non-compliance issues. The issues were:

.202- Warning letter 4-2013-5017W was sent to Transcanada on September 10, 2013 for not following their Construction Specifications to protect the coating from damage due to welding spatter.

.246(a) – Warning letter 4-2013-5017W was sent to Transcanada on September 10, 2013 for not following Construction Specifications when installing foam pillows to minimize external stresses on the pipe.

.214(a) and (b) -Warning Letter 4-2013-5021W was sent to Transcanada on September 26, 2013, for failing to perform welding on Spread 3 in accordance with a procedure qualified according to Section 5 of API 1104. Procedure KXL-SMAW-ML had revisions to essential variables which was not requalified.

.222(a) and (b) – Warning Letter 4-2013-5021W was sent to Transcanada on September 26, 2013, for failing to properly qualify welders on Spread 3 in accordance with Section 6 of API 1104. Procedure KXL-SMAW-ML had revisions to essential variables which the welders were not qualified to perform.

Transcanada responded to the Warning Letters and are located in the CPF Southwest Region files.

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015886

EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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Name of Operator:	TransCanada Oil Pipeline Operations Inc.		
OP ID No. [1]	32334	**Unit ID No.** [1]	74979 and 83245
HQ Address:		**System/Unit Name & Address:** [1]	
717 Texas Street Houston, TX 77002		717 Texas Street Houston, TX 77002	
Co. Official:	Mr. Vern Meier	**Activity Record ID No.:**	140666 and 135840
Phone No.:	832-320-5505	**Phone No.:**	832-320-5462
Fax No.:	832-320-6462	**Fax No.:**	832-320-6462
Emergency Phone No.:	800-447-8066	**Emergency Phone No.:**	800-447-8066

Persons Interviewed	Title	Phone No.
Dan Cerkoney	Manager Regulatory Compliance Major	713-693-6466
Transcanada Inspectors		
Michels Pipeline Construction Personnel		
Sunland Construction Personnel		
Meera Kothari	Engineer	713-693-6466

PHMSA Representative(s) [1]	Jon Manning, Jim Arnold, Agustin Lopez, Clint Stephens, Noah Matthews, Barry Small	**Inspection Date(s)** [1]	2011-2014
Company System Maps (Copies for Region Files):	Maps are located in the PHMSA "P" Drive		

Description of Construction [1]

The Keystone Gulf Coast pipeline consists of 485 miles of 36 inch X70 pipe ranging in wall thickness (.465,.515,.572,.618, and .748). The pipeline starts at the TransCanada Keystone Cushing Terminal in Lincoln County Oklahoma and terminates at the Terminal Facilities in Nederland, Jefferson County Texas. The pipeline transports crude oil from Cushing, OK to Nederland, TX where it ties into the Sunoco Terminal.

Spread 1 Contractor- Michels Pipeline Construction, MP 0.00 to 195.00
Spread 2 Contractor- Michels Pipeline Construction, MP 195.00 to 371.70
Spread 3 Contractor- Sunland Construction, MP 371.70 to 484.57

10 Pump Stations
PS-32, Cushing South, MP 0.00
PS-33, Cromwell, MP 49.21
PS-34, Tupelo, MP 95.70
PS-35, Bryan, MP 147.77
PS-36, Delta, MP 194.88
PS-37, Winnsboro, MP 238.96
PS-38, Lake Tyler, MP 284.62
PS-39, Lufkin, MP 338.74
PS-40, Corrigan, MP 380.9
PS-41, Liberty, MP 435.52

The Southwest Region inspected the pipeline in accordance with both the 57 Special Permit conditions and according to 49 CFR Part 195 regulations.

[1] Information not required if included on page 1.

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2013-0174_000003 015887

EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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PIPE SPECIFICATIONS		
.51	.112	Steel Pipe
	▪ Manufacturer:	Welspun (Little Rock, AR) – spiral, llva (Taranto, IT) – long seam
	▪ Manufacturing Standard:	API 5L PSL2 X70M 44th Edition
	▪ Pipe Grade:	X70
	▪ Outside Diameter (D):	NPS 36
	▪ Wall Thickness (t):	• 0.465 – Line Pipe (FBE) (PMSA 57 Conditions 1-9) • 0.515 – HCA (FBE) • 0.572 – Downstream of Corrigan Pump Station (FBE) • 0.618 – Road Bore (FBE/ARO) • 0.748 – HDD (FBE/ARO)
	▪ Type of Longitudinal Seam:	Long Seam and Spiral Seam
	▪ Specified Min. Yield Strength (S):	70,000
	▪ Joint Design - Bevel:	V groove
	▪ External Coating:	FBE
	▪ Internal Coating:	N/A
	▪ Minimum Joint Length:	Minimum of 8’ typical double joints 76’
	▪ Footage or Miles:	485 miles

Comments:
Pipe was stamped with the specifications and was verified in the construction inspections. Mill test reports were submitted to PHMSA to verify pipe specifications.

.100	DESIGN REQUIREMENTS			S	U	N/A	N/C
	.102		Check temperature rating (particularly if this is a CO2 line).	X			
	.104		All components are consistent with pressure rating. (consider MOP changes along PL)	X			
	.106		Pipeline design formula: **P = (2St/D) x F x E x T** F = .72 most cases F = other, Special Permit (typically 0.8) F = 0.6 offshore platform, risers, inland navigable waters F = 0.54 cold expanded to meet minimum SMYS	X			
	.108		External design pressure.	X			
	.110(a)		Design pipeline system to anticipated external loads, e.g., earthquakes, vibration, thermal expansion, and contraction. Follow section 419 of ASME/ANSI B31.4 for expansion and flexibility.	X			
	.110(b)		Pipe/components supported in a manner to minimize localized stresses. Compute and compensate for stresses to the pipe wall caused by attachments to the pipe.				
	.111		CO2 lines must be designed to mitigate fracture propagation			X	
	.112(b)		Pipe manufactured in accordance to API or ASTM.	X			
	.112(c)		Mark each length of pipe **≥ 4½ inches OD** to indicate SMYS or grade, pipe size, and specification.	X			
	.114		Used pipe installed in a pipeline system must comply with **§195.112(a) and (b)** and the following:				
		▪	Known API or ASTM specification, seam joint factor determined IAW .106(e), unknown yield or wall thickness IAW .106(b) or (c) as appropriate.			X	
		▪	Free of buckles, cracks, grooves, gouges, dents, corroded areas, or other surface defects that exceed the maximum depth.			X	
		▪	Depth of the corroded areas - is the remaining wall thickness equal to or greater than the minimum required by the tolerance in specifications, or MOP reduced.			X	
	.116		Valves installed in the pipeline system must comply with the following:				
		(a)	ANSI/API Spec 6D, 23rd edition April 2008, and errata 3 (2009)	X			
		(b)	Compatible with the pipe or fittings to which the valve is attached.	X			
		(c)	Compatible with carbon dioxide or each hazardous liquid the pipeline may carry.	X			

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EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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.100	DESIGN REQUIREMENTS				S	U	N/A	N/C
		(d)	Both hydrostatically shell and seat tested without leakage.(Sect. 11 API 6D)		X			
		(e)	Equipped with a means for clearly indicating valve position (open, closed, etc).		X			
		(f)	Marked on the body or nameplate with the following:					
			(1)	Manufacturer's name or trademark.	X			
			(2)	Class designation or maximum working pressure.	X			
			(3)	Body material.	X			
			(4)	Nominal size.	X			
	.118(a)	Butt-welding type fittings meet marking, end preparation, and bursting requirements of **ANSI B16.9, (December 2007 edition)**, or **MSS SP-75-2004.**			X			
	.118(b)	Fittings must be free of any buckles, dents, cracks, gouges, or other defects that might reduce strength.			X			
	.118(c)	Fittings must suitable for the intended service and at least as strong as the pipe and other fittings in the pipeline system to which it is added.			X			
	.120	New and replaced line pipe, valve, fitting, or other line component designed and constructed to accommodate the passage of instrumented internal inspection devices.			X			

Comments:

.111- Pipeline is not a CO2 line.

.112(b) - Pipe was manufactured to API 5L 44th edition (PSL 2). A portion of the Gulf Coast Pipeline was manufactured at the Welspun facility in Little Rock, AR., and was inspected by PHMSA/Southwest.

.114 – There will be no used pipe installed on the Gulf Coast Pipeline.

Design of fittings and valves were verified during the field inspections. PHMSA examined the fitting and valves in the field at the pipe yard and after installation of the valves.

.200	CONSTRUCTION REQUIREMENTS				S	U	N/A	N/C
	SPECIFICATIONS							
	.202	Comprehensive written construction specifications.				X		
	.204	Qualified inspector performing inspections.			X			
	.206	Materials visually inspected at site of installation for damage or service impairment			X			
	.207	Pipe transported in accordance with API RP 5L1 (6th edition, July 2002), or 5LW (2nd edition effective March 1, 1997), as applicable						X
	.208	Supports and braces not welded to the pipe operating above 100 p.s.i.			X			
	.210(a)	Pipeline ROW selected to avoid areas containing private dwellings, industrial buildings, and places of public assembly.			X			
	.210(b)	Pipeline located within **50 feet** of any private dwelling, industrial building, or place of public assembly provided with at least an **additional 12 inches of cover**.			X			
	.212(b)	Field bends cannot be wrinkle bends and made in compliance with:						
		(1)	Not impair serviceability.		X			
		(2)	Smooth, free from buckles, cracks, or mechanical damage.		X			
		(3)	Longitudinal weld near neutral axis unless - an internal bending mandrel is used; or pipe is **≤ 12 ¾ inches** or **D/t ratio is less than 70%**.		X			
	INSTALLATION OF PIPE							
	.246(a)	Pipe installed to minimize stresses and protect the pipe coating from damage.				X		
	.248(a)	Installed with appropriate cover and below cultivation (refer to table below)			X			

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EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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.200	CONSTRUCTION REQUIREMENTS			S	U	N/A	N/C

Location	Cover (inches) For Normal Excavation	Cover (inches) For Rock Excavation[1]
Industrial, commercial, and residential areas	36	30
Crossings of inland bodies of water with a width of at least 100 ft from high water mark to high water mark	48	18
Drainage ditches at public roads and railroads	36	36
Deepwater port safety zone	48	24
Gulf of Mexico and its inlets in water less than 15 ft deep as measured from the mean low tide.	36	18
Other offshore areas under water less than 12 ft deep as measured from the mean low tide.	36	18
Any other area	30	18
Additional cover required by 195.210.	As Above + 12	As Above + 12

[1] Rock excavation is defined as any excavation that requires blasting or removal by equivalent means.

	.248(b)		If minimum cover prescribed above cannot be attained because it is impracticable to do otherwise additional protection being provided as required	X			
	.250		**12 inches** of clearance between the pipeline and any other underground structure.	X			
	.252		Backfilling performed in a manner that provides firm support for the pipe and does no damage to the coating	X			
	.256		Pipe at each railroad or highway crossing installed so as to adequately withstand the dynamic forces exerted by anticipated traffic loads.	X			
			VALVES				
	.258(a)		Install valve in a location, accessible to authorized employees and protected from damage or tampering.	X			
	.258(b)		Each submerged valve located offshore or in inland navigable waters must be marked, or located by conventional survey techniques, to facilitate quick location when operation of the valve is required.			X	
	.260		Valves installed at each of the following locations:				
		(a)	On the suction end and discharge end of a pump station in a manner that permits isolation of the pump station equipment in the event of an emergency.	X			
		(b)	On each line entering or leaving a breakout storage tank area in a manner that permits isolation of the tank area from other facilities.	X			
		(c)	On each mainline at locations along the pipeline system that minimizes damage or pollution from accidental hazardous liquid discharge, as appropriate for the terrain in open country, for offshore areas, or for populated areas.	X			
		(d)	On each lateral takeoff from a trunk line in a manner that permits shutting off the lateral without interrupting the flow in the trunk line.	X			
		(e)	On each side of a water crossing that is more than 100 feet wide from high-water mark to high-water mark unless a waiver has been granted for a particular case where valves not are justified.	X			
		(f)	On each side of a reservoir holding water for human consumption.	X			

Comments:

.202- Warning letter 4-2013-5017W was sent to Transcanada on September 10, 2013 for not following their Construction Specifications to protect the coating from damage due to welding spatter.

.204 – The qualification records were checked for Chief Welding Inspector Ron Green.

.207 - TransCanada procedures for transporting pipe by rail is outlined in Condition 6 of the 57 Conditions, based on the Association of American Railroads (AAR) standard not API RP 5L1.

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2013-0174_000006 015890

EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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Comments:

.246(a) – Warning letter 4-2013-5017W was sent to Transcanada on September 10, 2013 for not following Construction Specifications when installing foam pillows to minimize external stresses on the pipe.

.258(b) - There are no offshore or submerged valves installed in the entire pipeline system.

.200	WELDING		S	U	N/A	N/C
	.214(a)	Welding must be performed by qualified welders using qualified welding procedures.		X		
		Welding procedures are qualified in accordance with Sec. 5 of API 1104 or Section IX of ASME Boiler & Pressure Code		X		
		Welding procedures must be qualified by destructive testing.		X		
	.214(b)	Each welding procedure must be recorded in detail, including results of qualifying tests.		X		
	.222(a)	Welders must be qualified in accordance with **Section 6 of API Standard 1104 (**20th edition 2007, including errata 2008**)** or **Section IX of the ASME Boiler and Pressure Vessel Code** (2007 edition), except that a welder qualified under an earlier edition than listed in **' 195.3** may weld, but may not requalify under that earlier edition.		X		
	.222(b)	Welders may not weld with a particular welding process unless, within the preceding 6 calendar months, the welder has – (1) Engaged in welding with that process; and (2) Had one weld tested and found acceptable under Section 9 of API 1104.		X		
	.224	Welding operations protected from weather conditions.	X			
	.226(a)	Arc burns require repair.	X			
	.226(b)	If a notch is not repairable by grinding, a cylinder of the pipe containing the entire notch must be removed. Do arc burn repair procedures require verification of the removal of the metallurgical notch by nondestructive testing? **(Ammonium Persulfate)**.	X			
	.226(c)	Ground not welded to pipe.	X			
	.228(a)	Welding must be inspected to insure compliance with the requirements of this subpart (line-up, pipe not in a bind, API 1104 requirements, welding procedures followed, etc). Visual inspections must be supplemented by nondestructive testing.	X			
	.228(b)	Except for cracks, acceptability of welds per **Section 9 or Appendix A, API 1104.**	X			
	.230(a)	Remove or repair cracks **≤ 8%**, remove cracks longer than **8%**.	X			
	.230(b)	Welds repaired, remove defect down to clean metal, preheat pipe, and assure acceptability.	X			
	.230(c)	Repairs in a previously repaired area must be in accordance with qualified written welding procedures and mechanical properties of the repaired weld equal to those specified for the original weld.	X			

Comments:
.214(a) and (b) -Warning Letter 4-2013-5021W was sent to Transcanada on September 26, 2013, for failing to perform welding on Spread 3 in accordance with a procedure qualified according to Section 5 of API 1104. Procedure KXL-SMAW-ML had revisions to essential variables which was not requalified.

.222(a) and (b) – Warning Letter 4-2013-5021W was sent to Transcanada on September 26, 2013, for failing to properly qualify welders on Spread 3 in accordance with Section 6 of API 1104. Procedure KXL-SMAW-ML had revisions to essential variables which the welders were not qualified to perform.

Welding qualifications, welder qualifications, and welding activities were reviewed by PHMSA either at the office or during the field inspections. Many locations were inspected during the construction of the pipeline in which welding was being performed.

.200	NONDESTRUCTIVE TESTING OF WELDS		S	U	N/A	N/C
	.228/.234	Detailed written procedure established and qualified for nondestructive testing.	X			
	.234(b)	Nondestructive testing of welds must be performed:				
		(1) In accordance with written procedures for **NDT.**	X			

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2013-0174_000007 015891

EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

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If an item is marked U, N/A, or N/C, an explanation must be included in this report.

.200	NONDESTRUCTIVE TESTING OF WELDS		S	U	N/A	N/C
		(2) Radiographer trained and qualified. (Level II or better).	X			
		(3) By a process that will indicate any defects that may affect the integrity of the weld	X			
	.234(c)	Procedures established for proper interpretation.	X			
	.234(d)	Nondestructively test **10%** of each welder's welds per day.	X			
	.234(e)	Test **100%** or **90%,** if impractical.				
		(1) Stream, river, lake, reservoir, or other body of water.	X			
		(2) Within railroad or public road ROWs.	X			
		(3) Overhead road crossings and within tunnels.	X			
		(4) Within the limits of any incorporated subdivision.	X			
		(5) Within populated areas such as residential subdivisions.	X			
	.234(f)	**100%** of all girth welds nondestructively tested on used pipe.			X	
	.234(g)	Test **100%** of girth welds at tie-ins.	X			

Comments:
.234(f) There is no used pipe being installed.
All welds were NDT. PHMSA inspected the NDT of many welds during the field inspections. Records were also reviewed during field inspections, office visits, and in the office.

	CORROSION PROTECTION REQUIREMENTS			S	U	N/A	N/C
		.557	Buried or submerged pipelines (constructed, relocated, replaced, or changed) must be externally coated prior to placing in service. See code for exceptions.	X			
		.561(a)	All external pipe coating inspected just prior to lowering the pipe into the ditch		X		
		.561(b)	Repair any coating damage discovered.	X			
		.563(a)	Adequate cathodic protection of the system.	X			
			Cathodic protection system installed **1 year**. (refer. ADB note below)	X			
		.567	Sufficient number of test leads properly installed.	X			

Comments:
Transcanada reported to PHMSA that there were some pipe sections that may have had coating damage due to welding spatter when the pipe was lowered into the ditch. Transcanada became aware of the problem by reviewing Transcanada inspector reports. Transcanada excavated the approximately 23 identified pipe sections which may have had the damage and were examined. Transcanada examined the pipe sections and made appropriate repairs to the coating in accordance to their specifications. PHMSA witnessed some of the excavations and repairs. PHMSA issued Warning Letter-4-2013-5017W for not following their specifications.

.266	CONSTRUCTION RECORDS	S	U	N/A	N/C
	Complete records showing the following:				
	(a) Number of girth welds and number of nondestructively tested welds, including number and disposition of each rejected weld.	X			
	(b) The amount, location, and cover of each size of pipe installed	X			
	(c) The location of each crossing of another pipeline	X			
	(d) The location of each buried utility crossing	X			
	(e) The location of each overhead crossing	X			
	(f) The location of each valve and corrosion test station	X			

Comments:
PHMSA reviewed Transcanada's welding records and witnessed the NDT of many girth welds. Transcanada submitted documents and maps which displayed any pipe crossings, utilities and the size of pipe installed. Test stations are installed in accordance with Specification TES-CP-CS and standard drawings.

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EVALUATION REPORT OF LIQUID PIPELINE CONSTRUCTION

Unless otherwise noted, all code references are to 49CFR Part 195. S – Satisfactory U – Unsatisfactory N/A – Not Applicable N/C – Not Checked

If an item is marked U, N/A, or N/C, an explanation must be included in this report.

.300	PRESSURE TESTING				S	U	N/A	N/C
		.302(a)	Hydrostatic testing required:					
			1.	The entire buried portion tested without leakage for **8 hours**	X			
			2.	The above ground portion tested for at least **4 hours** (if visually inspected)	X			
		.304	Test pressure at least 4 continuous hours at a pressure equal to 125 percent, or more, of the MOP. If not visually inspected, at least an additional 4 hours at 110 percent of MOP.		X			
		.305	Hydrostatically test all pipe and attached fittings, including components, (unless - if a component is the only item being replaced or added - manufacturer certifies hydrostatically tested at the factory)		X			
		.306	Appropriate test medium		X			
		.308	Pipe associated with tie-ins either pretested or hydrostatically tested in place		X			
		.310(a)	Hydrostatic test records retained for the life of the facility tested		X			
		.310(b)	Do the hydrostatic test records include the following:					
			(1)	Pressure recording charts	X			
			(2)	Test instrument calibration data	X			
			(3)	Operator's name, name of the person responsible for making the test, and the name of the test company used, if any	X			
			(4)	Date and time of the test	X			
			(5)	Minimum test pressure	X			
			(6)	Test medium	X			
			(7)	A description of the facility tested and the test apparatus	X			
			(8)	An explanation of any pressure discontinuities, including test failures, that appear on the pressure recording charts	X			
			(9)	Where elevation differences in the test section exceed **100 feet**, a profile of the pipeline showing the elevation and test sites over the entire length of the test section	X			
			(10)	Temperature of the test medium or pipe during the test period	X			

Comments:

Pressure testing was conducted in accordance with Specification TES-PROJ-LPCS-US. PHMSA inspected the hydrostatic testing during the field inspections and reviewed records at the Transcanada office.

.501-.509	OPERATOR QUALIFICATION (OQ) FIELD VERIFICATION	S	U	N/A	N/C
	Operator Qualification - Use PHMSA Form 15 OQ Field Inspection Protocol Form if applicable.	X			

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Appendix A Construction Summary Report.

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CONSTRUCTION SUMMARY

TransCanada Keystone Pipeline LP, notified PHMSA in a letter dated September 30, 2011 of the construction of the Keystone Gulf Coast Pipeline starting in Q1 of 2012. PHMSA's construction oversight of the Keystone began in 2011 and the pipeline was commissioned in 2014. The Keystone Gulf Coast pipeline consists of 485 miles of 36 inch X70 pipe ranging in wall thickness .465, .515, .572, .618, and .748. The pipeline begins at the TransCanada Keystone Cushing Terminal in Lincoln County, Oklahoma and terminates at the Terminal Facilities in Nederland, Jefferson County Texas. The pipeline transports crude oil from Cushing, OK to Nederland, TX.

Since 2011 until the commissioning of the pipeline on January 22, 2014, PHMSA Southwest Region conducted onsite inspections and inspected documents which include: construction specifications, construction inspection reports, welding qualifications, pipe mill reports, hydrostatic test results, etc., submitted by TransCanada. A total of 165.9 AFO days and 53.35 non-AFO days were spent on the TransCanada construction project.

Daily reports were submitted by each engineer/inspector to document the daily construction activities observed during the inspections. The engineers/inspectors moved around the various construction activities throughout the day depending on the logistics and activities being performed. The primary focus for the engineer/inspector is to observe construction activities and gather and compile all pertinent documentation to assure regulatory compliance with 49 CFR Part 195.

All daily reports, specifications, maps, and any other information gathered by PHMSA are located in the PHMSA "P" drive Construction Folder under "TransCanada Keystone Gulf Coast Pipeline North Final Construction Report".

TransCanada submitted their Commissioning Plan to PHMSA for review prior to commencing commissioning line fill activities. Line fill began in December 2014 and concluded on January 21, 2014. PHMSA engineers/inspectors were onsite to verify that the commissioning plan was being followed and to witness the testing of pump station alarms, valve operation and SCADA operations. On January 22, 2014 TransCanada commissioned the pipeline.

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CONSTRUCTION OVERVIEW

The Southwest Region performed a construction inspection of the TransCanada Keystone Gulf Coast Pipeline from 2011 to 2014. The construction inspection consisted of multiple visits to TransCanada's office for review of specifications, procedures, records and to discuss ongoing construction activities. TransCanada provided a link to their external SharePoint to PHMSA to review records and specifications. In addition, the construction inspection consisted of onsite field inspections of ongoing construction activities. Several SW Region Engineers/inspectors visited the pipeline construction from Cushing, OK to Nederland, TX.

Design Requirements

The pipeline used for the construction of the Keystone Gulf Coast project was manufactured by ILVA and Welspun in India and Little Rock, AR. PHMSA engineers/inspectors visited the Welspun pipe mill in Little Rock, AR to verify that the pipe was manufactured in accordance with API 5L and TransCanada's specifications. The inspection included a review of TransCanada's specifications and procedural QA/QC for pipe materials from the vendor (Welspun) at the mill location. Specifications, procedures & records were reviewed for completeness and compliance to pertinent regulatory and/or industry requirements/guidelines. TransCanada's specifications for coating, submerged arc welded pipe and double joined pipe were reviewed. The inspection team met with and directly observed TransCanada personnel and their assigned agents conducting third party monitoring on their behalf (D M Professional Services), who provided QA/QC for pipe materials being produced at the mill for the Keystone Gulf Coast project.

During the field inspections, the pipeline was verified for design specifications by examining the pipe for manufacturer stamping and reviewing manufacturer test reports (MTRs). Each pipe joint was marked with length, grade, pipe size, and specification. See Figures 1 and 2 for examples.

Figure 1: Pipe Specification Markings

Figure 2: Pipe Specification Markings

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Pipe used for the construction had different wall thicknesses for different application locations such as: 0.465” for line pipe, 0.515” for HCAs, 0.572” downstream of pump station, 0.618” for road bores, and 0.748” for HDDs. HDD and road bore pipe also had abrasion resistant overcoat (ARO) which was verified during the field inspections as seen in Figure 3. Pipe joints were marked with the appropriate specifications, for example, API 5L PSL2 36”, 0.465”, X70.

Figure 3: ARO Pipe with specification markings.

Valves and other pipeline components were also verified in the field. Valves were manufactured in accordance with API 6D and were stamped with manufacturer’s name, maximum pressure rating, temperature rating, nominal size and body material. Fittings were

Figures 4, 5, 6: Manufacturer Stamp on Valve, and Flange

examined for damage such as buckles, dents, gouges, cracks or other defects that might reduce the strength. Pipe joints were tracked by a labeling system with a bar code. See Figures 4-6.

Labels were checked in the field for damage or non-readable labels. See Figure 7. All components inspected were consistent with the pressure rating and in accordance with the established MOP.

Figure 7: Pipe Label

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Construction Requirements

Written Specifications

PHMSA SW Region reviewed TransCanada's construction specifications throughout the construction project. Specifications were reviewed in PHMSA's or TransCanada's offices, through the SharePoint site, and during the field inspections. The field inspections focused on verification that the specifications were being applied and followed during the construction of the pipeline. These field verifications help assure PHMSA that the pipeline was being construction according to Part 195 and the operators specifications.

During the onsite construction inspections there were some potential non-compliance issues identified by PHMSA. The first involved TransCanada not following their specification dealing with backfilling and sand padding of the ditch/trench which was in violation of §195.246. This will be further discussed later in the report.

Installation of Pipe

During the field inspections, PHMSA inspected the pipeline ROW for any private dwellings, industrial buildings, and places of assembly. The ROW of the pipeline avoided and was not in close proximity to any of these structures or locations. The inspection of soil cover and depth of pipe was in compliance with the regulations. The pipeline had a cover of at least the minimum cover required at all locations inspected during the field inspections. Figure 8 shows the depth of the pipe. The Figure demonstrates the cover and depth of the pipeline and the remoteness of the pipeline ROW. Figure 9 shows the depth of pipeline is verified with a GPS system.

Figure 8: Typical Right of Way depicting Depth of Cover.

Figure 9: Depth of Cover check with GPS

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To avoid many road and railroad crossings, other pipeline, bodies of water and any other encroachments, TransCanada horizontally directional drilled (HDD) the pipeline at these locations. The depth of the HDDs well exceeded the depth of cover required by the regulations. PHMSA witnessed and inspected HDD construction activities for any issues and to assure specifications were followed. The Figures demonstrate the inspection of the HDDs. Figure 10 shows pipe is being supported by a boom as it is being pulled into the drill.

Figure 10: Boom holding Pipe

Field pipe bends were observed by PHMSA during many field inspections. There were no wrinkle bends identified during these inspections. Pipe bends were performed by a bending machine which utilized an internal bending mandrel to achieve smooth and undistorted bends. PHMSA witnessed pipe bending activities which are shown in Figures 11 and 12. There was no mechanical damage identified during the pipe bending activities.

Figure 11: Bending Machine

Figure 12: Bent Pipe

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Valves

Federal regulations require that valves be installed "… at locations along the pipeline system that will minimize damage or pollution …". PHMSA raised an issue with TransCanada concerning its valve spacing as to whether or not they were being placed to minimize the environmental impact in case of a release. TransCanada submitted additional studies and records which included a Pipeline Assessment and Environmental Consequence Analysis, Keystone Gulf Coast Valve Siting Rationale and Gulf Coast Corridor Schematic. In addition, TransCanada installed remotely operated valves, with back- up generators at all locations mentioned in their study. PHMSA reviewed and met with TransCanada to discuss the locations of the valves which resolved the issue with the valve spacing.

Valve locations and automation equipment were verified during the field inspections by PHMSA.

Figure 13: Typical Valve location

Figure 14: Remote Operation Equipment at Valve site.

Valves were inspected at the pipe yard on several occasions to verify the rating and condition of the valves. Figure 15 shows valves inspected at the pipe yard. Valves were stored away from the pipe to protect from any damage.

Figure 15: Valve Storage at Pipe Yard

Topography maps were submitted to PHMSA showing all water crossings and location of valves. Valves were located at every water crossing and in locations along the pipeline to minimize pollution and damage in populated areas.

There were also valves located at each discharge and suction side of the pump stations. Figure 16 depicts an example of a pump station valve installation.

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Figure 16: Valve at Pump Station

All valves are motorized and remotely operational through SCADA. All valves had concrete foundation poured to handle any stresses the weight may put on the pipeline. Figure 17 is an example of concrete supports. Figure 18 demonstrates the protection from unauthorized personnel and vandalism. In addition, the photos show the satellite, electric power and generators for backup needed to operate the valves.

Figure 17: Concrete Pads for Valves.

Figure 18: Typical Fencing around Valve site

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Welding

Throughout the construction project, PHMSA reviewed welding procedures, specifications and conducted field observations of welding activities. In addition, PHMSA witnessed the qualification of procedures and welders to assure welding was being performed to a qualified procedure and by qualified welders.

Welding was performed in accordance with API 1104, the federal regulations and TransCanada's specifications. TransCanada utilized automatic welding on spreads 1 and 2 and manual welding on Spread 3. Both automatic and manual welding was being performed while PHMSA was on site.

Figure 19: Welder Qualification Test

Figure20: Automatic Welding Shack

Figure 21: Automatic Welding Set up

Welding inspections also included the inspection of nondestructive testing of all welds. In the field PHMSA observed NDT of the welds and assured that NDT specifications were followed. TransCanada utilized both AUT and X-ray methods for testing welds.

During the PHMSA field inspections and welding qualifications review, there were two issues and concern identified by PHMSA. One concern raised was the high welding repair/rejection rate. From the start of welding, TransCanada experienced a high weld rejection rate on Spread 3. A second issue identified by PHMSA was that TransCanada failed to properly qualify welders on Spread 3 of the

Figure 22: Manual Welding Set up

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Keystone Gulf Coast Pipeline project. TransCanada performed welder qualifications using a welding procedure that had not been properly qualified and then allowed these welders to weld on a Part 195 regulated pipeline. These issues will be furthered discussed alter in the report.

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Corrosion Protection

During the field inspections by PHMSA, the installation of corrosion control measures was verified. TransCanada provided corrosion control specifications which were reviewed by PHMSA. PHMSA witnessed the installation of many joints of pipe to assure that the coating was in good condition and was inspected (jeeped) for coating damage before burying the pipe. Any damage identified by this inspection technique was repaired. Each weld joint was coated and is seen in Figure 23. PHMSA also verified that there were a sufficient number of test leads installed throughout the pipeline.

Figure 23: Coating of field Joint

Figure 24: Typical Test Station

TransCanada conducted a Direct Current Voltage Gradient (DCVG) survey of the entire Keystone Gulf Coast Pipeline to check for any coating damage. After the survey, TransCanada submitted the findings of any coating damage found along with repairs made on anomalies. There were a total of 127 anomalies on Spread 1, 83 anomalies on Spread 2, and 43 anomalies on Spread 3 found by the survey. None of the anomalies found met the repair criteria of 35% IR, the highest was 32%. TransCanada performed verification digs on the highest IR readings on all three spreads to assure accuracy of the DCVG Survey. They made 8 digs in Spread 1, 8 digs in Spread 2, and 4 digs in Spread 3 and made repairs accordingly. The reports were reviewed by PHMSA to assure compliance with their procedures and the regulations. PHMSA conducted field inspections to verify dig sites identified by the DCVG survey. Figures 25 and 26 depict two locations identified by the DCVG survey during a PHMSA field inspection.

Figure 25 and 26: DCVG dig site (recoated)

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Pressure Testing

Pressure testing of the TransCanada was performed in accordance with their Specification TES-PROJ-LPCS-US and with CFR 195. The specification and records of all hydrostatic pressure tests conducted by TransCanada were reviewed by PHMSA. In addition, PHMSA conducted field inspections of the hydrostatic testing on various locations of the pipeline.

Figure 27: Hydrotest in Progress

Figure 28: Hydrotest in Progress

The entire pipeline was hydrotested to at least 8 hours for all buried pipelines. In addition, TransCanada conducted a one hour pressure test on all HDD piping before pulling the pipe section. The one hour test is part of TransCanada's procedures to verify the integrity of the HDD pipe before pulling it through the drilled hole. The test medium used for all testing was water. All records reviewed had documented the appropriate pressure of 125% or more of MOP, test medium, instrument calibration, pressure recording charts, temperature, date and time and description of the facility being tested. TransCanada also provided elevation profiles of all test sections with hydraulic pressure profiles. There were no leaks or failures detected in the records review and during the field inspections.

Figure 29: Drying process after hydrotest

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Commissioning

TransCanada notified PHMSA in December 2013 of the intent to start line fill and commissioning of the Keystone Gulf Coast Pipeline from Cushing, OK to Nederland, TX. TransCanada submitted their Commissioning Plan for approval from PHMSA to commence commissioning activities. PHMSA reviewed the commissioning plan and had no objections to start the commissioning process.

On December 7, 2013, TransCanada started line fill activities starting from the Cushing facility to their Nederland facility. TransCanada followed their commissioning plan and coordinated with personnel to monitor the line-fill to ensure the pipeline was operating safely and reliably. The plan included the commissioning of 485 miles of pipe, six pump stations and the Nederland Delivery Station. Product was tracked utilizing three batch pigs to assure the location of the product. Each pig was tracked by Corrpro personnel and predetermined above ground markers (AGM). During the commissioning phase, each mainline valve was operated to assure no leaks and satisfactory operation of the valve. In addition each pump station was started up in stages. Each stage consisted of testing each leak detection system and alarms per pump before starting up the next pump(4 pumps per station) at each station. On January 21, 2014 TransCanada notified PHMSA of the completion of the line-fill activities and the intent to start in-service operations. On January 22, 2014 TransCanada commissioned the pipeline and started in-service operations.

Figure 30: Pigs used during commissioning.

PHMSA received daily updates throughout the commissioning phase of all ongoing activities. In addition, PHMSA engineers/inspectors were onsite during the commissioning phase to witness and assure procedures were being followed by TransCanada personnel. PHMSA witnessed the line fill, testing of pump alarms and leak detection, valve testing and pig tracking operations. The Figures demonstrate the observations of the activities witnessed during the commissioning. The Figure 43 shows the pigs used to track the product while filling line. Figure 44 shows how the pigs were tracked from above ground.

Figure 31: Commissioning at Pump Station

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Issues identified during Construction

Welding

TransCanada performed welder qualifications using a welding procedure that had not been properly qualified and then allowed these welders to weld on a Part 195 regulated pipeline.

During the first weeks of construction of spread 3 significant welding issues were noted. Approximately 26.8% of the welds required repairs in one week, 32.0% the second week, 72.2% the third week, and 45.0% the fourth week. On September 25, 2012, TransCanada stopped the Spread 3 welding after 205 of the 425 welds, or 48.2% required repairs. Through the welding procedure review, PHMSA found that TransCanada failed to perform welding on construction Spread 3 of the Gulf Coast Pipeline project in accordance with a procedure qualified according to Section 5 of API 1104.

A comparison of the procedure being used to weld the pipe on Spread 3 (KXL-SMAW-ML, revised February 10, 2011) with the PQR revealed inconsistencies between at least two essential variables as defined by API 1104, the Joint Design and the Speed of Travel. The joint design on the document KXL-SMAW-ML being used to weld the pipe on construction Spread 3 specified a Root Opening of 1/16" ± 3/32" between pipe joints at the girth weld and the welding Speed of Travel for the Cap Pass to be 8.6 – 16.2 inches per minute. The PQR for the procedure that was actually qualified by destructive testing (PQR# KPS-RMS-SMAW-ML-PQR Rev 2) showed the root opening to be 1/16" to 3/32" and the Speed of Travel for the Cap Pass to be 6.6 – 16.2 inches per minute. The difference between the PQR and the welding procedure constituted a change in essential variables.

As a result, the welding procedure being used by TransCanada on Spread 3 of the Keystone Gulf Coast Pipeline project (KXL-SMAW-ML) had changes to essential variables that caused it to be different than the Procedure Qualifying Record. Because the procedure used to weld Spread 3 pipe was not re-qualified, TransCanada was using an unqualified procedure to weld Part 195 regulated pipeline.

A second issue identified by PHMSA was that TransCanada failed to properly qualify welders on Spread 3 of the Keystone Gulf Coast Pipeline project. TransCanada performed welder qualifications using a welding procedure that had not been properly qualified and then allowed these welders to weld on a Part 195 regulated pipeline. Paragraph 6.1 of API 1104, incorporated by reference states "the purpose of the welder qualification test is to determine the ability of welders to make sound butt or fillet welds using previously qualified procedures." Procedure KXL-SMAW-ML, Revised February 10, 2011 had changes to the essential variables of Joint Design and Speed of Travel from the Procedure Qualification Record, KPL-RMS-SMAW-ML-PQR Rev 2 but had not been re-qualified. Consequently, the welder qualification was not performed using a previously qualified procedure as required by Section 6 of API 1104.

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PHMSA issued Warning Letter 4-201305021W for both issues identified during the construction inspection. TransCanada responded to the Warning Letter stating that after more than twelve months of extensive meetings and discussion, comprehensive supplemental destructive testing and exhaustive records reviews, on November 25, 2013 a meeting held between PHMSA and TransCanada resulted in confirmation that the welder qualifications and manual welding procedures. In addition, The results of a root cause analysis performed by TransCanada to identify the cause of the high weld rejection rate on Spread 3 were documented in a paper titled "Girth Weld Repairs Due to Lack of Fusion in Root Pass," dated November 15, 2012. This analysis identifies the criticality of the essential variables of Joint Design and Speed of Travel by stating, "Weld fit up was increased to 3/32" which allowed the welders to decrease their travel speeds and welding amperages which is a key factor in reducing internal under cut and lack of fusion defects during the welding process. This modification improved the weld quality and reduced the overall weld defects. PHMSA witnessed the re-testing of the welding procedure to verify the modification of the procedure reduced the internal under cut and lack of fusion defects, at the RMS lab in Edmonton, Alberta, Canada.

Dents

TransCanada did not assure that its Keystone Pipeline was installed in the ditch in a manner that minimizes the possibility of damage to the pipe. The deformation tool identified dents on the pipe that appear to be caused by secondary stresses on the pipe. The ILI tool identified a total of 421 anomalies which required investigation per the specifications. There were a total of 236 dents, 56 pipe ovality and 129 anomalies with both dent and ovality. TransCanada verified the locations by excavating the anomalies and made repairs in accordance with their specifications. After excavating and examining the anomalies, there were a total of 350 anomalies within the specifications, 37 anomalies which required being cut-out and 34 anomalies with no indications of a dent or ovality. During the field inspections, PHMSA witnessed and examined anomaly investigations being conducted by TransCanada due to the results of the deformation tool run. In this report you can see examples of the types of dents identified with the inspection tools. Each dent was examined

Figure 32, 33, 34 Examples of dents found with inspection tool.

and measured and nondestructively tested with ultrasound testing equipment to check for cracks. All dents were either cutout or were below the repair criteria. Several anomaly reports stated that foam pillows and rocky terrain were present at the dig sites which may

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attribute to the dents on the pipe. During the field inspections the PHMSA inspector verified the locations of several dents which were located in the same vicinity as the foam pillow supports.

TransCanada's TES-PROJ-LPCS-US Onshore Liquid Pipeline Construction Specification, Section 22.4 states "when foam pillows are installed, approved fill will be supplied to provide a uniform support along the underside of the pipe." Assuring a uniform fill underneath the pipe at all foam pillow locations will minimize external stresses on the pipe. In addition, Section 22.5 states that "rock, stone laden soil, or frozen material shall not be backfilled into the trench until the pipe has been surrounded by stone free soil."

In reviewing the anomaly reports and PHMSA inspections it demonstrated that TransCanada was not following their Construction Specifications, Section 22.4 and 22.5. PHMSA SW Region issued a Warning Letter, CPF 4-2013-5017W warning TransCanada to follow their procedures/specifications and assure that backfill is free of large rocks and have sufficient support at the foam pillows to minimize the external stresses on the pipe to be in compliance with 195.246.

Coating Damage

Another issue identified involved TransCanada not following their specifications during welding of the pipeline.

TransCanada did not follow its written specification, specifically, protecting existing coating from damage due to welding. In an email dated June 7, 2013, TransCanada notified PHMSA of a non-conformance issue involving coating damage on Spread 3 which TransCanada was in the process of investigating. The problem only occurred in Spread 3 due to the manual welding process with stick rods being utilized. Manual welding was used mainly due to the terrain and the number of water crossings. Spread 1 and 2 utilized the semiautomatic welding process. There were several locations in which the contractor did not follow TransCanada's coating specifications. Specifically, weld blankets were not being utilized to protect the existing coating on the pipe to prevent weld splatter from damaging the coating. TransCanada's specification TES-WELD-PL- US Welding of Pipelines and Tie-ins, Section 8.11 states that "existing coatings on piping shall be protected to minimize damage that may result from the welding operations" which was not being followed by the contractor. After investigating 23 suspected locations, TransCanada confirmed the coating damage and repaired the coating per the specifications.

Figure 35: Repair of coating due to weld splatter.

During the field inspections, PHMSA observed several girth welds had coating damage due to weld splatter. Figure 35 shows the coating repair on the girth welds due to damage of the weld

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splatter. The coating repair was made after the pipeline was exposed and examined. The pipe was coated and backfilled per the specifications. There were a total of 130 identified locations excavated in which TransCanada examined for damage and made repairs were necessary. All discovered damage was inspected and repaired to original specification criteria.

PHMSA issued a Warning Letter, CPF #4-2013-5017W, warning TransCanada to follow their specifications/procedures and assure that specification 8.11 is followed to be in compliance with 195.202.

TransCanada responded to the Warning Letter and assured that they were taking steps to enhance its design, specifications and inspection practices, by conducting a thorough review of their inspection practices, design, and construction specifications, and would implement changes to try to reduce the number of inspection digs that are required after the pipeline has been backfilled going forward, which included, but not limited to restricting the use of foam pillows, increased use of bedding material in rocky or hard pan conditions, and specifying the minimum size of weld splatter protection devices.

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WARNING LETTER

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 10, 2013

Mr. Vern Meier
Vice President, Field Operations
TC Oil Pipeline Operations, Inc.
717 Texas Ave.
Houston, TX 77002

CPF 4-2013-5017W

Dear Mr. Meier:

During the months of June and July 2013, a representative of the Pipeline and Hazardous Materials Safety Administration (PHMSA) pursuant to Chapter 601 of 49 United States Code inspected the construction of the Keystone Gulf Coast Project.

As a result of the inspection, it appears that you have committed probable violations of the Pipeline Safety Regulations, Title 49, Code of Federal Regulations. The items inspected and the probable violations are:

1. §195.246 Installation of pipe in a ditch.

(a) All pipe installed in a ditch must be installed in a manner that minimized the introduction of secondary stresses and the possibility of damage to the pipe

Transcanada did not assure that its Keystone Pipeline was installed in the ditch in a manner that minimizes the possibility of damage to the pipe. During the field inspections, PHMSA witnessed and examined anomaly investigations being conducted by Transcanada due to the results of a deformation tool run. The deformation tool identified dents on the pipe that appear to be caused by secondary stresses on the pipe. Several anomaly reports state that foam pillows and rocky terrain were present at the dig sites which may attribute to the dents on the pipe. During the field inspections the PHMSA inspector verified the locations of several dents which were located in the same vicinity as the foam pillow supports.

Transcanada's TES-PROJ-LPCS-US Onshore Liquid Pipeline Construction Specification, Section 22.4 states "when foam pillows are installed, approved fill will be supplied to provide a uniform support along the underside of the pipe." Assuring a uniform fill underneath the pipe at all foam pillow locations will minimize external stresses on the pipe. In addition, Section 22.5 states that "rock, stone laden soil, or frozen material shall not be backfilled into the trench until the pipe has been surrounded by stone free soil."

In reviewing the submitted anomaly reports and PHMSA inspections it demonstrates that Transcanada is not following their Construction Specifications, Section 22.4 and 22.5. Transcanada needs to assure the backfill is free of large rocks and have sufficient support at the foam pillows to minimize the external stresses on the pipe to be in compliance with 195.246.

2. §195.202 Compliance with specifications or standards.

Each pipeline system must be constructed in accordance with comprehensive written specifications or standards that are consistent with the requirements of this part.

Transcanada did not follow its written specification, specifically, protecting existing coating from damage due to welding. In an email dated June 7, 2013, Transcanada notified PHMSA of a non-conformance issue involving coating damage which Transcanada was in the process of investigating. There were several locations in which the contractor did not follow Transcanada's coating specifications. Specifically, weld blankets were not being utilized to protect the existing coating on the pipe to prevent weld splatter from damaging the coating. Transcanada's specification TES-WELD-PL- US Welding of Pipelines and Tie-ins, Section 8.11 states that "existing coatings on piping shall be protected to minimize damage that may result from the welding operations" which was not being followed by the contractor. After investigating 23 suspected locations, Transcanada confirmed the coating damage and repaired the coating per the specifications.

During the inspection, PHMSA observed several girth welds had coating damage due to weld splatter. There were a total of 98 identified locations excavated in which Transcanada made coating repairs. Transcanada needs to assure that specification 8.11 is followed to be in compliance with 195.202.

Under 49 United States Code, § 60122, you are subject to a civil penalty not to exceed $200,000 per violation per day the violation persists up to a maximum of $2,000,000 for a related series of violations. For violations occurring prior to January 4, 2012, the maximum penalty may not exceed $100,000 per violation per day, with a maximum penalty not to exceed $1,000,000 for a related series of violations. We have reviewed the circumstances and supporting documents involved in this case, and have decided not to conduct additional enforcement action or penalty assessment proceedings at this time. We advise you to correct the item(s) identified in this letter. Failure to do so will result in Transcanada being subject to additional enforcement action.

No reply to this letter is required. If you choose to reply, in your correspondence please refer to **CPF 4-2013-5017W**. Be advised that all material you submit in response to this enforcement action is subject to being made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b).

Sincerely,

R. M. Seeley
Director, Southwest Region
Pipeline and Hazardous Materials Safety Administration

TransCanada Keystone Pipeline LP

Keystone Pipeline Project – Phase 2

Cushing Extension Lessons Learned

Houston, TX March 21, 2011

TransCanada

In business to deliver

015914

Project Management

- Include contractor in weekly schedule review meeting
- Contracting strategy put focus back on executing the work correctly rather than compromise

Field Project Controls

- Appropriate (required) training of field PC staff
- Collaborative training for Inspectors to ensure consistent and accurate progress measurement

Facilities Interface

- Incorporate phase 2 E&I RFI's into Phase 3&4 designs
- Ensure three valve cluster and piping within fence line scope and specs are consistent and clear in both the facilities and pipeline SOW/contracts ex compaction, material delivery
- Communication requirements while working in proximity to each other – venting during hydro/pigging, NDE tie ins, fence
- Walk downs of RMLV sites conducted with commissioning field engineer, E&I contractor - success

Materials

- **Field receiving inspection must be performed by competent individual with cross check to tags, drawings and inspection for damage**

TransCanada

Field Engineering

- **Issue CP test lead instalaltion bulletin**
- **Inspect HDPE used for buoyancy before installed inside HDD pipe, potential integrity test**
- **Actuation Failure**
  - Eliminate cycling with high power drill to ensure not over-torqued/travel past stops when operating during fabrication and construction
  - Engineering Bulletin to be issued by Supplier to all groups for incorporation in construction documents

Construction Inspection

- **Inspection team doesn't always take time to study construction drawings and specifications. Too many of more "seasoned" inspectors have attitude that old ways acceptable**
  - Project should developed materials and multiple choice test on construction drawings and specifications.
- **It must be considered that either an additional utility inspector dedicated to only coating or that the welding inspector receive training on tasks other than just welding so multi task crews such as a tie-in crew receives the coverage for all the tasks being preformed**

TransCanada

Construction Inspection

- **Inspector training (OQ task qualifications, excavation competency, environmental/safety training should be completed at the project office as a part of inspection personnel mobilization. This would ensure that all inspection team members receive all required training and that they are prepared to go to work on the spread without and disruptions due to training.**

TransCanada

Land (during construction)

- **Contractor should look ahead so that change order requests are submitted at least 7 days before needed as per the process**
- **Develop a plan prior to acquisition on how to handle temporary fencing**
- **Trees cleared on off ROW tracts due to assumptions made that fences were on property lines when staking was done**
  - Property line markers should be located to verify property lines prior to staking
- **Construction agreement has too many items where landowner request items at time of easement signing and then changes his mind during construction**
  - Revise construction agreement so as to not offer landowners so many options and rather build per CMRP requirements
- **Provide the use of qualified appraiser to determine fair market value for the trees**
- **Encourage landowner to use own contractor to repair terrace or hire local contractor to do terrace repairs**

TransCanada

Quality

The UPI QA leads in coating and welding were carried over from PH 1 construction.

- Recommendation: Once the QA Mgr is determined he/she should have input into building the Quality Assurance / Audit team
- Need more field based / trouble shooting personnel rather than office focused team members

The Coating & Welding QA leads worked for UPI but reported daily to the Keystone QA Manager.

- Although this was a step in the right direction there were many instances where the two UPI employees were caught in between getting direction from Keystone and being directed by UPI Construction Manager to do other tasks.

- **Recommend to separate QA team from construction management supplier – use a third party to hire QA team employees. This would allow an independent QA / audit team from the construction management team.**

Quality - Documentation

Near the end of construction it was noted that not all welds had corresponding coating documentation (C11A & C11B forms).

- Recommendation: At construction start – Sr Welding Inspector and Sr Coating Inspector need to get linked in and plan a weld log / coating review. The frequency is flexible (every 1 or 2 weeks).

Coating documentation (C11A & C11B) were found to be incorrectly filled out on an on-going basis.

- Some inspectors believed the C11A form was to confusing for the contractor coating personnel to follow. (The coating personnel are usually the least experience workers on the spread)
- Review the forms to make them more user friendly for field personnel

Quality - Documentation

Both welding and coating documentation forms were modified by the end users; this resulted in inconsistencies in reporting.

- Recommendation – all excel forms need to be protected so that the format and data required can not be changed.
- In a lot of cases I do not believe there was intent to change the form but section were deleted due to lack of computer experience by some inspection staff.
- Spread Construction Managers felt it would be easier for the inspectors if they could hand write the forms – this was approved on a case by case basis after explaining that the office manager would have to complete a review on these individuals to ensure the data was legible.

Quality – Documentation

- **Weld log data between the three spreads was inconsistent and inaccurate. Weld numbering system developed in the UPI Quality Manual was not well liked by the NDE auditors. They adapted to make it work for themselves.**
  - Recommendation – allow the NDE auditors to have input into the development of the NDE log. They are the end users it must be workable.

015926

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Quality - Qualification of Coating & Welding Personnel

The contractor would try to qualify applicators and welders on a daily basis on some spreads. This would cause the SWI & SCI to be tied up in the yard and not out on the line.

- Recommendation – Require the contractor to develop a weekly personnel qualification plan. Dedicate a day each week to qualify personnel. (This was more of an issue for coating as the SWI could assign a welding inspector to qualify welders)

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Safety - Highlights of items submitted

- JSA Quality
- Eye and Face Protection
- Pipe rolling off skids
- OQ personnel identification and span of control
- Case Management
- Excavation Practices
- Buried Utility Locates
- Overhead Powerline Avoidance
- TapRoot
- Vehicle Safety
- Leadership Involvement
- Positive Recognition

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JSA Quality

Is the Foreman given the tools for success

- Too often the contractor supplied forms are too general
- Simply a *check box*…don't require crew to look beyond the obvious
- Don't help initiate discussion and involvement

Were hazards effectively identified

- Large percentage of TapRoot investigations identified pre-job planning as either a root cause or contributing factor

Process in place to identify insufficient JSAs

- Contractors used a *check-off* practice for their safety reps
  - Largely ineffective process
  - Not able to observe delivery
- Keystone Safety Reps were not in the field during JSA delivery

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JSA Quality

Process in place to increase delivery and effectiveness

- Need to develop process where leadership ***and*** safety are in the field at time of JSA delivery (contractor and Keystone)
- Mentoring program

Encourage employee participation

- Too often the foreman delivers and the crew listens…
- Employees need to be coached into looking for hazards aside from those mentioned by the Foreman
- Interdependence….

Develop tomorrow's leaders

- Need to increase the delivery by the Foreman so they can effectively lead the development of others in delivering an effective JSA.

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Eye and Face Protection

2009 - *28* OSHA Recordable Eye Injuries

- 100% eye and face protection when welding/grinding
- Attempted to prohibit pancake style weld hoods – later allowed
- Continually fought for compliance
  - Little to no enforcement
  - Lacked support from UA

2010 - *5* OSHA Recordable Eye Injuries

- 100% eye and face protection when welding/grinding
- Prohibited pancake style weld hoods
- Effective pre-job (Keystone developed) by contractor
- UA support

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Eye and Face Protection

Welding Hood Demonstration

- Spread 10 initiated
- Keystone elected to keep prohibition of hoods in 2010
- Committed to revisit prior to 2011 construction

2011

- Continue with 100% eye and face protection requirement
- Aligned support from Keystone and contractor management
- UA support is critical due to size of workforce, exposure, pressure etc…

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Pipe Rolls off Skids

Selection of skids

- Reinforce training – importance of task
- Quality control process to ensure defective skids are disposed of

Quality of stacks

- Skid rack integrity to include, but not limited to design, position and spacing.

Placement of stacks

- In accordance with construction specs
- Adjusted as needed

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Pipe Rolls off Skids

Factors for consideration

- Deteriorating ROW conditions from exposure to the elements such as sun and rain,
- Vibrations from the adjacent railroad tracks could have weakened the structural integrity of the skid stack,

- Expansion of the pipe from the heat causing the pipe to “walk” in the rack thus weakening the structural integrity, and
- Vibrations from heavy equipment tracking through the area and adjacent to the skid stacks.

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Operator Qualifications

2010 – 5 tasks identified

2011 – 40 tasks potentially identified

Bison lessons learned for both Keystone and PHMSA

- Weaknesses have been identified
- Need to ensure proactive compliance

Span of control issues

- Foreman were sometimes unaware of who was OQ'd for what task
- The "best" operator was chosen without verifying qualifications

Management of change

- Crew members change crew creating gap for Foreman/Inspector

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Operator Qualifications

Identification of personnel

- Field verification reports not maintained at the spreads
- Need to develop method of *spot ID* to identify trained personnel (hard hat sticker)
- Need to be able to identify qualified contractor and CM personnel
  - For both contractor leadership and Keystone personnel to quickly ensure work is performed only by qualified personnel
  - Increased exposure during audits?

OQ Planning Meetings

- Lessons Learned shared from Bison
- Coordination between facilities and Pipeline
- Michels invited to share their program

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Case Management

Need to ensure focus remains on preventing injury

Contractors and spreads that had effective case management were able to better control the level of loss incurred

Once the injured left the spread for treatment, the likelihood of severity increase was heightened

- OTC pain relievers were now prescription = OSHA recordable

Clinics were not operational in a timely manner

- Perfect world – upon mobilization
- Operational prior to the onset of the pipegang at the latest

Clinics were not used to effectively treat injury

- Lack of communication/understanding/support from spread
- Used as a pass through prior to transport to offsite facility

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Excavation Practices

Contractor and CM Excavation training

- Contractor delivered “refresher” training
- UPI delivered ETS training
  - short of competent persons

Improved Quality of excavations to prior years

Daily Inspection posted “at site”

Lingering Issues…

- Supporting crews entering ditch w/
  - Survey, AUT, coating, etc…
- Employer certified competent persons on these teams

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Buried Utility Locates

2010 – struck *44* buried gas lines

Lessons Learned from Bison

- Look beyond conventional locate methods

Gap Analysis performed prior to SSSP approval

- Between excavation procedure and TCPL Excavation Spec
- Include a post contact policy

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Buried Utility Locates

Spotter training

- Multiple TapRoot findings revealed that spotters were not fully trained and understanding was often minimum
  - Spotter positioning
  - Responsibilities and “big picture” of importance of task
  - Recognizing abnormal operating conditions (AOCs)

Span of control was exercised

- Would suggest operator **and** spotter OQ evaluations

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OHPL Avoidance

2010 struck *3* OHPLs

OHPL heights surveys

- Adequate time to employ actions to mitigate the hazard where possible
- Including OHPLs paralleling the ROW

Gap analysis between OHPL Avoidance Procedure and TOP

Avoidance Practices

- Proximity Warning Devices (SigAlarm)
- Install devices strong enough to withstand elements
- Properly installed
- Preventive maintenance
- Frequently inspected

OHPL Avoidance

Training

- Foreman and Inspection
  - To include selection of equipment
  - Identification of high risk areas
  - Look beyond the ROW
    - Lines that parallel the ROW
    - When loading/unloading equipment
- Spotters
  - Multiple TapRoot findings revealed that s
    trained and understanding was often minimum
    - Spotter positioning and ability to identify proximity to lines
    - Responsibilities and “big picture” of importance of task

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TapRoot

No formal root cause system used

- By project or by contractors
- Oftentimes the root cause was found to be “employee error”

TapRoot adopted by Keystone in 2010

- Allowed for more in depth incident investigation techniques
- Enabled fact finding not fault finding investigations
- Explored techniques and procedures

Proved useful in other disciplines

- Environmental incidents (sp10 success story)

TapRoot required for all key personnel

- Safety Leads, Project Managers, Chief Inspectors, etc…

Vehicle Safety

Leadership commitment

- Varying response from spread to spread (sp9 vs sp10)
- gain support from spread mgmt early
- enforce disciplinary policy
- pre-job with unions as a requirement

Driver's training

- defensive driver training (Smith System) for all supervisor positions - CM and contractor

Backing avoidance

- Continual struggle year after year

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Vehicle Safety

UPI policy

- A safety cone placed at the front and the rear of each parked vehicle
- Requires driver to perform a walk-around prior to operation
- Results
  - 75% reduction in vehicle incidents in past 2 years
    - Prior to implementation, UPI experienced an estimated 15 backing incidents per quarter
  - Improves driver awareness of surroundings

Leadership Involvement

Positive **Leadership Involvement is paramount**

- Union Stewards were very engaged on sp9
- Superintendant response to seatbelt/cell phone use
- Management (contractor and CM) response to PPE use or NonCompliance

Negative **Leadership Involvement…**

- Spread personnel were negative and impacted project personnel and culture
- The culture of One Team, One Project, One Message was lost after the Summit
- Management response to seatbelts, cell phones, PPE, etc…

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Positive Recognition

Immediate recognition items

- Available at kickoff
- New items introduced routinely
- Tracking system for expended items

Championship Belt

- Introduced midway through construction
- Provided boost in employee involvement

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Environment Phase 2 Lessons Learned

Challenges / Lessons Learned

Plan for Improvement

Next Steps

- Discuss Follow-up and Decisions Needed

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Environment - Positive News

2009 Phase 1 Lessons Learned

- Majority of Lessons Learned from Phase 1 were incorporated into the work on Phase 2
- Significantly improved structure, organization, TransCanada presence on the spreads
- Completed construction of Phase 2 with no formal agency violations or work shutdowns
- Plenty of challenges remain

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Environment - Organizational Lessons Learned

Lesson – Environmental Compliance Staff Levels

- Started construction with three EIs per spread
- Initial staff received 3 day environmental inspector training
- Construction progress quickly over-stretched EI field staff
- Additional qualified staff were difficult to find mid-year
- Subsequent EI staff did not receive full EI training

Plan

- Identify and retain key staff positions early
- Recruit and train entire EI staff
- Bring all staff onto the project at the beginning
    - Build teamwork
    - Build relationships
    - Verify ROW and resources

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Environment - Field Resource Identification

Lesson

- Stratified resource surveys conducted during regulatory process
  - All resources were not identified accurately
  - Additional costs and project regulatory exposure resulted, although improved from Phase 1
- **Pre-Clearing only first X miles = bad idea**
  - Most beneficial to pre-clear entire spread

Plan

- Resource specialists assigned to each spread pre-construction
    - Verify all resources and install signage/flagging, etc.
    - Address surveys, unanticipated resources, etc.
    - Clear procedures need to be established for marking environmental resources

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Environment - Contractor Compliance – Project Exposure

Lesson

- One spread experienced extremely high non-compliance record
- Minimal / lack of participation by construction management and construction inspection
- Lack of Contractor commitment to ensuring compliance
- Lack of Contractor involvement in training/communicating commitment to workers
- Need for a proactive approach to compliance
- Lack of accountability and contract teeth to enforce compliance

Plan

- Improved contract language
    - Increased teeth included in project scope documents
- Increased Keystone management on spread will increase compliance
- Requirement of construction inspection staff to participate actively

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Environment - Contractor Compliance

Lesson

- Lack of qualified Contractor Environmental Management staff
  - e.g., winch truck driver was contractor's environmental coordinator on one spread
  - e.g., winch truck driver straw was an environmental foreman

Plan

- Contract language
  - Contractor required to qualified (approved by Keystone) environmental coordinator
  - Contractor required to conduct environmental training
  - Additional tailgate trainings required for each crew
  - Minimum environmental crew requirements

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Environment - Positive News

Spread 9C

- Very good coordination, communication and compliance record

- Strong Contractor's environmental coordinator
  - Contractor made their expectations clear to workers at the morning environmental training program
  - Environmental issues were addressed quickly
  - Commitment by the Contractor to pre-planning

- This approach included in Scope of Work documents and clarifications

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Environment - Additional

Lessons

- Permits – Some permit issues had not been identified
  - HDD mud disposal
  - Public comment period for water withdrawal permits
- Hydrotest Dewatering Challenges – Discharges exceeded permitted limits
  - No internal coating on pipe
  - Single water source and discharge location – long duration of water inside pipeline
  - Dewatering location established on condemnation tract
  - Dewatering structure located on-ROW
  - All of the above created significant compliance and dewatering challenges

TransCanada

Environment - Additional

Lessons - Environmental Inspection

- Consistent application between spreads
  - Proactive approach to compliance (part of the team)
  - Calibration between spreads/within spreads
  - Thorough review of NC issues for accuracy
  - Root Cause Analyses for environmental non-compliances
- Significant EI staff turnover during construction
  - Staff levels resulted in overextended/burned-out staff
  - Thorough EI training for new EIs critical, requires dedicated trainer for orientation
- Confusion on Role of Env. Consultant's Recruiter
  - Establish clarity on consultant's role & Keystone's expectation
- Challenges with environmental compliance support from UPI spread management
  - Will be improved with Keystone staff management on spreads

TransCanada

Environment – Additional

Lessons – Preparation of Bio / Cultural / Tribal Monitors

- Tribal monitoring scope was fluid
  - Scope expanded by factor of 3 during construction
  - Management of tribal monitors reduced project exposure
    - Monitor immediately behind grade & trench
    - Avoid monitoring immediately in front of crews
  - Full-time cultural monitor on spread during tribal monitoring
- Bio & Cultural Monitors came to field unprepared
  - Monitors need to come to field with maps & plan
    - Extra maps/alignment sheets will be in spread offices
  - Monitors will participate in portion of EI training

TransCanada

Environment - Additional

Environmental Training

- EI Training
  - Comprehensive training
  - Environmental inspector handbook for procedures, forms & expectations
  - Thorough training needed for new staff
- Contractor's Supervisor Training
  - Contractor needs to communicate expectations to foremen
  - More interactive training and testing
- Contractor's Crew Training
  - Need Contractor's Coordinator to conduct training/communicate expectations to workers
  - Additional tailgate trainings needed in the field for each individual crew

TransCanada

Environment - Additional

Critical to have TC leadership involvement

- Phase 2 direct involvement was significant improvement

Turf battles on spread and Keystone management

Addressing non-compliance issues

- Defined procedures for addressing environmental non-compliances
- Define plan for dealing with contractor that does not take non-compliances seriously
  - Contractor needs to have a commitment
  - Accountability needed for foremen, individual workers, spread management

TransCanada

Guideline for Professional Member as a Witness

V1.0
October 2003

The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

015960

FOREWORD

An APEGGA guideline presents procedures and practices that are recommended by APEGGA. In general, an APEGGA member should conform to the recommendations in order to be practising in accordance with what is deemed to be acceptable practice. Variations may be made to accommodate special circumstances if they do not detract from the intent of the guideline.

Guidelines use the word should to indicate that among several possibilities, one is recommended as particularly suitable without necessarily mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is disapproved of but not prohibited (should equals is recommended that). The word shall is used to indicate requirements that must be followed (shall equals is required to). The word may is used to indicate a course of action permissible within the limits of the guideline (may equals is permitted).

This guideline is a new document developed by APEGGA in response to queries from members about the various issues surrounding the role of a professional engineer, geologist or geophysicist when faced with the prospect of serving as a witness in a professional capacity.

PARTICIPANTS

APEGGA's Practice Standards Committee (PSC) publishes practice standards and guidelines to promote high levels of professional service. A PSC subcommittee with the following membership prepared the draft guideline:

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015961

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015962

1 OVERVIEW

Professional engineers, geologists and geophysicists are called upon by quasi-judicial bodies or courts of law to assist in the search for truth. Professionals called upon for the first time might react with trepidation. They likely have not received training regarding the procedures, obligations and risks associated with participation in legal and quasi-legal hearings. However, witnesses who are adequately prepared can and do leave the proceedings feeling satisfied that their efforts have assisted the court or administrative tribunal to make an informed decision. The key to successful performance is for professionals to understand the role that they have.

1.1 SCOPE

This guideline deals with the requirements of the expert witness in criminal and civil proceedings. It is also intended to assist members who might not be necessarily regarded as "expert" witnesses, but who simply give testimony on professional matters before a tribunal or court.

1.2 PURPOSE

The purpose of this document is to assist APEGGA members in preparing to appear as witnesses regarding professional matters by describing what is expected of them and offering some background as to the processes involved in giving testimony. This guideline should be regarded as an addition to, but not a substitute for, any specialized witness training that might be conducted by legal counsel.

1.3 DEFINITIONS

For the purposes of this guideline, the following terms and definitions apply.

Administrative Tribunal
An administrative tribunal is decision-making body created by legislation with the power to affect the legal rights of persons.

Affidavit
An out of court statement reduced to writing that is authorized by legislation and sworn under oath.

Applicant
One who requests something; a petitioner, such as a person who applies for letters of administration.

Civil Law
The law that deals with the competing rights as between individuals.

Criminal Law
That body of the law, which deals with conduct considered so harmful to society as a whole that it is prohibited by statute, prosecuted, and punished by the government. The law regulates how suspects are investigated, charged, and tried, and establishes punishments for convicted offenders.

015963

Crown
The word refers specifically to the Queen of Canada (or the King of Canada, as the case may be). Prosecutions and civil cases taken (or defended) by either the Federal or provincial government are done so in the name of the sovereign as head of state (the Prime Minister being the head of government). That is why Canadian public prosecutors are referred to as "Crown prosecutors", and criminal cases are styled: "Her Majesty the Queen v. John Doe", or "Regina v. John Doe" (Regina being Latin for "The Queen"), or "Rex v. John Doe" (if the Sovereign is male; Rex being Latin for "The King"). The common abbreviation is "R. v. John Doe".

Cross-Examination
Questions asked by the party who did not call the witness.

Discovery
Within the civil law, discovery refers to the pretrial disclosure of pertinent facts or documents by one or both parties to a civil action or proceeding. The primary discovery devices are interrogatories, depositions, requests for admissions, and requests for production.

Evidence
Proof of fact(s) presented at a trial.

Examination in Chief
Questions asked by the party calling the witness.

Expert Witness
An expert witness is qualified by knowledge, skill, experience, training, or education to provide a scientific, technical, or specialized opinion about the evidence or an issue of fact. Only the expert witness is entitled to offer opinion evidence; the testimony of all other witnesses is limited to their personal knowledge and observation. Expert evidence is not allowed for issues within everyone's normal experience (i.e. describing the symptoms of a person who is intoxicated, describing a scene, or reporting what a person said).

Intervener
One who voluntarily intervenes as a third party in a legal proceeding, who may be supporting or opposing the applicant's case.

Litigant
A party to a lawsuit.

Panel
A group of people selected for some service as investigation or arbitration.

Professional Member
A professional engineer, professional geologist, professional geophysicist, registered professional technologist (engineering), registered professional technologist (geological), registered professional technologist (geophysical) or licensee entitled to engage in the practice of engineering, geology and geophysics under the Act.

015964

Subpoena
An order of a court, which requires a person to be present at a certain time and place or suffer a penalty (subpoena being Latin for "under penalty"). This is the traditional tool used by lawyers to ensure that witnesses present themselves at a given place, date, and time to make themselves available to testify.

Testimony
Evidence that a competent witness under oath or affirmation gives at trial or in an affidavit or deposition.

2 ROLE OF THE PROFESSIONAL SERVING AS A WITNESS

A fair question to ask is why should the APEGGA member be concerned about procedural rules when appearing before administrative tribunals or when the member is not providing expert evidence.

While the administrative tribunal does relax these rules as is appropriate to the greater informality of such proceedings, the role of the expert witness is the same whether the court is a judge and jury or a disciplinary hearing panel.

An APEGGA member should conduct himself or herself according to the highest standards at all times. That standard should not to be relaxed regardless of the prestige of the tribunal before which they are appearing or the status of the witness. The phrase “professional witness” better describes that high standard of conduct.

It is natural that the professional member wants to do well when he or she testifies before any tribunal. Yet, stories of unsatisfactory experiences for both the professional and the tribunal are common. Many tribunals express a lack of confidence in the testimony being offered by APEGGA members – causing frustration for the tribunals and a great deal of stress for the members. The tribunal assumes that the witness “knows his or her function” and may be surprised, and even insulted when they do not.

This frustration on the part of the member and the lack of confidence by the tribunal arises because of a profound misunderstanding of the role of the professional witness; it is not a reflection on the personal integrity of the witness at all.

2.1 FUNDAMENTAL MISCONCEPTIONS

The lack of faith in the professional serving as a witness arises from two fundamental misconceptions.

Misconception #1: **The professional witness believes that he or she should be an advocate for the party who called him or her.**

This is the most common misconception and the one most easily exploited by lawyers. The misconception is hardly new:

> *“Partly because of their tendency to espouse the cause of the party by whom they are called, the value to the expert witness has been doubted from time to time during the 19th and 20th centuries.”* [1]

1 Byrne, D. and J.D. Heydon (1991) *Cross on Evidence*, p. 785. Butterworths.

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This fatal flaw was also recognized in Engineering Law, a publication which has been circulated to APEGGA members to assist them in preparing for court:

> *"The weakness of opinion evidence lies in the fact that an expert usually goes to court with a bias to become zealous for his employer."*[2]

Why is it so wrong to be an advocate for the client's cause?
There are several reasons against advocacy. First the decision maker, whether a court composed of a judge and jury or a disciplinary hearing, is concerned with the search for the truth. The decision maker, not the witness must hear all of the evidence and make a determination. The only basis upon which the APEGGA member is entitled to appear in his or her professional capacity arises in those circumstances where the Court needs his or her experience and knowledge to understand the facts. If the evidence were such that an ordinary person could draw the appropriate conclusions, the professional would not be required and would not be entitled to testify at all. The professional witness is in reality the Court's witness because it is the Court that requires his or her or services.

If the professional witness only advances the position of the party who called him or her, the Court cannot rely upon the testimony, and the witness is of no assistance to the Court. The Court expects that the professional witness understand his or her role in the proceedings and is surprised and insulted if the witness does not, whether the fault is innocent or not.

The second reason that it is inappropriate to act as advocate is that the job is already taken. That is the role of counsel. It is also insulting to the lawyers to have witness try to do their job for them.

Why does this misconception persist?
There are a number of reasons why this misconception persists. First, television perpetuates the myth that witnesses are like members of a team and that they are there to see that "their side" wins. This makes for entertaining TV and a disastrous performance in real life. Second, very few professional members have any experience testifying before a court or tribunal.

Third, if the member has any experience with the judicial system, it is more likely in the context of the examination for discovery in a civil case. The examination for discovery is the formal process by which the litigants investigate the issue that is under dispute. The evidence at an examination for discovery is under oath and recorded by a court reporter, but there is no judge present and there is no final determination of any issue. In that context, the APEGGA member may have accessed published excerpts from publications and papers dealing with civil proceedings to this effect:

> *"He should be cooperative, avoid volunteering information not specifically requested, and avoid revealing any item that might prove embarrassing to either himself or his attorney."*[3]

Such advice is appropriate in the examination for discovery because the whole point of the proceeding is a formal investigation by the litigants. Admissions in that context may form part of the evidence at trial. Not surprisingly, the professional serving as a witness

2 Laidlaw, R.E., C.R. Young and A.R. Dick (1981) *Engineering Law, Fifth Edition*, p. 168. University of Toronto Press.
3 Crawford, Robert J. (2001) *The Expert Witness – A Manual for Experts*, p. 87. 1st Books Library.

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in that context is cautioned not to assist the other side voluntarily. The legal counsel who has engaged the witness will advance the counsel's interests.

The APEGGA member will only be involved in discoveries if they were party to the lawsuit, a designated officer of a corporate party, or a current or former employee of a party. Witnesses who do not fall into one of those categories are not examined at the discovery stage (at least not in Alberta, there is a different regime in Ontario).

The experience of examination for discovery does not assist the witness in preparing to testify before a court or tribunal - the rules of engagement are very different. In the trial situation, the court is preoccupied with the search for the truth, and the witnesses are under oath and compelled to testify fully. The witness who is coy about his or her answers, and, instead of fully answering the question, edits the answer so that it becomes misleading because of what it does not include, will be viewed as unreliable by the Court. In extreme cases, the Court could sanction such conduct by a finding of contempt with all its possible consequences.

The overt display of client advocacy is not only fatal to the credibility of the professional witness on the trial in which he or she has been called, but may tarnish the professional member's reputation in the legal community. The legal community is very small in Alberta (there are only 107 judges of the Provincial Court, 78 justices of the Court of Queen's Bench, and 150 prosecutors in the province), and reputations become widely known. The measure of any witness's reputation is the degree to which he or she fulfills the mandate to assist the court in its inquiry into the truth.

Misconception #2: The professional witness believes that he or she is the ultimate decision-maker on the issue for which his or her evidence is being sought.

The second pervasive, although less common, misconception is that the professional witness assumes that because he or she been asked for an opinion, the professional is the ultimate decision-maker, rather than just an assistant to the court. Regardless of whether the tribunal is a court composed of a judge and jury or an APEGGA disciplinary hearing, the tribunal will make the decision, not the parties appearing before it. It is offensive to the decision-maker to have a witness attempt to usurp that responsibility.

2.2 UNDERSTANDING THE ROLE OF THE PROFESSIONAL WITNESS TO ASSIST IN PREPARATION FOR COURT

There is a great fear among APEGGA members that when they testify they will fall victim to the games that lawyers play with witnesses and much of the American publications that are available to APEGGA members focus on techniques to avoid this.

In reality though, these "games" have a simple purpose, they are designed to reveal that the witness' first interest is the promotion of either of his or her client's position or his or her own position as the font of all knowledge. Lawyers are not experts in science; they are experts in exploiting human weaknesses, but the professional witness who understands that his or her role is to assist the tribunal in the finding of fact will never commit the most common errors:

- going outside his or her expertise or knowledge,

- being argumentative,
- failing to listen,
- failing to accept any proposition that might favour the other side, or
- becoming defensive.

No person is perfect and no witness infallible. A court will forgive less than perfect recall, nervousness, and a less than polished performance, but no court will forgive a professional witness who acts as the cheerleader for one side or tries to usurp the decision-making power of the court or tribunal.

2.3 DUTY TO ACT AS A WITNESS

Many people assume that involvement in a judicial proceeding is a matter of choice for the professional. This is not necessarily the case. Professionals may be subpoenaed as involuntary witnesses for criminal and civil courts. Sections 705 and 706 of the Criminal Code provide as follows:

> *(705) Where a person who has been served with a subpoena to give evidence in a proceeding does not attend or remain in attendance, the court, judge, justice or provincial court judge before whom that person was required to attend may, if it is established that:*
>
> *(a) the subpoena has been served in accordance with this part and*
> *(b) that the person is likely to give material evidence issue or caused to be issued a warrant in Form 17 for the arrest of that person.*
>
> *(706) Where a person is brought before a court, judge, justice or provincial court judge under a warrant issued pursuant to Section 705, the court, judge, justice, or provincial court judge may order that the person:*
>
> *(a) be detained in custody or*
> *(b) be released on recognizance in Form 32 with or without securities to appear and give evidence when required.*

These subpoena powers of the Criminal Court apply equally to administrative tribunals and the appointed commissioner(s) by virtue of Section 5 of the Public Inquiries Act R.S.A. 2000, ch. P-39:

> ***Evidence***
> ***4*** *The commissioner or commissioners have the power of summoning any persons as witnesses and of requiring them to give evidence on oath, orally or in writing, and to produce any documents, papers and things that the commissioner or commissioners consider to be required for the full investigation of the matters into which the commissioner or commissioners are appointed to inquire.*
>
> *RSA 1980 cP-29 s3*
>
> ***Attendance of witnesses***
> ***5*** *The commissioner or commissioners have the same power to enforce the attendance of persons as witnesses and to compel them to give evidence and to produce documents and things as is vested in a court of record in civil cases, and the same privileges and immunities as a judge of the Court of Queen's Bench.*
>
> *RSA 1980 cP-29 s4*
>
> ***Contempt***

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> ***6(1)*** *When a judge of the Court of Queen's Bench is appointed as a commissioner or as one of several commissioners, the commissioner or commissioners so appointed have the same power of committal for contempts of the commissioner or commissioners as a judge of the Court of Queen's Bench has in respect of that Court.*
>
> ***(2)*** *When pursuant to an Act of the Legislature a person or group of persons is or may be vested with the power to inquire into any matter and that Act grants to that person or group of persons the powers of a commissioner under this Act, subsection (1) applies to those powers if the person so appointed or any of the persons composing the group appointed is a judge of the Court of Queen's Bench.*
>
> *RSA 1980 cP-29 s5*

3 ETHICAL CONSIDERATIONS IN ACCEPTING AN ASSIGNMENT

Professionals must examine their ethical position relative to any possible voluntary involvement in proceedings. The APEGGA Code of Ethics addresses the following areas and governs members' behaviour.

3.1 COMPETENCE

When deciding whether to appear before a hearing or a civil proceeding as an expert witness, professionals must consider whether they have the depth and range of experience to provide an opinion on the topic in question. There may be situations where they find themselves beyond their personal capabilities. The terms "qualifying" (as in "qualifying for membership in a professional body") and "competence" should not be confused. "Qualifying" means that a person has a quality or accomplishment suitable for some function or office. It is a one-time, static fact that cannot be lost or diminished by time. "Competence" is the "quality of having suitable skill, knowledge or experience for some purpose". It is dynamic and relates to the present task, assignment, or activity.

Professionals must carefully assess their competence to undertake a proposed assignment. This involves judging whether their theoretical knowledge, practical experience, and reputation in their field are of suitable pertinence, extent, and depth to enable them to put forward and to defend a position that would be helpful to the court.

Professionals must ensure that the client understands the possibility that some situations may demand particular skill or knowledge that they do not have and that the client must retain or pay for such specialist services. If the client is unwilling to retain or pay for necessary specialist services, the professional must decide whether this denial is sufficient for refusal of the assignment.

3.2 CONFLICT OF INTEREST

In the case of voluntary participation in proceedings, professionals must examine their personal involvement in the affairs of any of the parties to the action or inquiry to be able to assure their client that they have no conflict of interest and that others can show none. If there appears to be any conflict of interest, the professional should immediately advise both the client and legal counsel.

In addition, professionals should examine any relationships with other clients who are not directly involved and be certain that participation in the action or inquiry will not result in any disadvantage to them. Where one of the parties to the action or inquiry is a client

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in other instances, professionals must judge whether participation would jeopardize their future relationships. Through appropriate inquiry, the professional must be satisfied as to the good faith of the parties to the dispute. If they are not able to find that satisfaction, they should seriously consider not becoming involved.

3.3 CONFIDENTIALITY

In their day-to-day practices, professionals have an ethical and often a contractual obligation to keep secret and confidential any conclusions reached during an assignment undertaken on behalf of a client. However, there is no legal privilege that is created by the relationship alone and if ordered to do so by the court, the professional must answer. “Privilege” is a rule of evidence, which permits a witness to refuse to answer a particular question or to produce particular documents. However, privilege arises in very limited circumstances, namely as between husband and wife and solicitor and client. For example, there is no legal privilege between a doctor and his patient or priest and his penitent.

Further, solicitor-client privilege will only apply to reports and documents prepared by non-legal professionals (employed or retained by a party) if the dominant purpose of the preparation of the report or document was to instruct legal counsel in respect of contemplated or anticipated litigation.

The fact that documents are prepared in the context of a confidential relationship between a professional and client or are marked “confidential” will not preclude disclosure in court. Thus, professionals may be called upon to reveal the source or nature of their information, even though they have given promises of confidentiality. In some instances, the court may impose terms upon the disclosure or take other measures to protect the confidentiality outside the courtroom. It will be up to the court or the tribunal involved to determine the hardship that would ensue should the professional members be forced to violate such promises of confidentiality and to decide if the members will be permitted to hold their promises.

The professionals who are asked to keep the source or the nature of secret information or trade secrets fully confidential and protected must understand that they cannot make that promise unconditionally.

Finally, it is important to emphasize that privilege is a matter that should be raised by the lawyers in the case and not the witness. Therefore it is important to raise any concerns with respect to privilege with counsel before the trial.

3.4 OTHER ETHICAL RESTRICTIONS

Professionals must understand that full and timely discharge of the proposed service may be limited, restricted, or delayed by a number of factors. The client may impose restrictions relating to monetary matters, confidentiality, access to essential information, and certain directions that an investigation might take. Situations may arise that professionals judge to be outside their personal capabilities and that will require outside expert assistance. The professionals’ investigation of the facts may suggest that their testimony may take a direction not in keeping with the wishes of the client. In such circumstances, the professionals have an immediate obligation to advise the client and counsel of the situation.

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Where the involvement in legal proceedings is on a voluntary basis, professionals should ensure that their normal business activities are not put at risk because of unexpected or unreasonable demands on their time. They should advise their other obligations and make arrangements to meet time constraints. They should also ensure that informal or personal short-term commitments do not lock them into unwanted longer-term involvement that could prevent the discharge of regular commitments or participation in new business. Court attendance, for example, typically overrides all other commitments. The witness must be there when the court is ready.

4 CONDUCTING AN INVESTIGATION

Before professionals can act as witnesses or give testimony, they must conduct a thorough examination of the matter in dispute before the tribunal for review and adjudication. The role of professional witness is to assist the judicial process.

Expert testimony must meet several criteria:

- The findings must be based on the scientific methodology, not on the fact that a professional is presenting it.
- The findings must fit the case technically, conforming to known scientific, physical, or engineering principles and be supported by a documented trail of reasoning that links the evidence to the case. Science or engineering should not be applied to situations that are not subject to scientific analysis or to an area about which there is no scientific knowledge.
- The witness must be an expert in the field relevant to the case.

4.1 THOROUGHNESS

Professionals are ethically bound to express opinions only based on adequate knowledge and sound conviction. To reach a conclusion or to form an opinion, professionals must assess how much information must be gathered to reach a supportable, documented conclusion and how much evidence will be required to prove an assertion. They should also understand the general approach being taken by the client's legal counsel to be able to support it appropriately. The professionals however, should address only those areas within their areas of competence and avoid extraneous investigation.

Because unanticipated technical questions might arise, professionals should examine all documents related to the case, including correspondence, tests, plans, logs, sections, maps, and materials supplied by other witnesses. They should draw on their special skills and knowledge derived from study, readings and analysis to develop their expert testimony. Professionals must co-operate with all investigators involved and be prepared to share matters of fact. All parties should be starting with the same facts.

4.2 EXAMINATION OF A SITE

The professional may have to conduct a personal inspection of local conditions in cases such as those involving accidents, hazards, working conditions, or project location and features. At the time of inspection, the professional should take detailed notes before the facts fade from memory. The professional must be aware that notes taken might be producible to all parties in an action.

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The professional should record all details that might be pertinent in the proceeding and, where appropriate, support them with photographs. Any changes that might have occurred between the time of the incident and the examination should be noted and, if possible, the site should be restored to its condition at the time of the incident. It may also be important to note the time of examination and weather conditions.

Professionals do not have the right to trespass to obtain data. Access to property, both private and public, is possible only if expressly permitted by the owner or with the agreement of the parties involved, unless there is a statutory provision allowing access for a specific purpose.

4.3 PREPARATION OF DATA

Professionals should prepare all data and documentary evidence in a way, which will help educate the non-expert tribunal. Even the most honest witnesses are ineffective if the evidentiary basis of their opinion is not established. They should inform the client of the need for any specific tests, calculations, analyses or other assessments necessary to arrive at their professional opinion. They should also advise the client of the desirability of preparing exhibits or demonstrations, where appropriate, for use in hearing room. These exhibits may include tables, diagrams, samples, drawings, maps, sketches, cross-sections, plans, reconstructions, photographs, etc.

Professionals serving as witnesses do not testify in the abstract, but are called upon to interpret data, whether they collected data themselves or others provided it. Hence, they should have personal knowledge of any tests or analyses to ensure compliance to technical specifications.

4.4 PRESERVATION OF EVIDENCE

In criminal prosecutions, preservation of evidence is the responsibility of the investigator and the Crown. However, there are situations where the witness is called upon long after the initial involvement. All pertinent information should be properly identified, recorded, and catalogued for later legal use.

The catalogued information should include all rough calculations, original data, preliminary drafts, telephone records, and notes of interviews and of any conferences with others connected with the case. In the criminal context, such records are subject to disclosure.

5 HEARING AND INQUIRY PROCESS

The hearing and inquiry process for most quasi-judicial regulatory boards is quite similar, with only minor variations from one to another. There are also many similarities to the court trial process. Every witness, whether an expert or not, should insist upon meeting with counsel in advance of the tribunal for a proper briefing of procedure. The confidence of a witness can be easily undermined by confusion over seemingly minor procedural matters, such as standing during the giving of evidence and asking for permission to read from notes. In advance of the tribunal session, counsel can easily address these matters.

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5.1 INTRODUCTORY REMARKS AND THE OPENING OF THE HEARING OR INQUIRY

Commonly, a panel of three board members or commissioners sits at a hearing, with one member designated as the chair or presiding member. Most often, a court reporter is present to take a verbatim record of the proceedings. After opening comments about the purpose of the hearing, the presiding member will register the participants.

5.2 PRESENTATION OF EVIDENCE

The presiding member will first ask the applicant to present its application. If counsel represents the applicant, they will ask the presiding member to mark the application and supporting documents as exhibits to the proceeding, including any reports to be provided by witnesses. All of this material will have been provided to the panel and the other participants much earlier. The counsel will then introduce the people who will speak to the applicant's evidence, including representatives from the company and other professionals serving as witnesses. The counsel will qualify the witnesses by describing their background, education and experience, including any special qualifications they may have related to their evidence. Most often, counsel will submit the witnesses' curriculum vitae to be marked as exhibits and become part of the hearing record. Other parties have the right to challenge the qualifications through cross-examination. Most tribunals will ask the reporter to swear in the witnesses, although some do not. Those that do not still expect witnesses to tell the truth.

The witnesses rarely read their evidence into the record because it is already documented, but most often they will highlight the major points and identify any possible errors in their written material. Once all of the witnesses have gone through this process, they are open for questions from the interveners (other participants in the hearing who may be supporting or opposing the applicant's case), the board staff and the members of the panel.

If after cross-examination of the applicant's witnesses, counsel for the applicant decides that some matters need further clarification; the counsel may ask more questions of the witnesses. This testimony is also subject to questions, from the intervener although that seldom occurs.

Interveners who intend to submit evidence to the panel must provide that evidence to the panel, the applicant, and other interveners by the deadline prescribed in the notice of hearing. At the hearing, the presiding panel member will ask to present the intervener's case. The same steps are then followed as in the case of the applicant: marking of interventions and supporting documents as exhibits to the hearing, qualification of the witnesses, swearing in of the witnesses (if required), examination-in-chief, cross-examination, and re-examination. This process is repeated for each intervener. It is possible that some interveners will not present evidence but will participate in the hearing for the purposes of cross-examination and argument only.

The applicant may wish to rebut or dispute some of the evidence presented by interveners. The applicant may ask the assistance of its witnesses in this process. In such cases, it is necessary to have the witnesses take the table again to answer any questions that the rebuttal evidence raises.

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5.3 CLOSING ARGUMENTS OR SUMMARY STATEMENTS

In the last step in the hearing process, the presiding member will invite the applicant and each intervener to make a closing statement. This is an opportunity for each participant to summarize its case, and the issues that have been raised and present the reasons why its case ought to be accepted by the panel. Counsel, not a witness, provides a closing argument.

5.4 CLOSE OF THE HEARING AND UNDERTAKINGS

Most often, the presiding member will close the hearing, advising the parties that the evidence will be carefully considered and a written decision issued in due course.

It is possible that any one of the parties will have made an undertaking to provide additional information or answers to questions during or after the close of the hearing. In rare cases, these undertakings might raise substantial questions, necessitating the re-opening of the hearing.

6 TRIAL PROCESS

6.1 OPENING OF THE TRIAL

The court trial process is similar to but stricter than a hearing or tribunal. A civil trial (with the rarest of exceptions) is presided over by a Judge. The Judge or jury weighs the evidence and makes the final decision. A criminal trial may be held before a Judge of the Provincial Court or a Judge of the Court of Queen's Bench sitting alone or with a jury. A court reporter or court recording device is present to take a verbatim record of the proceedings.

6.2 QUALIFICATION OF EXPERT WITNESSES

Professionals called upon to give expert or opinion evidence must first be qualified by the court to do so. As with all aspects of a trial, the rules of evidence are more strictly applied than in a hearing. Only the expert witness is entitled to offer opinion evidence. The testimony of all other witnesses is limited to their personal knowledge and observation.

The procedure by which a witness is qualified as an expert is called a voir dire, which has been described as a trial within a trial. During the voir dire, the court will hear evidence relating to the witness's qualifications and determine whether he or she may testify in that capacity. The lawyer seeking to have the witness qualified as an expert will define the area of expertise very specifically and then ask questions as to the witness's background to show why the witness is in a position to assist the court in wrestling with issues within that area of specialization.

Since expertise is based on experience, there is no requirement for formal education, publications, or standing in academic or professional associations. The question before the court is essentially whether this potential witness has the experience that would allow the court to have confidence in his or her ability to assist. However, when dealing with professionals, the counsel presenting the witness will canvass the following areas:

- academic qualifications
- professional background and experience

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- membership in professional or academic associations
- published and unpublished reports and papers
- teaching experience

After the party seeking to have the witness qualified as an expert asks their questions, the opposite counsel is entitled to cross-examine on those qualifications. Although the questions might seem insulting, the strategy of the opposite counsel is often simply to limit the area of expertise that the witness can deal with. At the conclusion of the questioning, the judge will decide whether the person can testify as an expert witness, and if so, to what extent.

Once it is ruled that a witness may testify as an expert, the testimony is restricted to matters within the strict definition of their area of expertise; the witness may not stray beyond that expertise. The courts, and especially the criminal court, are very strict in enforcing the rule that an expert may not testify beyond his or her stated area of expertise.

6.3 PRESENTATION OF EVIDENCE

Once the witness has been qualified as an expert, the trial proceeds. The counsel who has called the witness goes first, questioning the witness. This “examination in chief” follows very strict rules. Counsel calling the witness is not entitled to suggest answers or to put words in the witness’s mouth. The information must come from the witness, not from counsel.

Thereafter, the opposite party is entitled to cross-examine the witness. Rules against leading questions do not apply to cross-examinations, because the point is to challenge the evidence just given, whether based on its merits or by attacking the credibility of the witness. An attack on credibility is most offensive to an inexperienced expert witness, yet it is a necessary and accepted part of the trial process. Witnesses, who react angrily or defensively to cross-examination, misunderstand their role in the judicial process. If witnesses remember that their only role is to assist the court, they will be invulnerable to personal attack. The Court will stop an abusive cross-examination, but perceptions of what is abusive may differ between the witness and the Court.

Many witnesses expect the counsel who called them to rise to their defense when the cross-examination is particularly vigorous. The function of cross-examination is to challenge the witness and there are very few legitimate objections to cross-examination questioning. So to the surprise of the witnesses, the counsel who called them may remain mute. However, the judge may rise to the defense of a witness if he or she believes that the witness is truly trying to help the Court with the complicated facts of the case.

Following cross-examination, the original party may ask further questions to clarify new issues raised in cross-examination. After re-examination, on occasion, the court might have its own questions of clarification for the expert witness.

In virtually every case, there is an order for exclusion of witnesses, so that one witness cannot hear the evidence of another until he or she has completed testifying. The purpose of this is to prevent the evidence from being tainted or altered by what is heard in court. The frequent exception to this exclusion is the expert witness, who, for practical

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purposes, may need to hear the evidence that has been called in order to comment upon it. However, the decision to exclude or allow the expert witness is made by the court, not the witness.

Because of the traditional order for exclusion of witnesses, it is absolutely critical that witnesses not discuss the case outside the courtroom, as this would obviously undermine the order of exclusion. It is especially important for the professional serving as a witness not to be drawn into conversation with other witnesses on issues relevant to the case either before or after court.

6.4 PRACTICAL ADVICE FOR SERVING AS A WITNESS IN CRIMINAL COURT

The following points will help prepare the professional serving as a witness in the criminal courts:

- The best preparation to be a witness for a trial is to watch an unrelated trial.
- The witness should insist upon being briefed by the lawyer who has called him or her.
- The Judge in Provincial Court is called “Your Honour”. The Judge in Court of Queen’s Bench is addressed as “My Lord” or “My Lady”. All judges may be addressed as “Sir” or “Madam”.
- When sworn in criminal court, the witness stands in the witness box.
- After being sworn in, the witness may not sit down unless and until permission is given from the Court to do so.
- The witness may not refer to notes unless and until given permission by the court to do so. Counsel will usually look after this technicality for the witness.
- Lawyers are required to bow when they cross the bar and when they enter or exit the courtroom, but this is not a requirement for witnesses.
- A witness does not have the right to refuse to answer or object to a question. If the questioning is offensive, irrelevant or improper, counsel or the court will object.
- At the same time, if a witness does not understand the question, it is his or her duty to say so.
- If the lawyer phrases a question poorly, it is still the witness’s duty to try to assist. The witness may ask the lawyer for clarification, further information, or further details. If the witness’s question is truly an attempt to assist, it is perfectly acceptable. Problems occur when a witness starts to argue with the lawyer.
- If the question is outside the witness’s area of expertise, it is his or her duty to say so.
- If a witness makes a mistake, he or she must say so. If the witness realizes the mistake after he or she has testified, it is to be brought to the attention of the lawyer who called him or her.
- It is highly desirable that the witness provides graphs, maps, diagrams or any other visual aids that assist in the presentation of evidence. However, all such materials must be provided to the opposite side in advance. Counsel will assist in that process.
- In theory, every answer to a question is directed to the Judge, not the lawyer who asked the question. However, in practical terms, this is almost impossible to do and

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the witness will feel very awkward if he or she tries. As a compromise, from time to time, the witness should turn and address the judge.

- The witness should never use technical terms without an explanation.
- The witness should spell difficult words to assist the court reporters.
- It is best that the witness separate him or herself from the other witnesses prior to testifying so as to preclude any possibility of discussing evidence prior to testifying.
- Once the witness is subject to cross-examination, he or she must not discuss his or her evidence, even with the lawyer who called the expert until such time as the witness has completed testifying.
- It is best for the witness to leave the courtroom after he or she has testified.

7 FEES AND AGREEMENTS

7.1 CIVIL COURT

In the civil courts, the level of compensation mandated by law is minimal. Professionals who are subpoenaed as involuntary witnesses in any legal matter are entitled only to legal witness fees, as well as travel and living expenses, if warranted. But if an expert is called under such circumstances, the witness cannot be forced to give an opinion without extra compensation. The skill and knowledge of the expert are regarded as their personal property, and property may not be taken for public use without compensation. It is not practical to obtain expert professional services through the payment of ordinary witness fees, since this results in little investigation of the problem and the witness cannot be expected to risk an opinion on such an insecure basis. Therefore, the professional should speak with counsel prior to accepting a retainer to deal effectively with an issue.

7.2 CRIMINAL COURT

In the criminal courts, there is no right to compensation for any witness, including the expert witness. However, there is a system in place to compensate expert witnesses and these arrangements should be discussed with the prosecutor or defense counsel in advance of the trial. It is no defense to a charge of failing to appear as a witness to suggest that payment is required.

7.3 GENERAL TERMS

On the other hand if one is being asked to provide an opinion in advance of a trial as part of the investigation or pre-trial preparation, the professional witness is entitled to compensation on the same basis as for any professional service, even in the criminal courts.

It is useful and courteous to provide the client, as soon as possible, with an advance estimate of the investigative costs to be incurred by the professional serving as a witness. Professionals may refer to fee schedules established by APEGGA. Hourly or per diem rates should be quoted for consultations and court appearances. This will permit the client to consider alternatives, if appropriate.

The legal proceedings in which the professional is involved may be an adjunct to another commission for which fees have already been established. If preparation and

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appearance as a witness is a part of his or her normal duties, then the employer will address fees payable by an outside client, and no additional remuneration to the professional is warranted. On the other hand, if normal income from an employer is curtailed because of being a witness, then the professional may be justified in negotiating an appropriate fee for services.

For situations of minimal involvement and complexity, a formal written contract is unwarranted. It may be prudent, especially with a new client, to request a retainer in such situations to ensure that a commitment exists, which is sufficient to make the requested preliminary judgments.

For lengthy and complex commissions, a written contract is preferable. If a formal contract cannot be achieved, then a detailed letter of advice should be prepared by the professional and directed to the client as soon as possible outlining the understanding of the commission. The agreement should clearly set out the services to be provided, the rates of payment applicable to the various services, and the times and terms of payment. For extended periods of investigation or other activity, provision should be made for progress payments and escalation of rates, if appropriate.

Any agreement should make clear to the client that the professional must remain technically impartial and is to be reimbursed for professional services, regardless of outcome. A specific statement, such as “payment to the professional is to be made without delay, and is not contingent upon the results of any legal action, arbitration, or out of court settlement”, should be included in the agreement.

In an agreement or contract, it should be possible to describe the full program envisaged, at least up to the actual court appearance, at which time control passes out of the hands of the professional. It is normal for changes and additions to the original terms of the contract to occur, initiated by the client, legal counsel, or the professional. Careful documentation and accounting should be kept for all extras.

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Control of DC and AC Interference on Pipelines

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CORROSION

AND

CATHODIC PROTECTION

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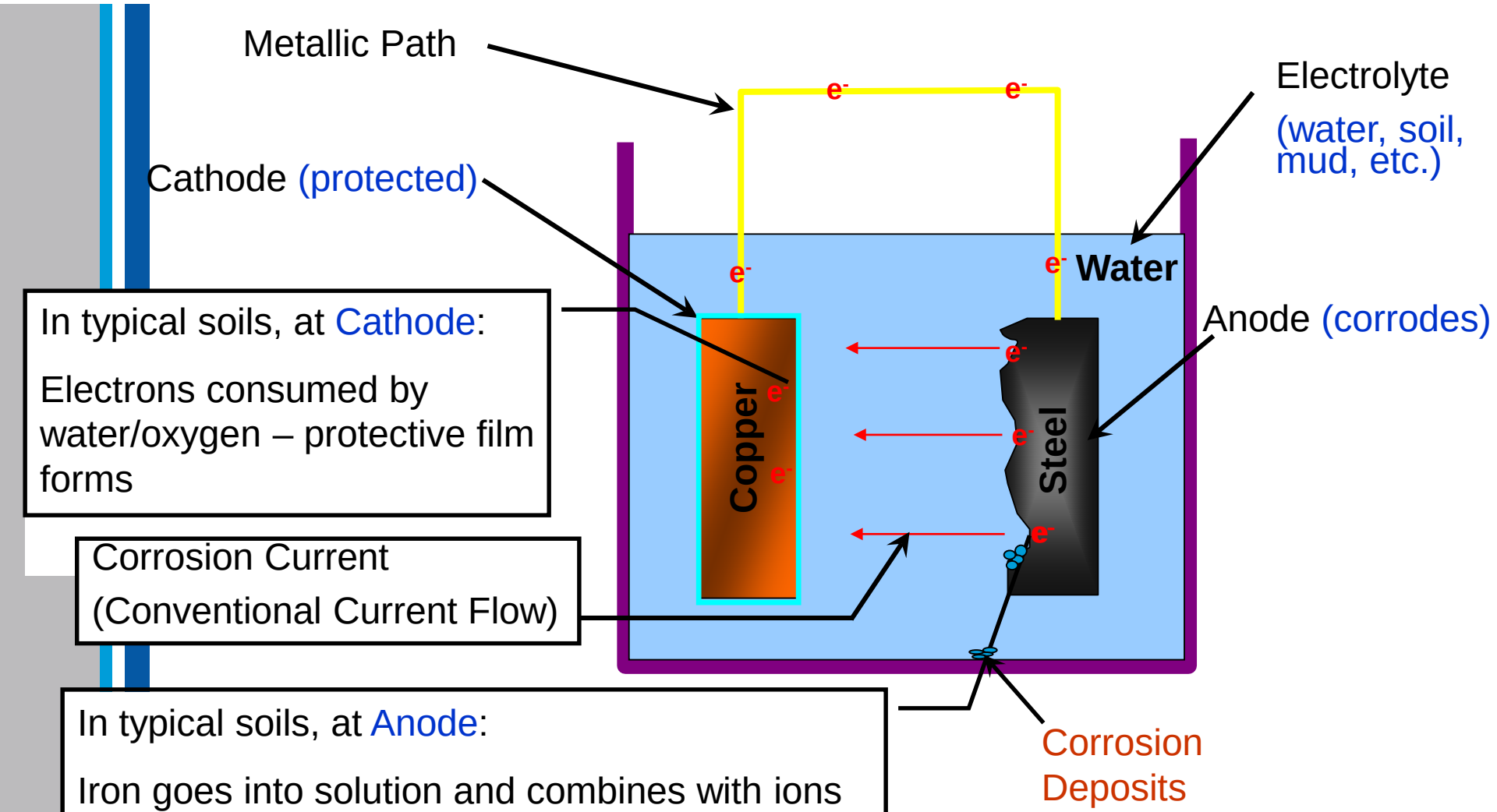
Basic Corrosion Mechanism



In typical soils, at Cathode:

Electrons consumed by water/oxygen – protective film forms

Corrosion Current
(Conventional Current Flow)

In typical soils, at Anode:

Iron goes into solution and combines with ions

in the electrolyte to form corrosion Deposits

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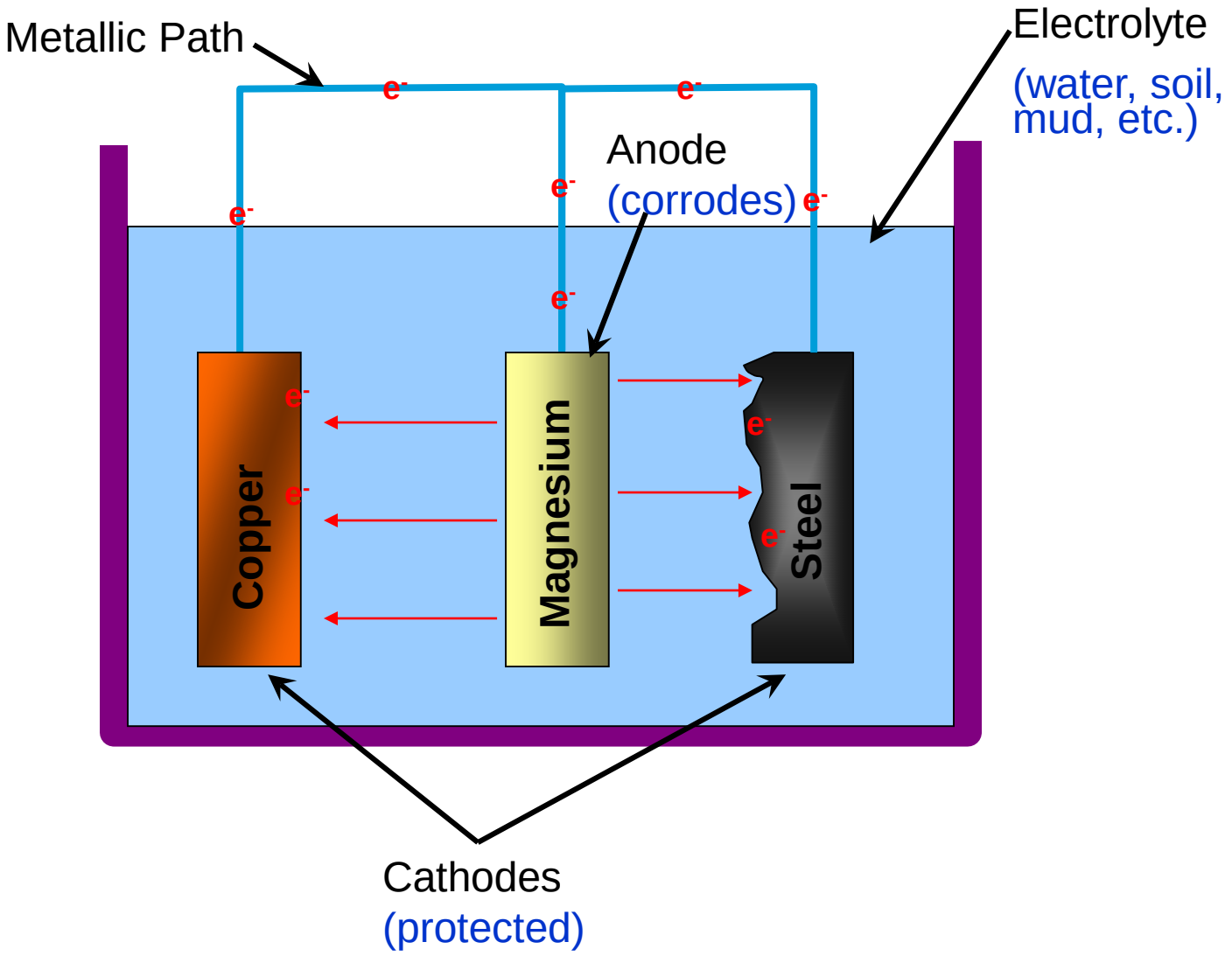
Basic Cathodic Protection Mechanism



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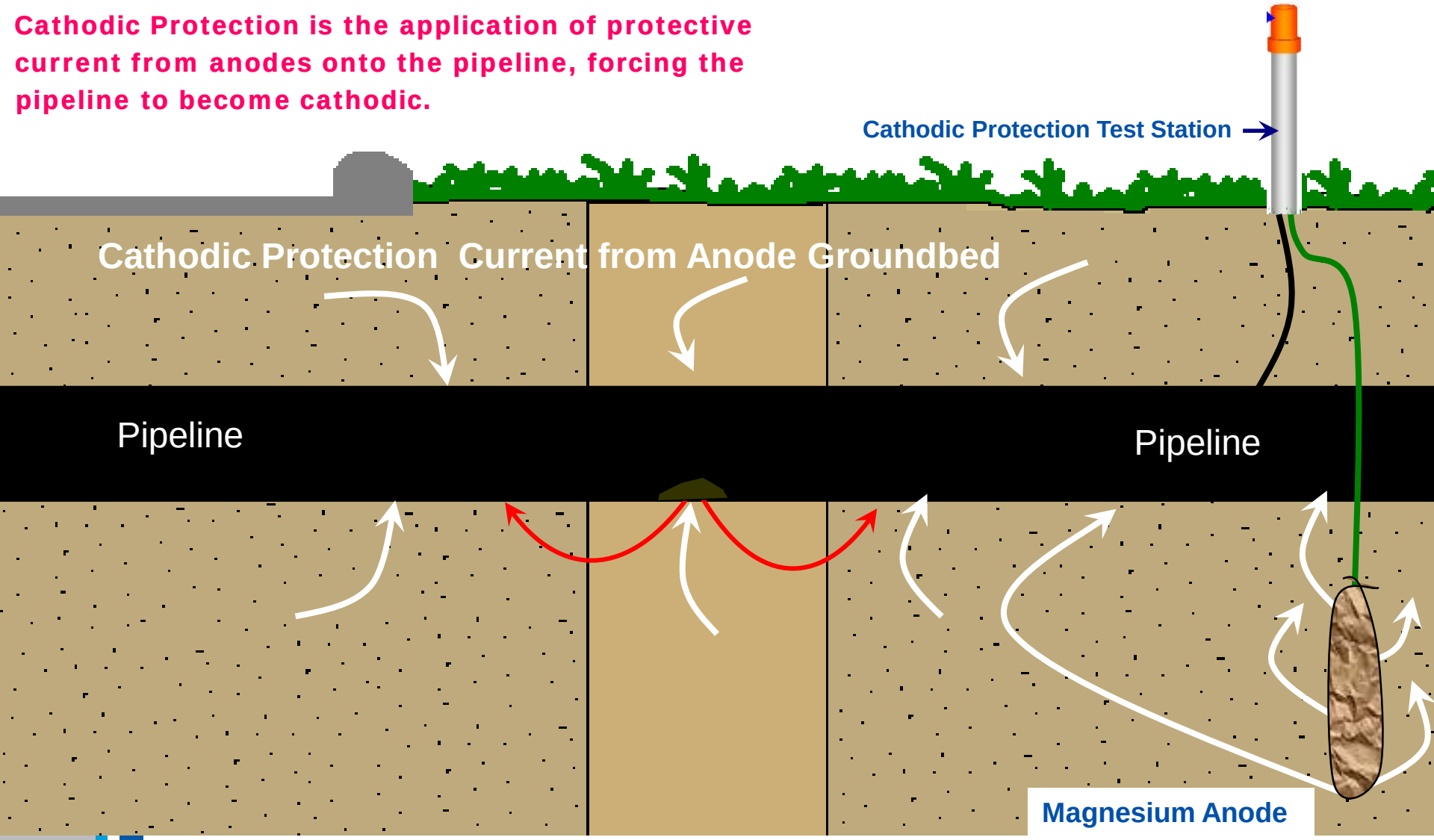
Cathodic Protection – Galvanic System

Cathodic Protection is the application of protective current from anodes onto the pipeline, forcing the pipeline to become cathodic.



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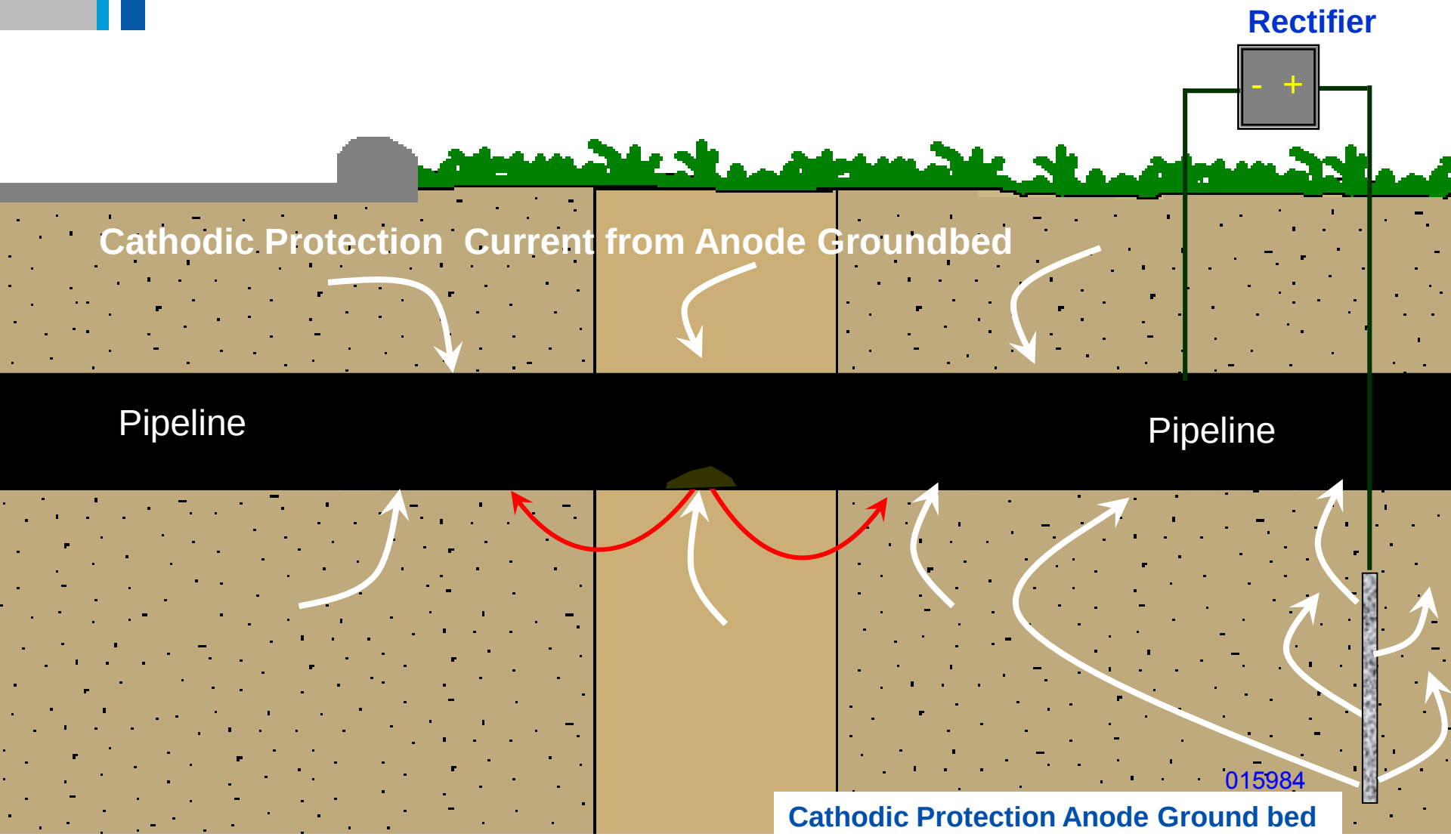
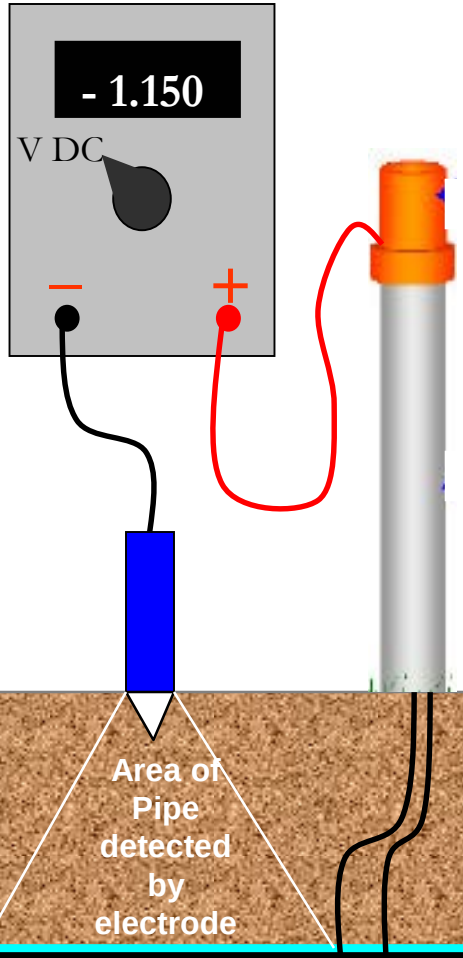
Cathodic Protection – Impressed Current System



Basic Pipe-to-Soil Potential Measurement

Copper-Copper Sulfate Reference Electrode

High Impedance Voltmeter (Miller LC-4 Pictured)



DC STRAY CURRENT INTERFERENCE

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DC Stray Current Interference

- Stray current interference occurs when DC current travels along a non-intended path.
- Where DC stray current is received by a structure, the area becomes cathodic and generally, no corrosion occurs
- Where DC stray current exits the structure to return to its source, corrosion occurs and depending on magnitude of stray current, can lead to accelerated corrosion failures.

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DC Stray Current Interference

Using Faraday's Law, weight loss is directly proportional to current discharge and time … Steel is consumed at ~21 lbs/amp-year

Example: A 1-inch diameter cone shaped pit in 0.500" thick steel would weighs 0.04 pounds.

One ampere of DC current discharging from a 1-inch diameter coating holiday would cause a through wall, cone shaped pit to occur in 0.0019 years or 16 hours.

Stray current corrosion can be a serious problem.

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Sources of DC Stray Currents

Static DC Currents:

- Foreign Cathodic Protection Systems

Dynamic DC Currents:

- DC Traction Power Systems: Transit, People Movers, Mining Transport Systems
- HVDC : Imbalance, Monopolar Earth Return
- Welding Equipment with Improper Ground
- Geomagnetic (Telluric) Earth Currents

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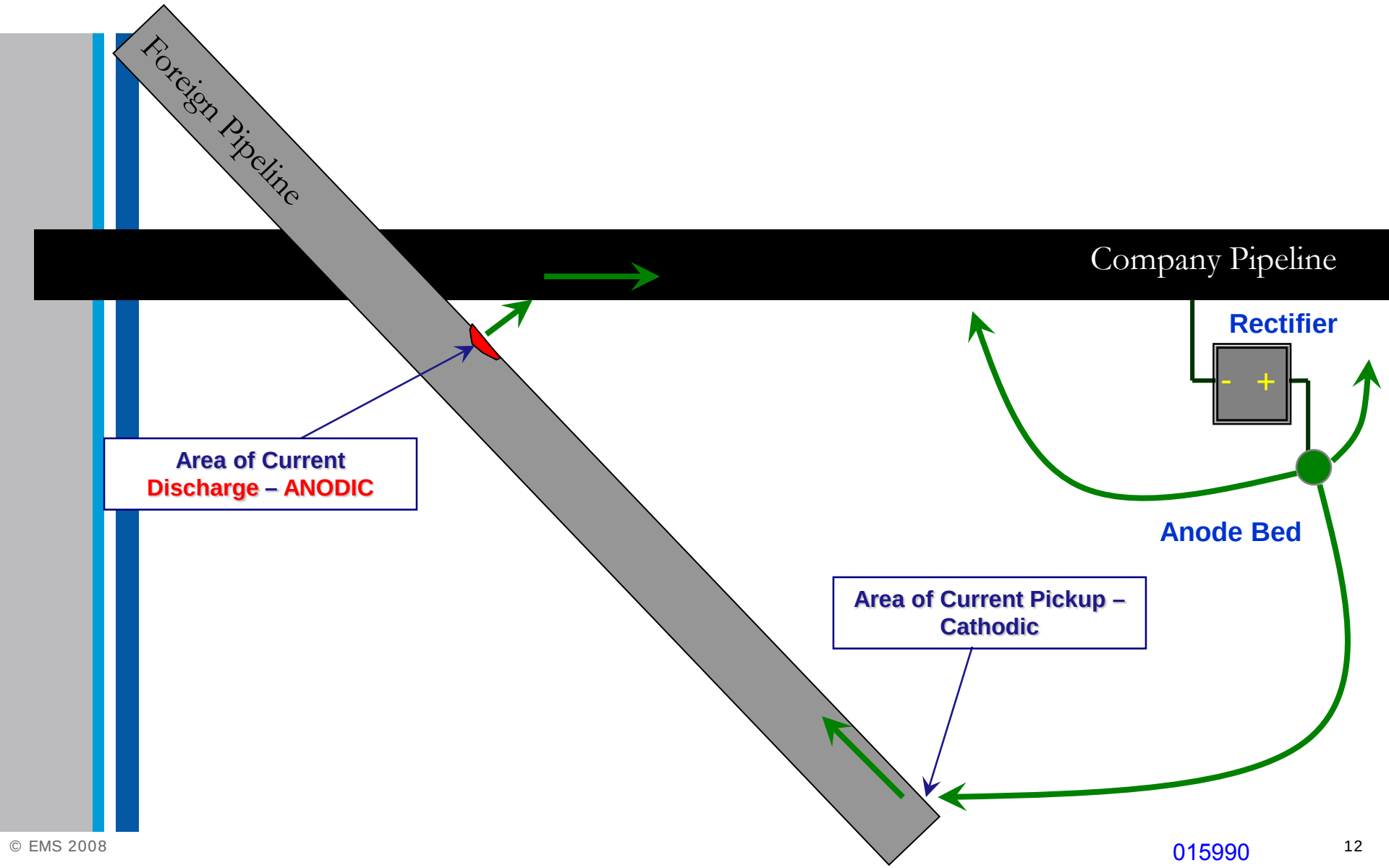
Corrosion Caused by Stray Current



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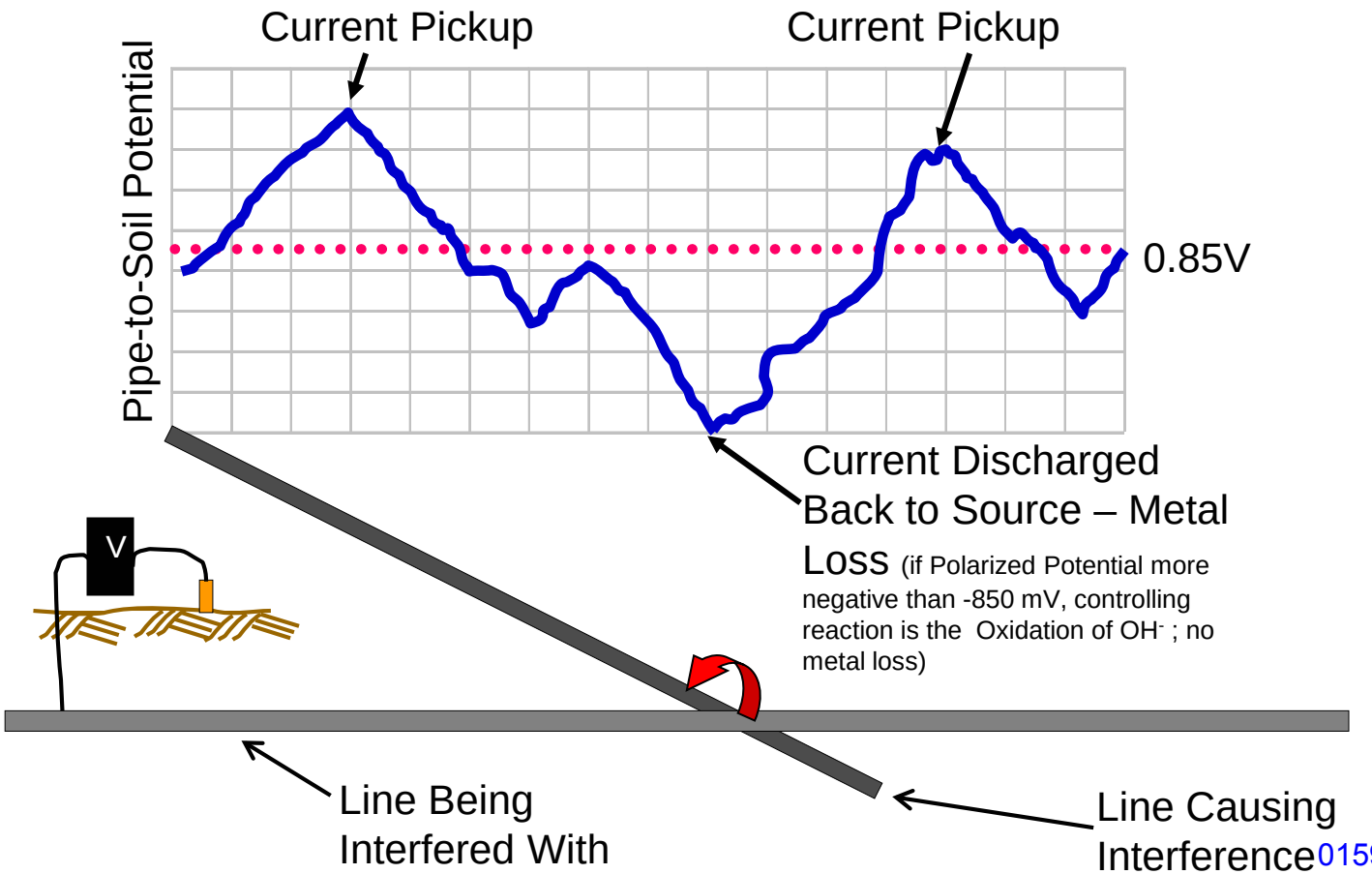
Testing and Identifying DC Stray Current

Potential measurements (Close Interval Surveys) are typically used to identify stray current areas.



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Mitigation of DC Stray Current

There are several methods to control/eliminate DC stray currents:

1. Eliminate the source, if possible
2. Bond (direct bond or resistance bond)
3. Recoating
4. Shields
5. Drain sacrificial anodes

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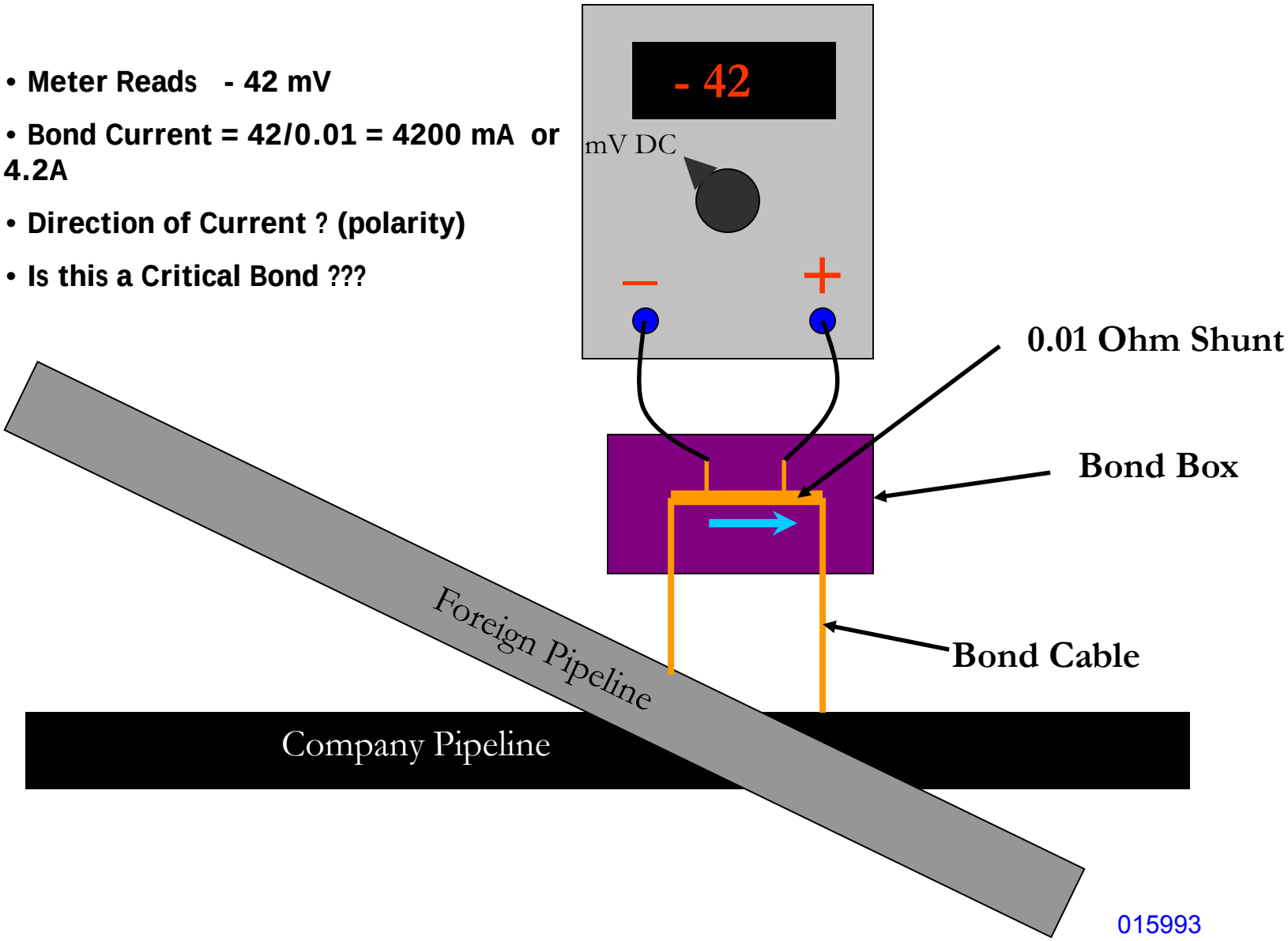
Mitigation of DC Stray Current - Direct Bond

- Meter Reads - 42 mV
- Bond Current = 42/0.01 = 4200 mA or 4.2A
- Direction of Current ? (polarity)
- Is this a Critical Bond ???



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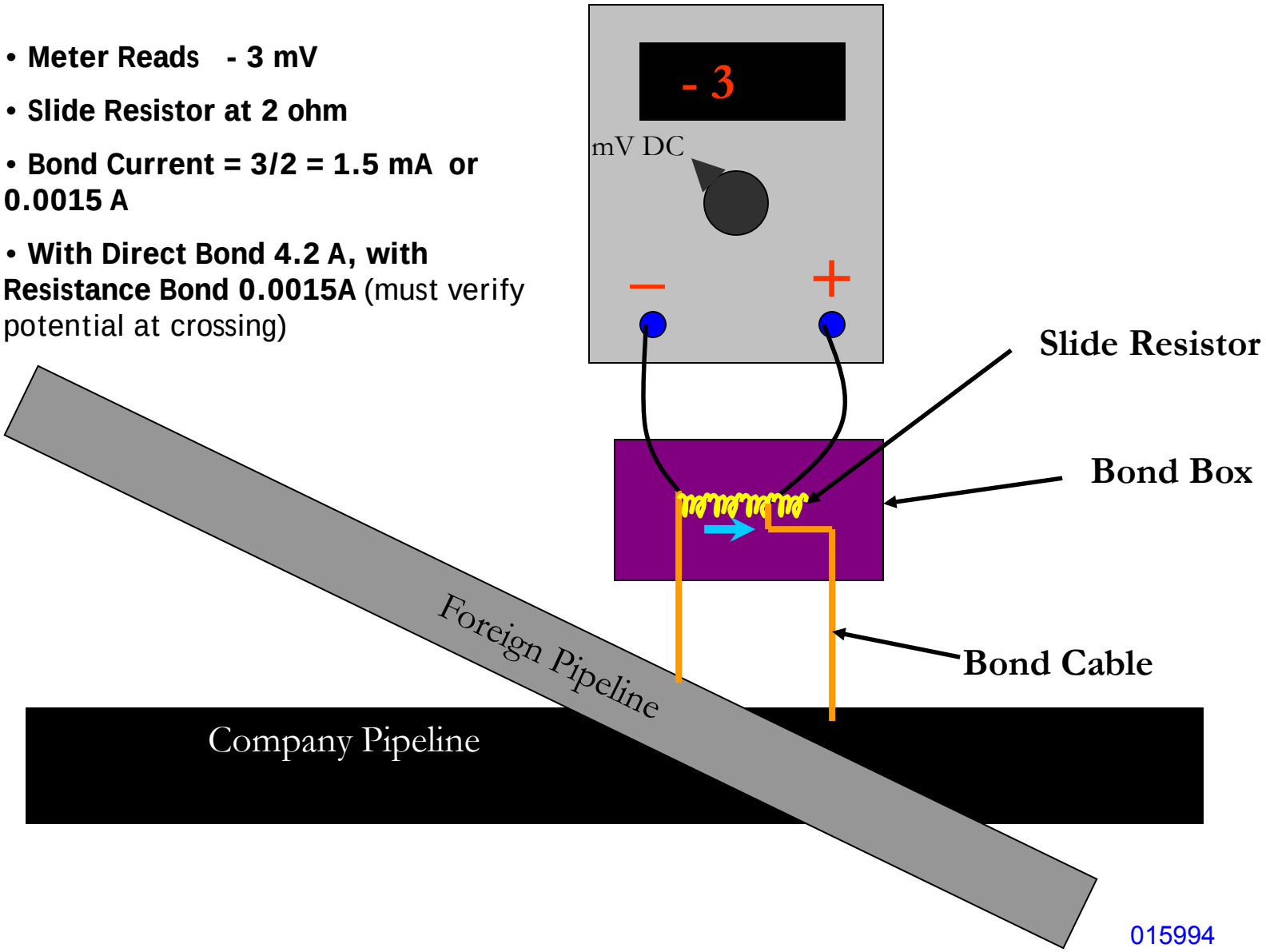
Mitigation of DC Stray Current - Resistance Bond

- **Meter Reads - 3 mV**
- **Slide Resistor at 2 ohm**
- **Bond Current = 3/2 = 1.5 mA or 0.0015 A**
- **With Direct Bond 4.2 A, with Resistance Bond 0.0015A** (must verify potential at crossing)



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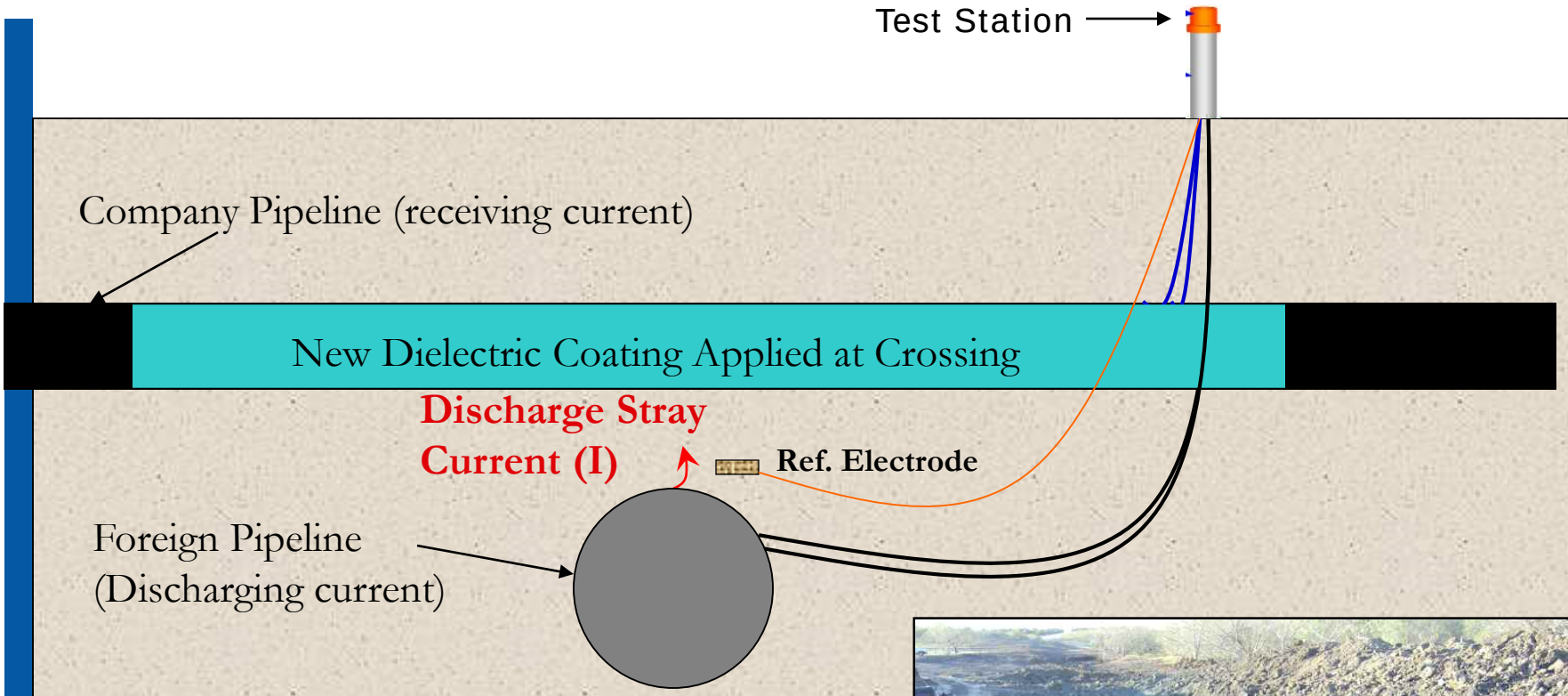
Mitigation of DC Stray Current - Recoating



The application of the coating increases the resistance between the two pipelines, resulting in large reduction (and possibly elimination) of the Discharge Stray Current

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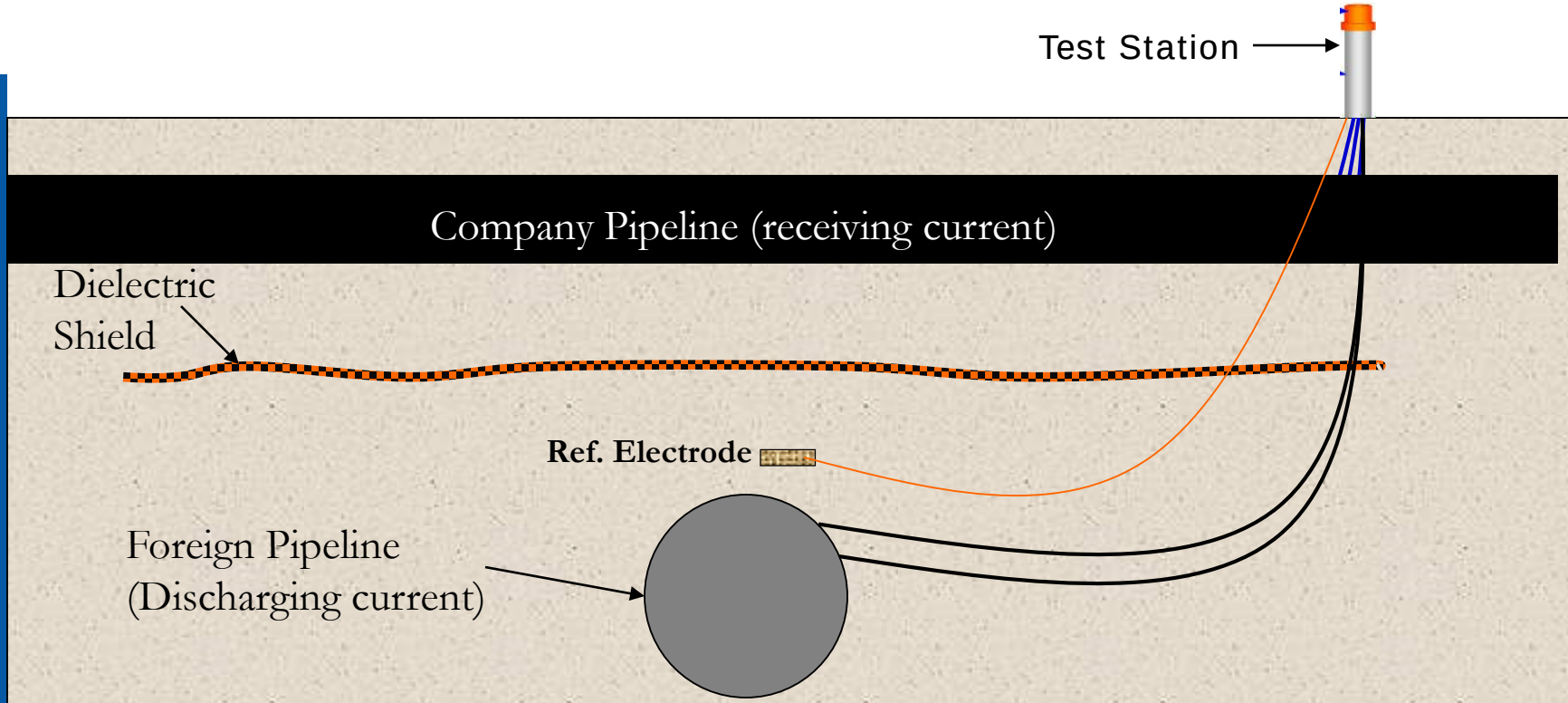
Mitigation of DC Stray Current - Shields



The application a non-conductive shield increases the resistance between the two pipelines, resulting in large reduction (and possibly elimination) of stray current

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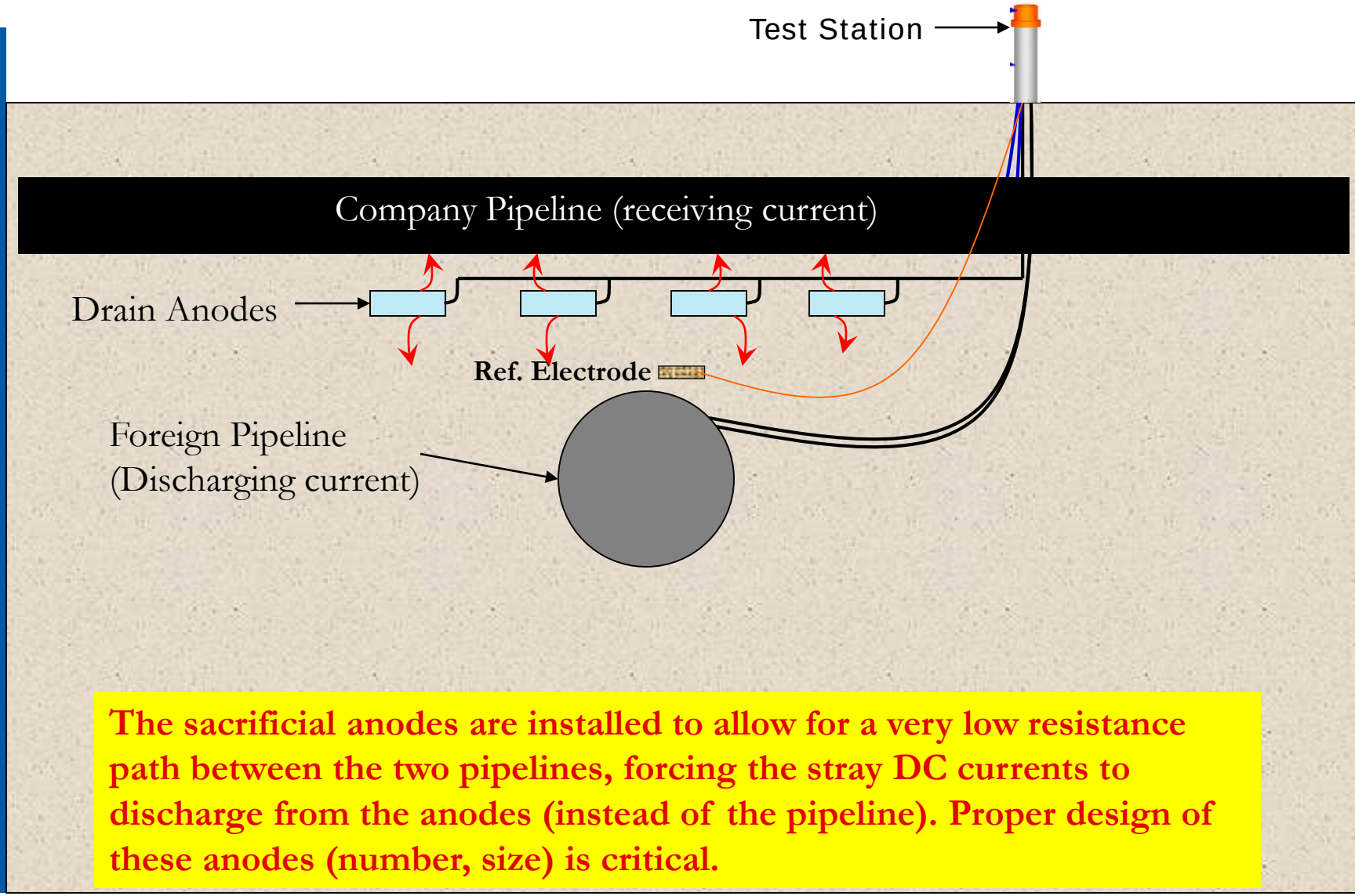
Mitigation of DC Stray Current - Drain Anodes



The sacrificial anodes are installed to allow for a very low resistance path between the two pipelines, forcing the stray DC currents to discharge from the anodes (instead of the pipeline). Proper design of these anodes (number, size) is critical.

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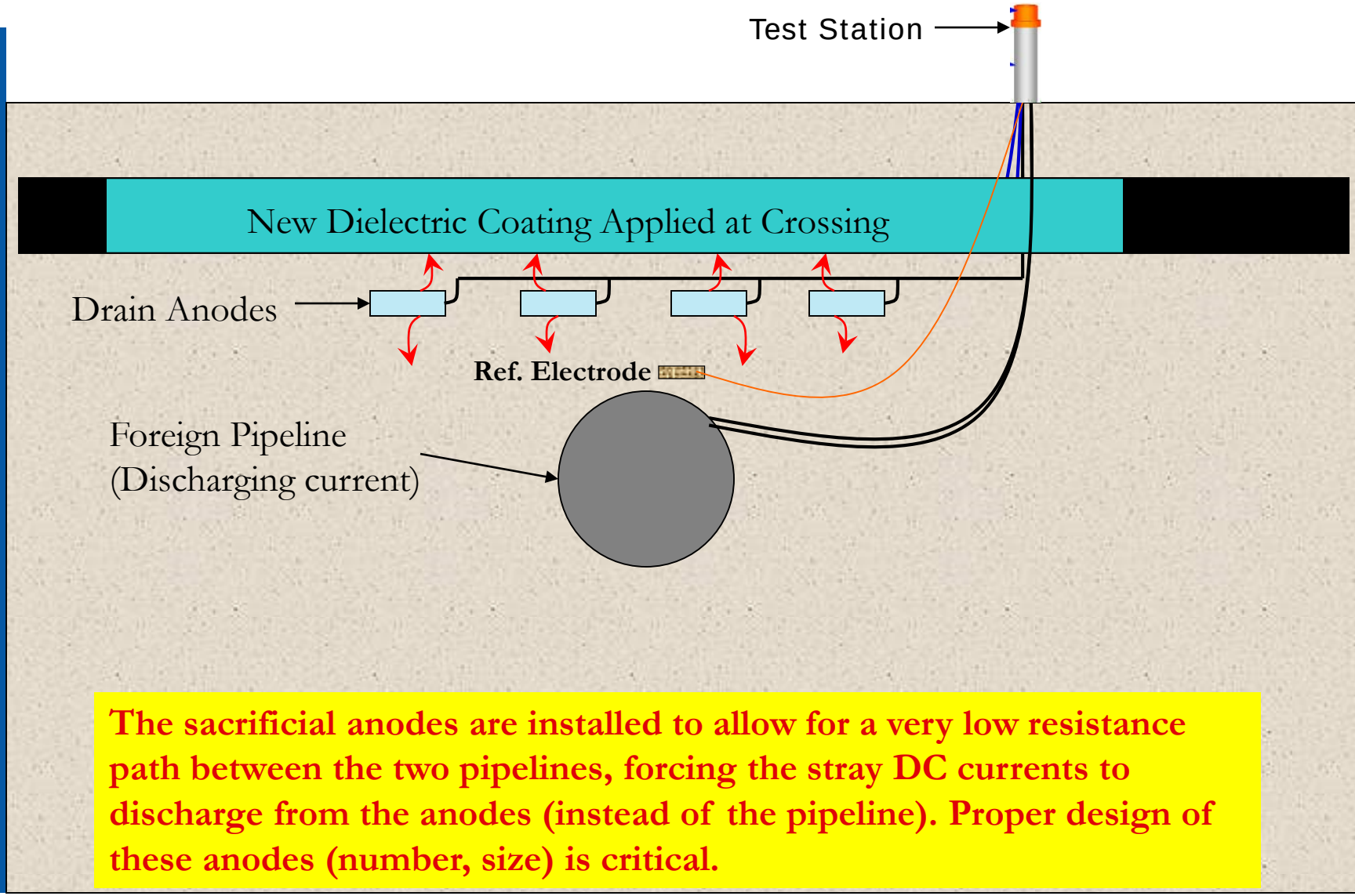
Mitigation of DC Stray Current
Combination of Control Measures



The sacrificial anodes are installed to allow for a very low resistance path between the two pipelines, forcing the stray DC currents to discharge from the anodes (instead of the pipeline). Proper design of these anodes (number, size) is critical.

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AC STRAY CURRENT INTERFERENCE

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AC Interference

High Voltage AC Power Lines Can Cause:

1. AC Corrosion of The Steel
2. Personnel Shock Hazard Due To Induced AC Voltages

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AC Corrosion

AC current can cause corrosion of the steel pipeline.

Courtesy NACE

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AC Corrosion

Based on recent studies of AC corrosion related failures, the following guideline was developed:

- AC induced corrosion does not occur at AC current densities less than 20 A/m^2; (~ 1.86 A/ft^2)
- AC corrosion is unpredictable for AC current densities between 20 to 100 A/m^2; (~ 1.86 A/ft^2 to 9.3 A/ft^2)
- AC corrosion typically occurs at AC current densities greater than 100 A/m^2; (~9.3 A/ft^2)
- Highest corrosion rates occur at coating defects with surface areas between 1 and 3 cm^2 (0.16 in^2 – 0.47 in^2)

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AC Induced Current Calculation

$$i_{ac} = \frac{8V_{ac}}{\rho \pi d}$$

i_{ac} – AC current density (A/m^2)
V_{ac} – AC Volts (V)
ρ – Soil resistivity (Ω–m)
d- holiday diameter (m)

Courtesy NACE

Example:

A holiday area of 1.5 cm^2, with an induced voltage of 5.4 V would produce an AC Current Density of 100 A/m^2 in 1000 ohm-cm soil.

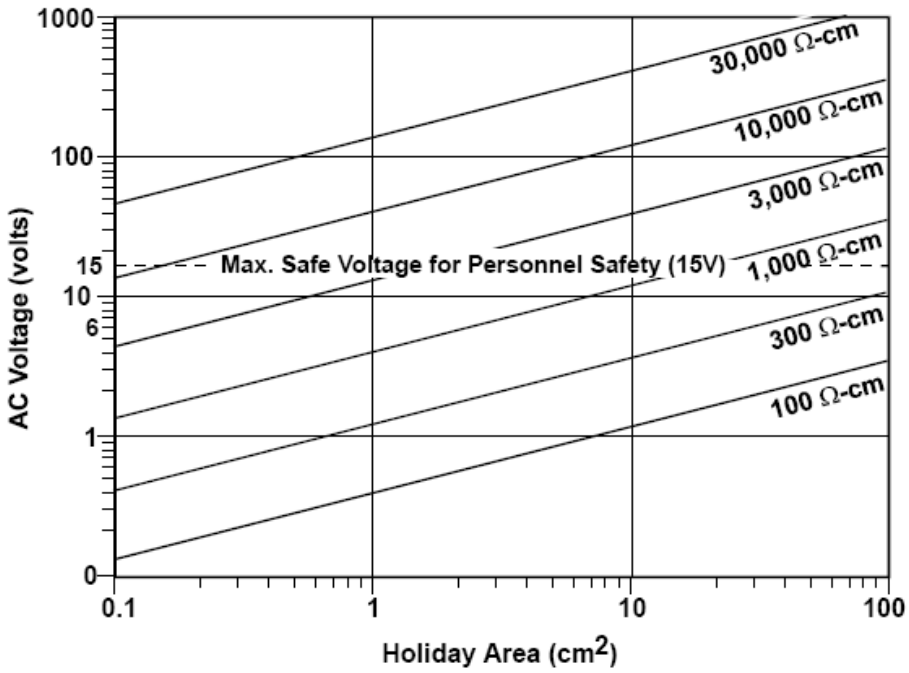

Figure 3-55: AC Voltage Required to Produce 100 A/m^2 Current Density for a Variety of Holiday Sizes and Soil Resistivities

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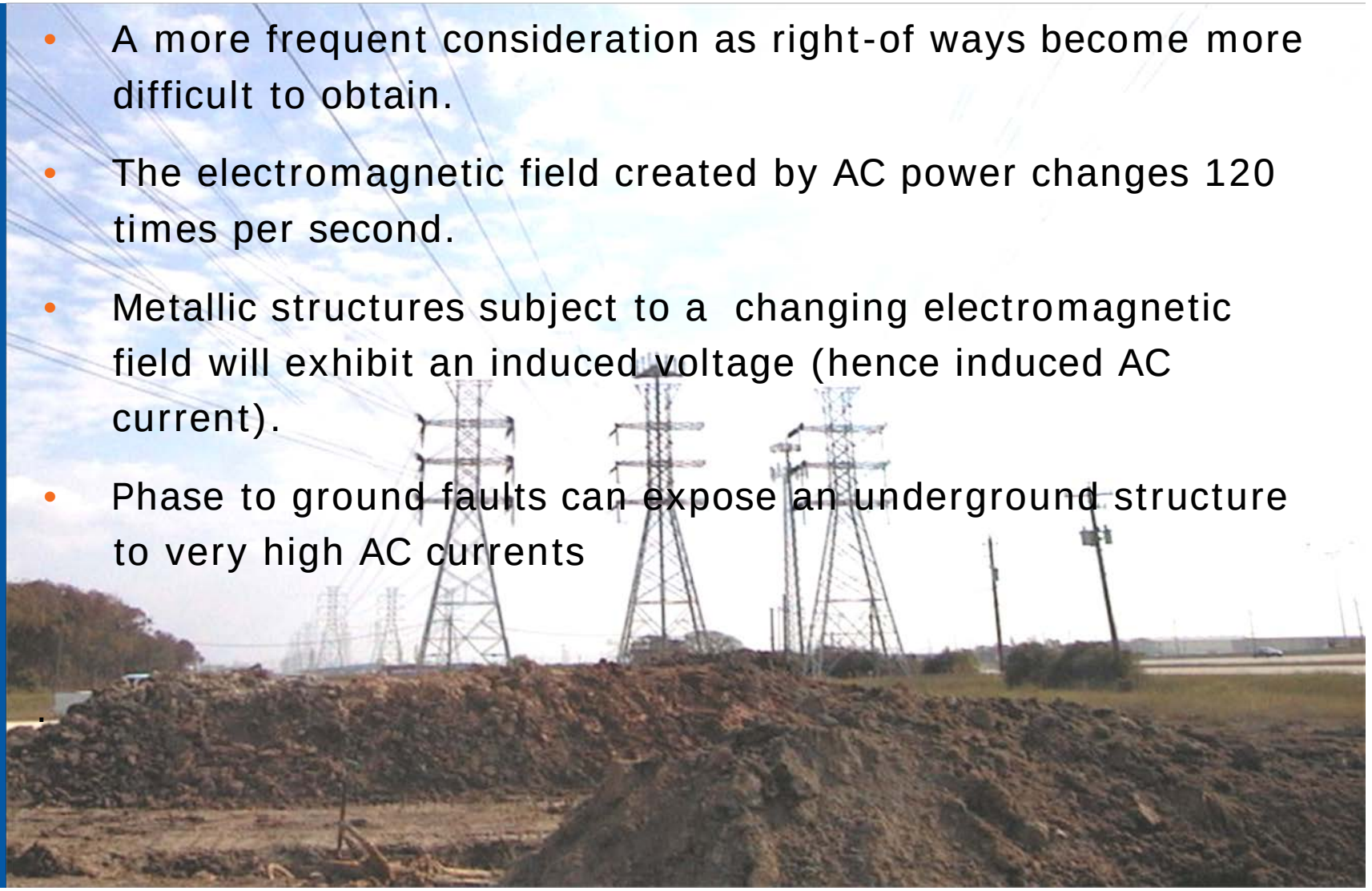
AC Interference

- A more frequent consideration as right-of ways become more difficult to obtain.
- The electromagnetic field created by AC power changes 120 times per second.
- Metallic structures subject to a changing electromagnetic field will exhibit an induced voltage (hence induced AC current).
- Phase to ground faults can expose an underground structure to very high AC currents



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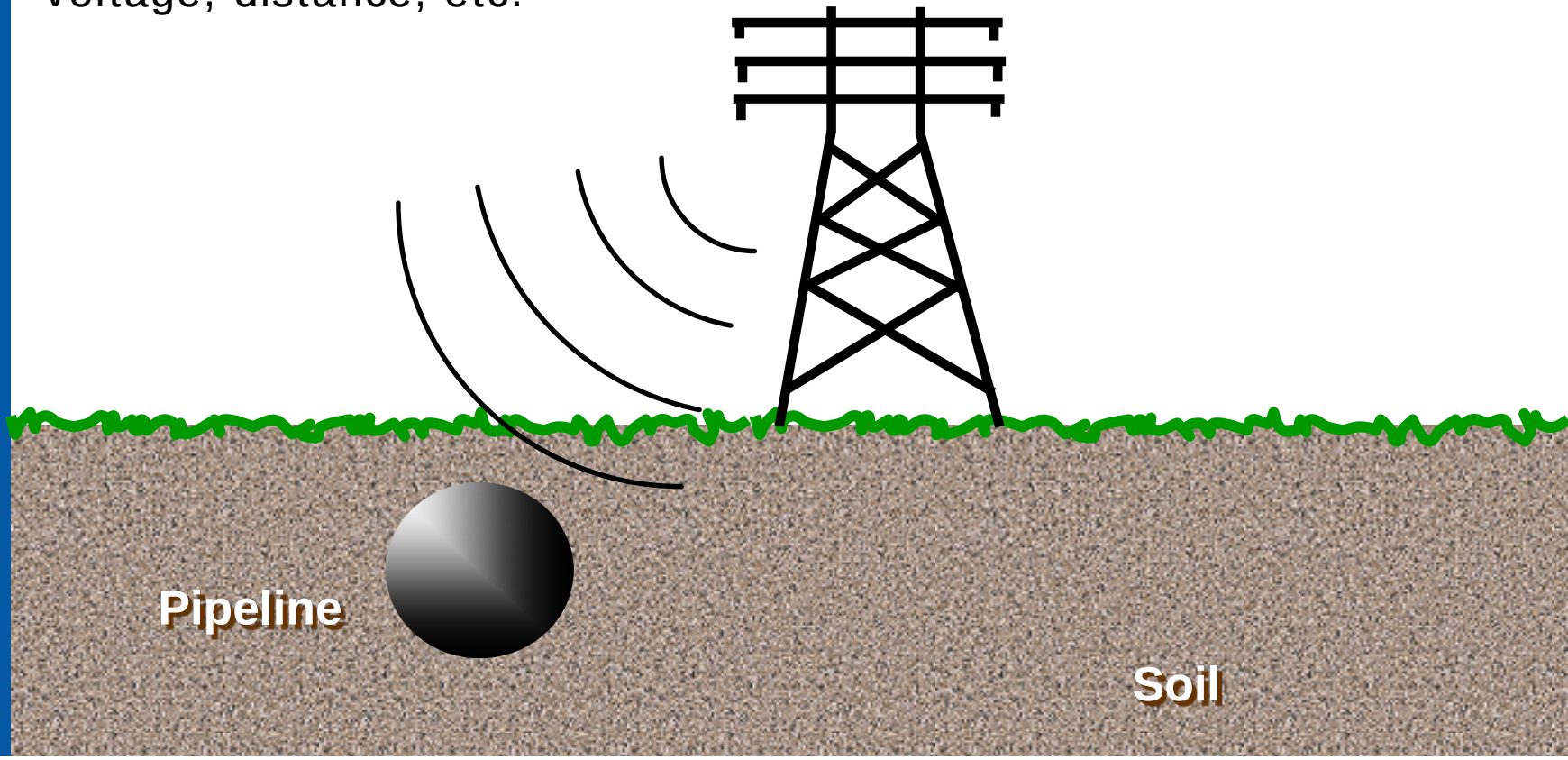
AC Interference

The magnetic field generated by the overhead power lines induces an AC voltage onto the pipeline (which creates AC currents). The magnitude of such currents depend on many factors such as coating condition, soil composition, power line voltage, distance, etc.



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AC Interference

Electrostatic (Capacitive) Coupling

- Aboveground Structures Only

(such as an above ground test station, a car, or pipe stored near ditch)

Electromagnetic (Inductive) Coupling

- Structure Acts As Secondary Coil
- Structure Above Or Below Ground

(most important component, causes AC corrosion of steel as well as personnel hazard potential)

Conductive (Resistive) Coupling

- Buried Structures Only (during line faults)

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AC Interference – Computer Modeling

Conditions Modeled:

- Steady State Induced AC Levels
- Pipe Potentials Under Phase-to-Ground Fault
- Potentials to Remote Earth
- Step Potentials
- Touch Potentials

- 15 volt Limitation for Protection of Personnel
- 1000 volts - 3000 volts Causes Coating Damage
- >5000 volts Can Cause Pipe Structural Damage

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AC Interference – Mitigation Measures

- Separate Structure and AC Line
- Use Dead Front Test Stations (to eliminate shock hazard)
- Install Polarization Cells to Ground (grounding)
- Install Semiconductor Devices to Ground (grounding)
- Use Bare Steel Casings or anode beds as Grounds with DC Decoupling devices (capacitors, polarization cells)
- Install Equipotential Ground Mats at valves, test stations (for shock hazard)
- Use Sacrificial Anode and paralleling zinc ribbon or Copper wire as Ground Electrodes (normally with decoupling devices)

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Codes and Standards

- EPRI/AGA “Mutual Design Considerations for Overhead AC transmission Lines and Gas Pipelines”
- NACE RP 0177 “Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems”
- Canadian Electrical Code C22.3 No. 6-M1987 “Principles and Practices of Electrical Coordination between Pipelines and Electric Supply Lines”

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Dead Front Test Station (Personnel Protection)

Insulated
Test Posts

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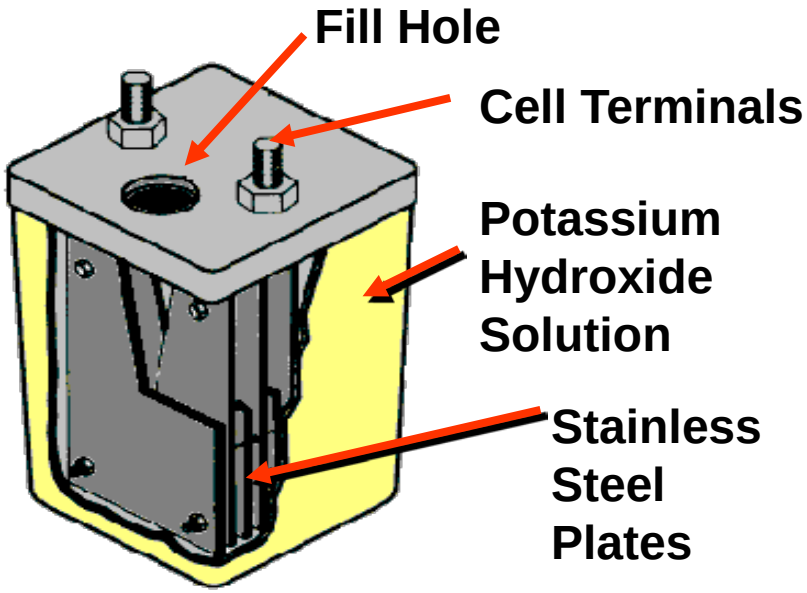
Polarization (Kirk) Cell - Grounding



Model	Rated Capacity for 0.5 seconds (amps)	Steady State Rating (amps)
K-5A	5,000	30
K-25	25,000	175
K-50	50,000	350

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Semiconductor Decoupling Devices - Grounding

PCR – Polarizartion Cell Replacement

Courtesy of Dairyland

SSD – Solid State Decoupler

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Examples of De-Coupling Devices - Rating

Polarization Cell Replacement (PCR)

- 60 Hz Fault Current @ 1 cycle: 6,500; 20,000; 35,000 A
  @ 3 cycles: 5,000; 15,000; 27,000 A
- Lightning Surge Current @ 8 X 20 µseconds: 100,000 A
- Steady State Current Rating: 45 or 80 amps AC

Solid State Decoupler (SSD)

- 60 Hz Fault Current @ 1 cycle: 2,100; 5,300; 6,500; 8,800 A
  @ 3 cycles: 1,600; 4,500; 5,000; 6,800 A
- Lightning Surge Current @ 4 X 10 µseconds: 100,000A ; 75,000 A
- Steady State Current Rating: 45 amps AC

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Zinc Ribbon Installation for AC Mitigation - Grounding

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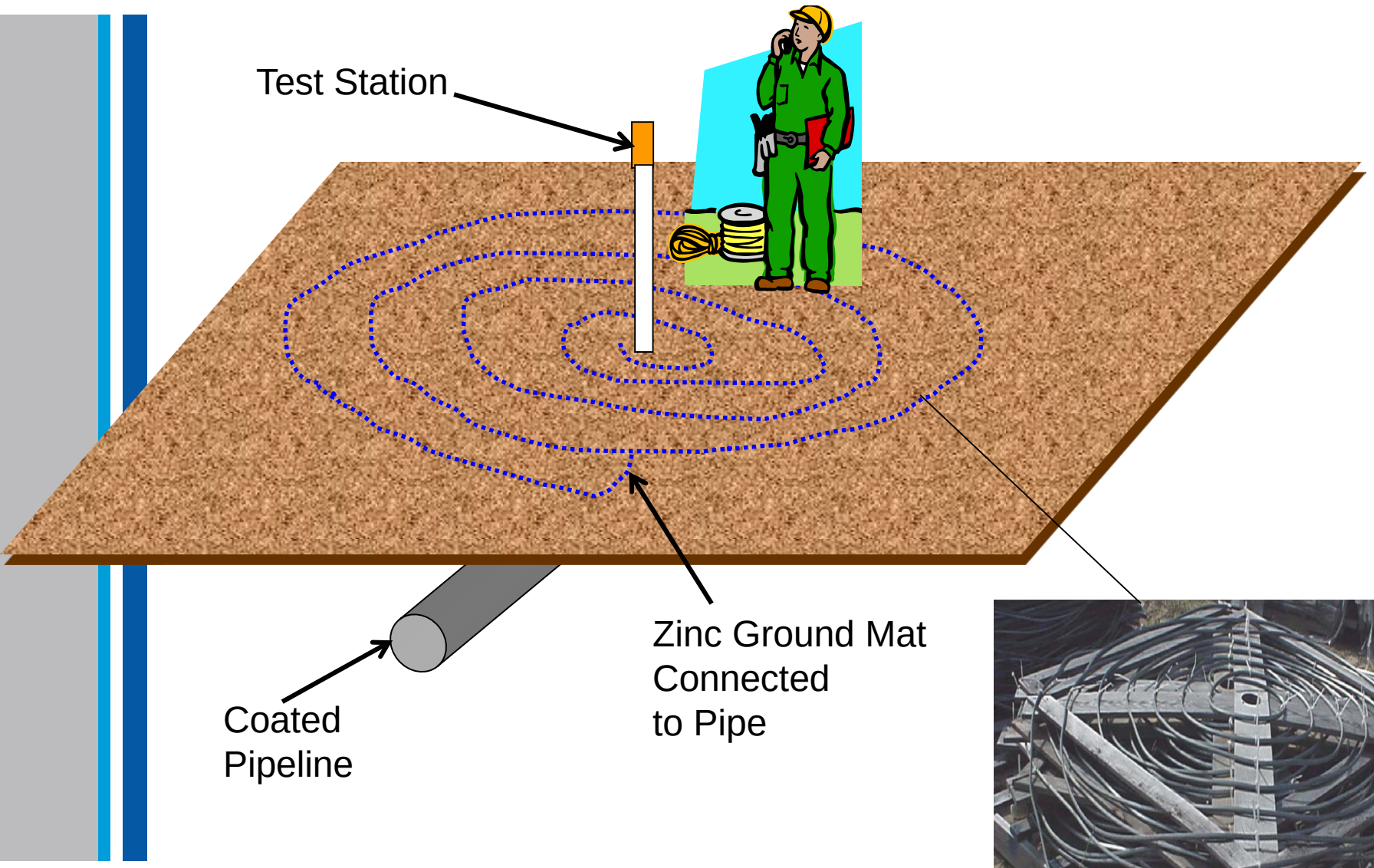
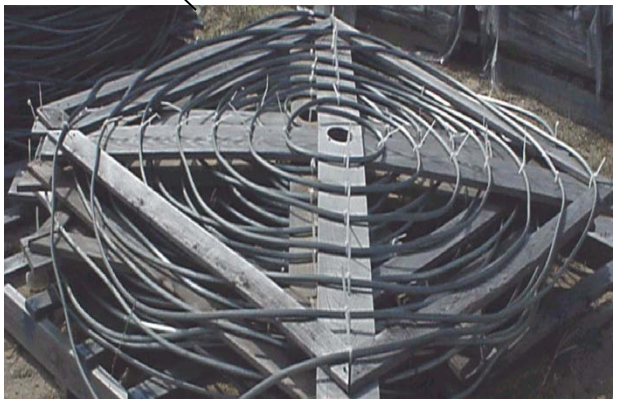
Equipotential Ground Mat - Used to Protect Personnel from Electric Shock (at test stations, valves, etc.)





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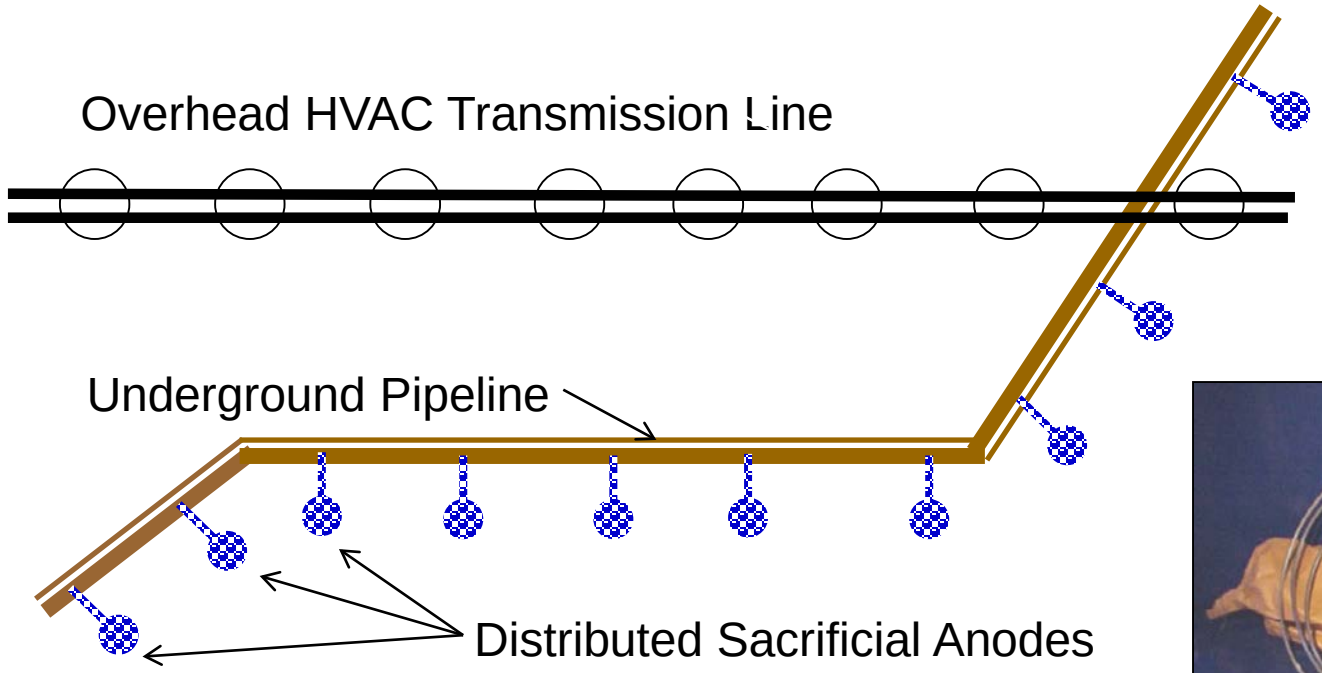
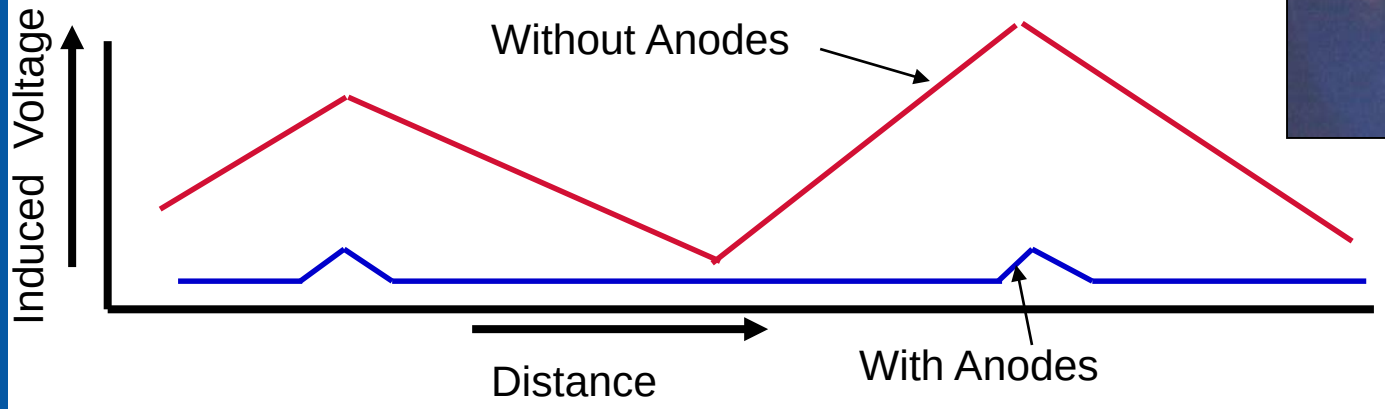
Mitigation of AC Interference Using Distributed Galvanic Anodes





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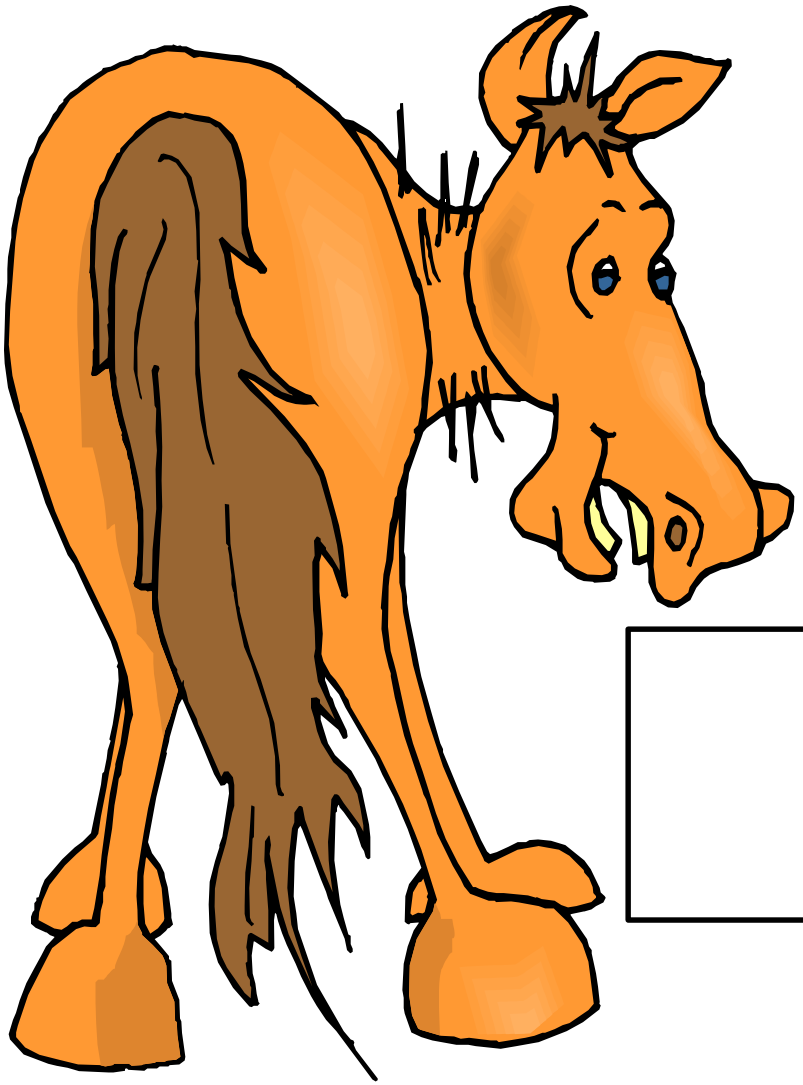
THE END



Thank You!

Questions?

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TRANSCANADA

FOOT HILLS

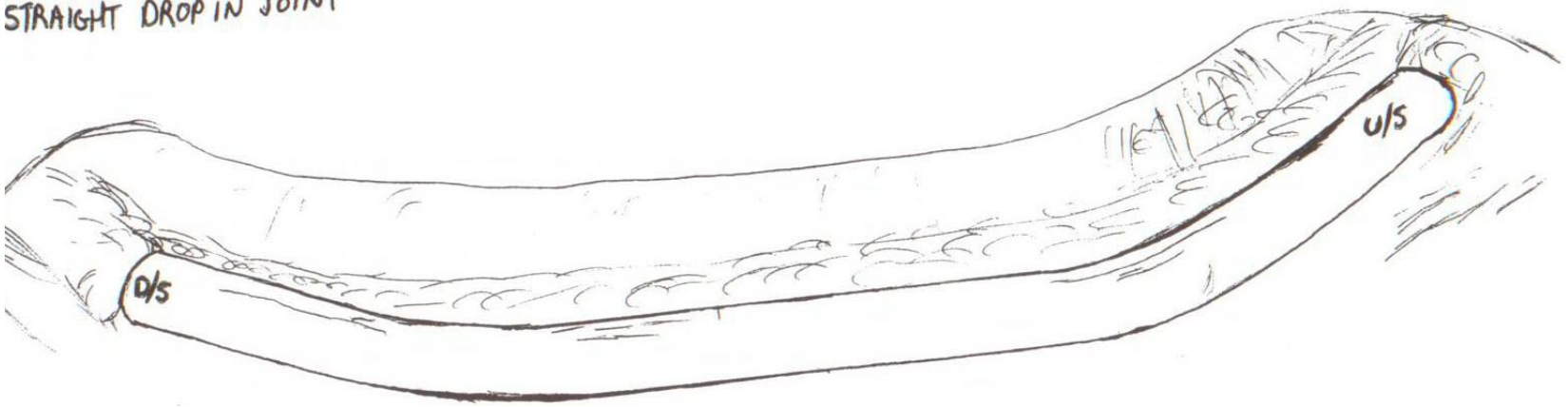
36" PIPE DIG PROGRAM, 2007

SITE # 02A

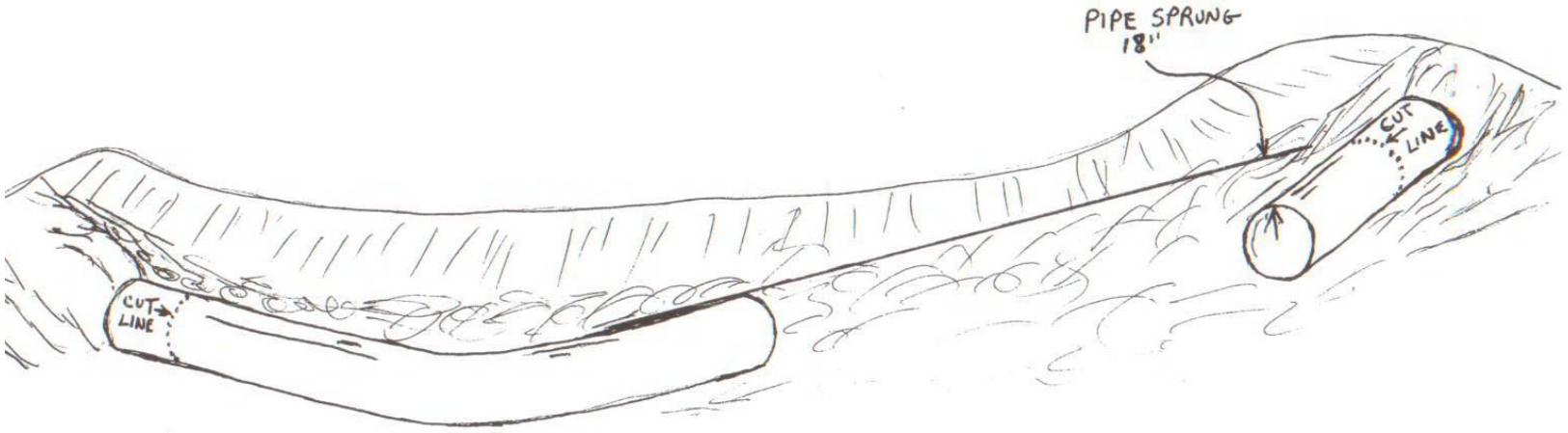
FERNIE B.C.

9 – PAGES

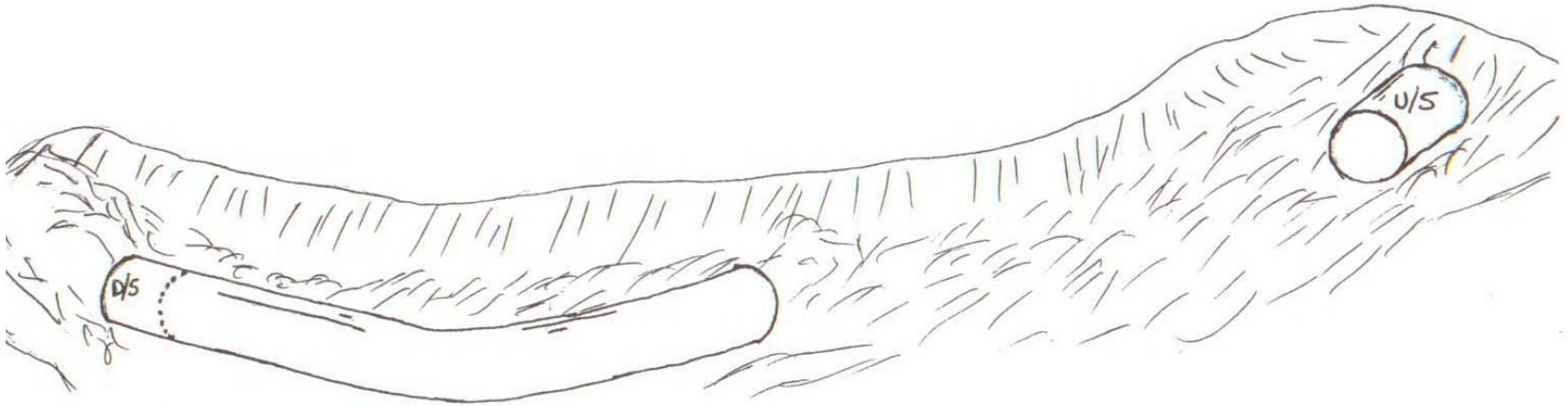
SITE # 02A TRANSCANADA, FOOTHILLS 36"
PIPE DIG PROGRAM, SUMMER OF 2007. THIS
IS HOW THE PIPE LOOKED AFTER EXPOSURE.
DUE TO CORROSION CRACKING THIS 3 JOINT
SECTION WAS TO BE REPLACED. WHAT
FOLLOWS IS THE SEQUENCE OF HOW IT WAS
DONE. THERE WAS ON THE **UPSTREAM SIDE(U/S)**
A ROLLED SIDE BEND, AND ON THE **DOWN STREAM(D/S)**
SIDE A SAG. IN BETWEEN THE 2 THERE IS A
STRAIGHT DROP IN JOINT



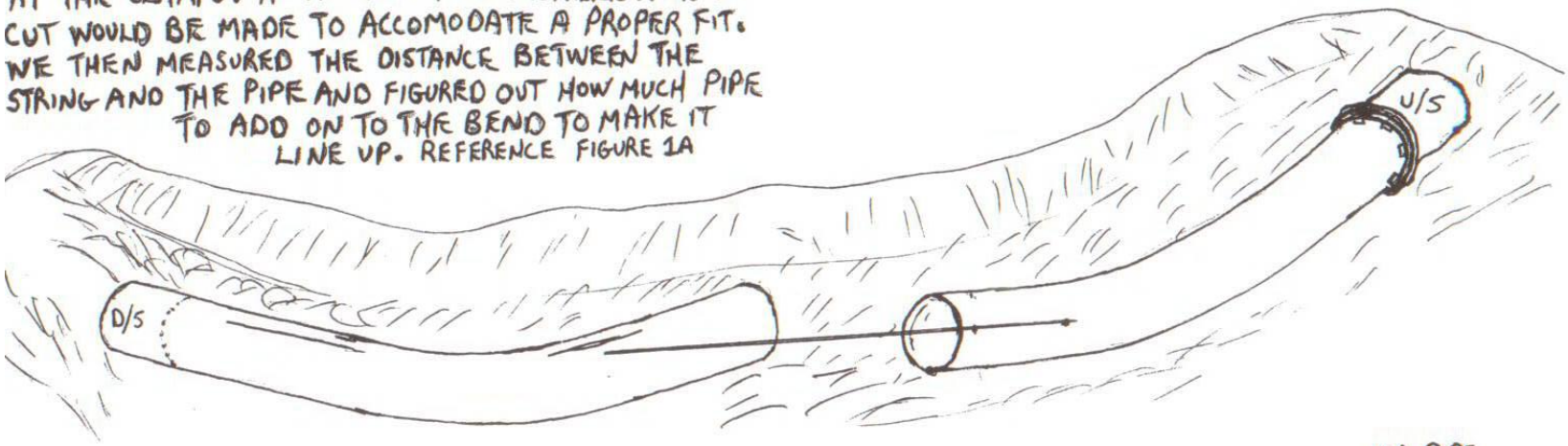
THIS IS HOWTHE SITE LOOKED WHEN REPLACEMENT CREW ARRIVED. SIDE BEND HAD ALREADY BEEN REMOVED, AND THE SAG UPON STRING LINING HAD SPRUNG UP APROX. 18". SURVEY HAD MARKED CUT LINES ON THE PIPE. REPLACEMENT PIPE WAS ALREADY BENT AND ON SITE.

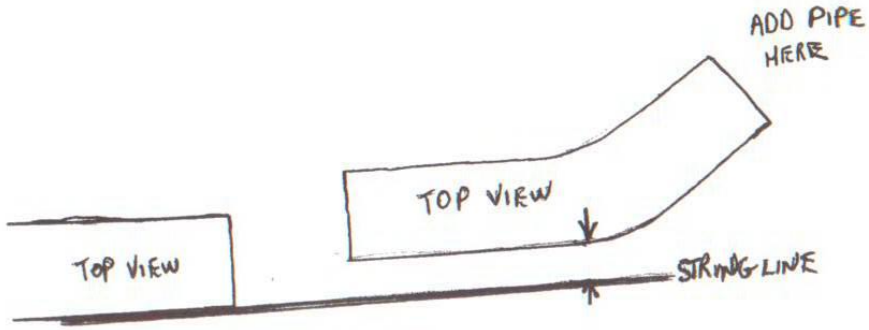


BECAUSE THE SIDE BEND WAS REMOVED WE HAD NO IDEA OF ITS DIMENSIONS. THE SAG BEING STILL THERE AFFORDED US A PLACE TO SHOOT OUR NEW BEND TO. WE THEN CUT THE U/S SIDE AT THE CUT MARKS AND PUT THE PIPE CLAMPS ON U/S SIDE

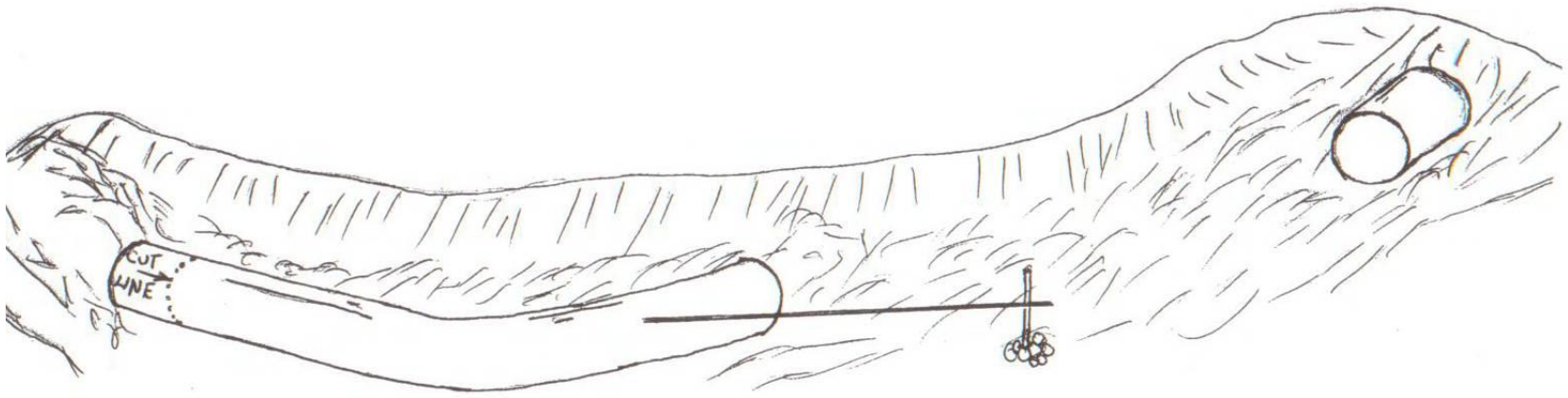


AFTER CUTTING U/S SIDE WE PLACED THE NEW BEND IN THE CLAMPS AND ROLLED IT AS YOU SEE BELOW. THE FIT AT THE CLAMPS WAS SQUARE AND THE ROLL OF THE BEND WAS SQUARE TO THE DOWN STREAM PIPE ACCORDING TO THE STRING LINE. IF THE BEND WAS NOT SQUARE TO THE D/S PIPE, THE BEND WOULD HAVE BEEN MOVED BACK AND FORTH TO MAKE IT SO. THIS WOULD HAVE CHANGEDTHE FIT AT THE CLAMPS. IF IT WASN'T WELDABLE A NEW CUT WOULD BE MADE TO ACCOMODATE A PROPER FIT. WE THEN MEASURED THE DISTANCE BETWEEN THE STRING AND THE PIPE AND FIGURED OUT HOW MUCH PIPE TO ADD ON TO THE BEND TO MAKE IT LINE UP. REFERENCE FIGURE 1A



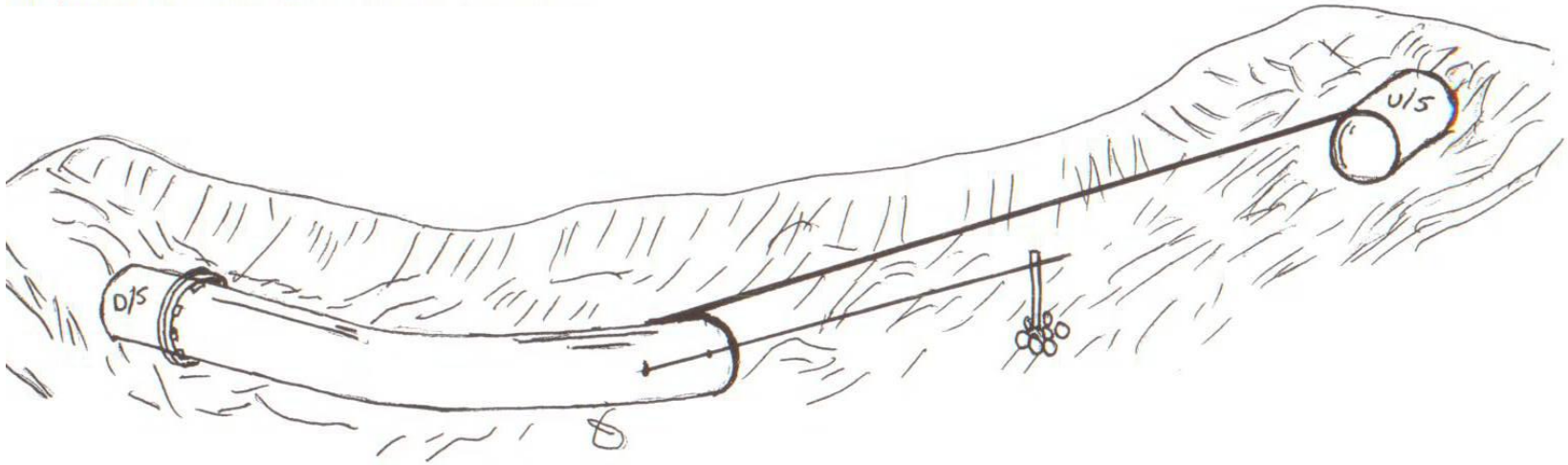


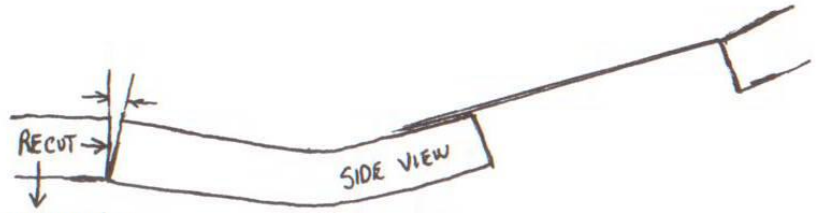
AFTER TAKING OUT BEND AND ADDING EXTRA PIPE TO IT, WE FOCUSED ON REMOVING THE DOWN STREAM SAG. BEFORE DOING THIS A WITNESS POST WAS SET UP AS BELOW. THIS WAS DONE TO MAKE SURE THE NEW SAG WOULD BE IN THE SAME PLACE SIDE TO SIDE AS THE OLD. PIPE WAS THEN CUT AND REMOVED



SITE AFTER ALL PIPING WAS REMOVED
NOTE WITNESS POST IS NOT TO BE TOUCHED
UNTIL D/S PIPE IS WELDED IN PLACE

UPON PUTTING IN NEW SAG IN CLAMPS WE FIRST RUN A STRING FROM THE TOP OF SAG TO THE TOP OF THE U/S CUT. WE HAD TO LOWER THE D/S SAG TO SQUARE IT TO THE U/S CUT. WE THEN MOVED THE SAG SIDE TO SIDE TO SQUARE TO THE WITNESS POST. RECUTTING THE DOWN STREAM SIDE WAS REQUIRED FOR A PROPER FIT. ONCE DONE JOINT WAS WELDED ON AFTER RESTRINGING AS PRIORLY STATED

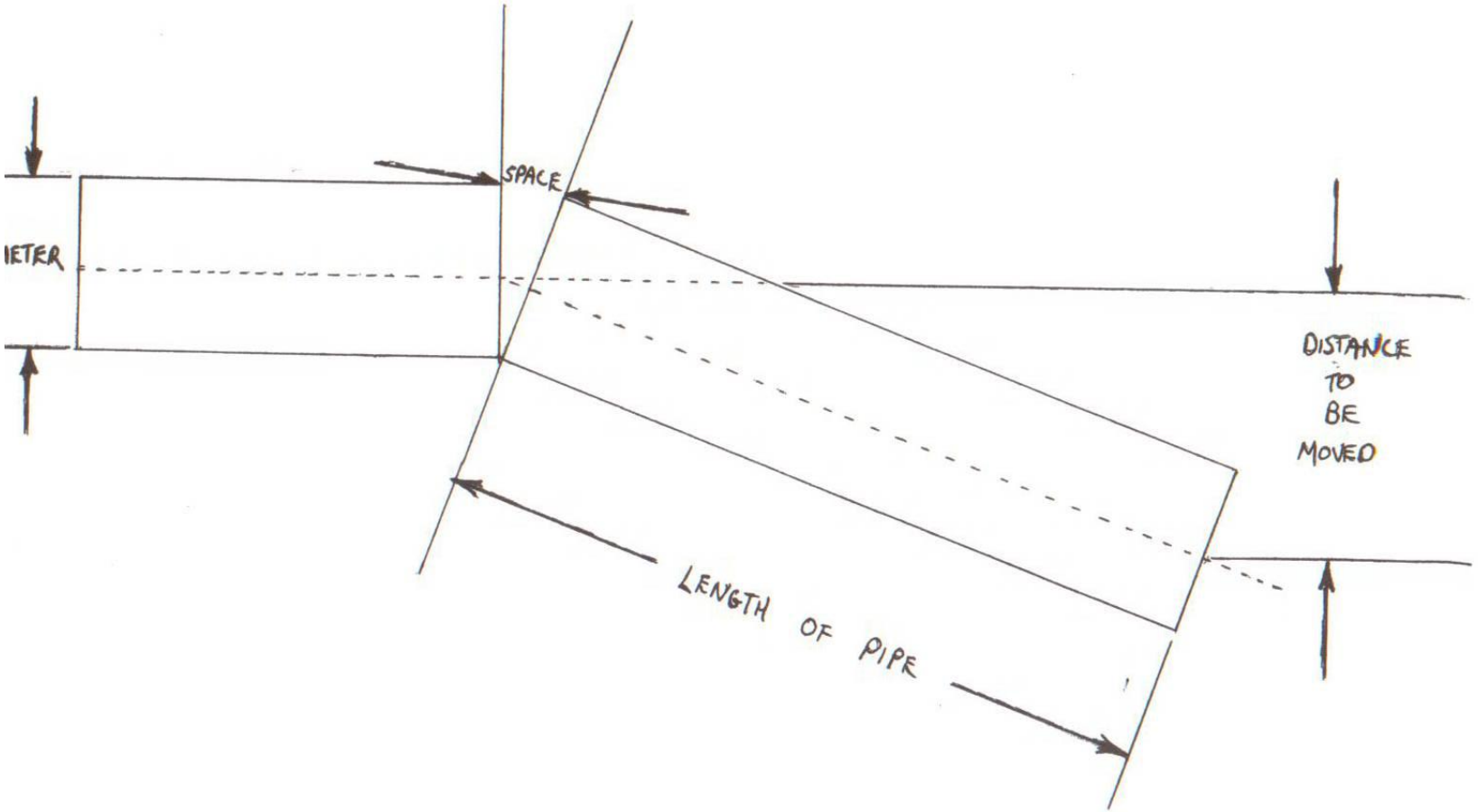




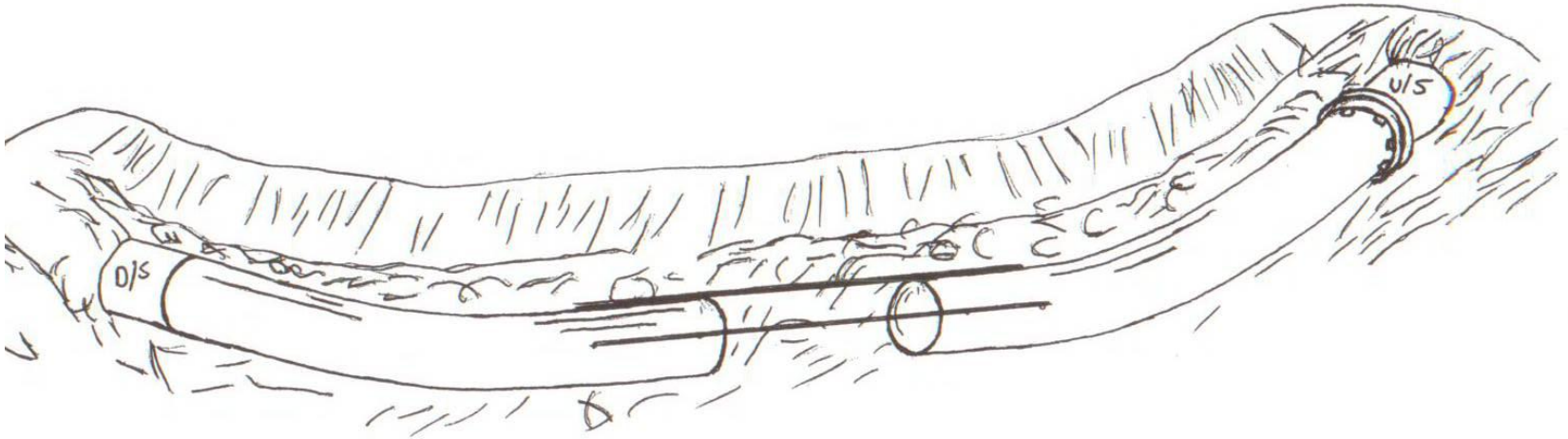
REFERENCE FIGURE 4

IRE

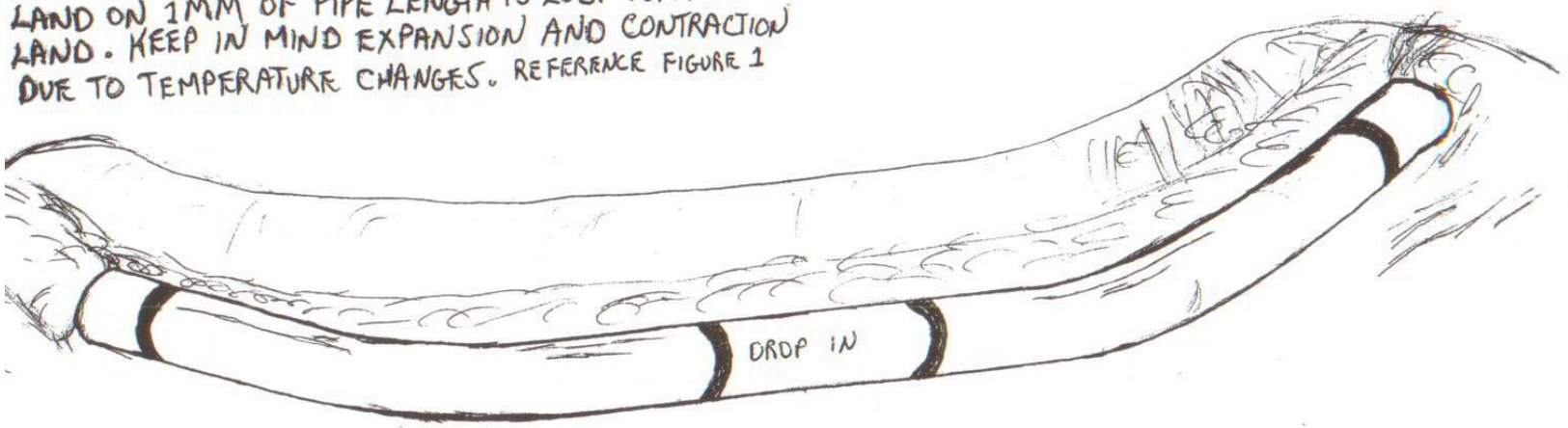
(LENGTH OF PIPE ÷ DIAMETER) X SPACE = DISTANCE TO BE MOVED



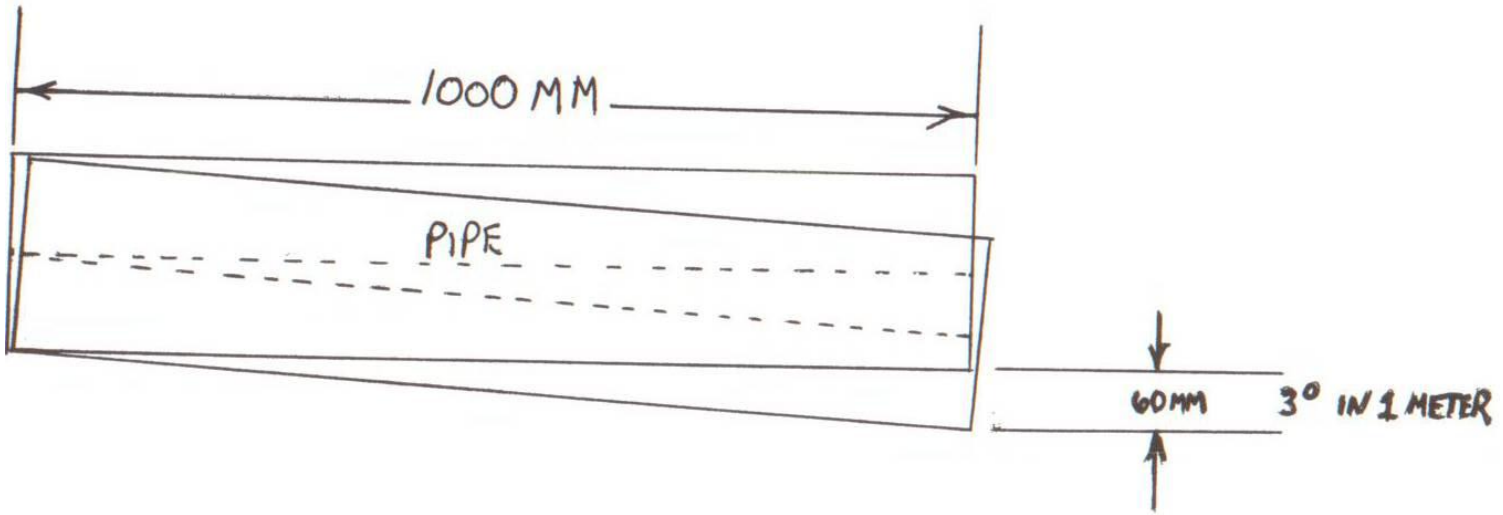
D/S JOINT WAS SKIDED WITH A SLIDER AFTER IT WAS WELDED. LENGTHENED SIDE BEND WAS THEN PUT IN AND LINED UP TO D/S SAG AS PICTURED BELOW, AND WELDED IN PLACE. A STRAIGHT DROP IN WAS THE NEXT ORDER OF BUSINESS



THE STRAIGHT DROP IN WAS PUT IN
AFTER CHECKING MEASUREMENT OF
TOP + BOTTOM AND SIDE TO SIDE. SQUARENESS
OF BOTH D/S + U/S, CUTS WAS ALSO CHECKED.
IF ONE OR BOTH ARE BADLY OUT OF SQUARE
RECUTS ARE TO BE DONE. ALWAYS CUT THE DROP
IN TO FIT THE D/S + U/S CUTS, REMEMBER WHEN
DRESSING UP ENDS WHEN YOU PUT YOUR 2MM
LAND ON 1MM OF PIPE LENGTH IS LOST FOR EACH
LAND. KEEP IN MIND EXPANSION AND CONTRACTION
DUE TO TEMPERATURE CHANGES. REFERENCE FIGURE 1



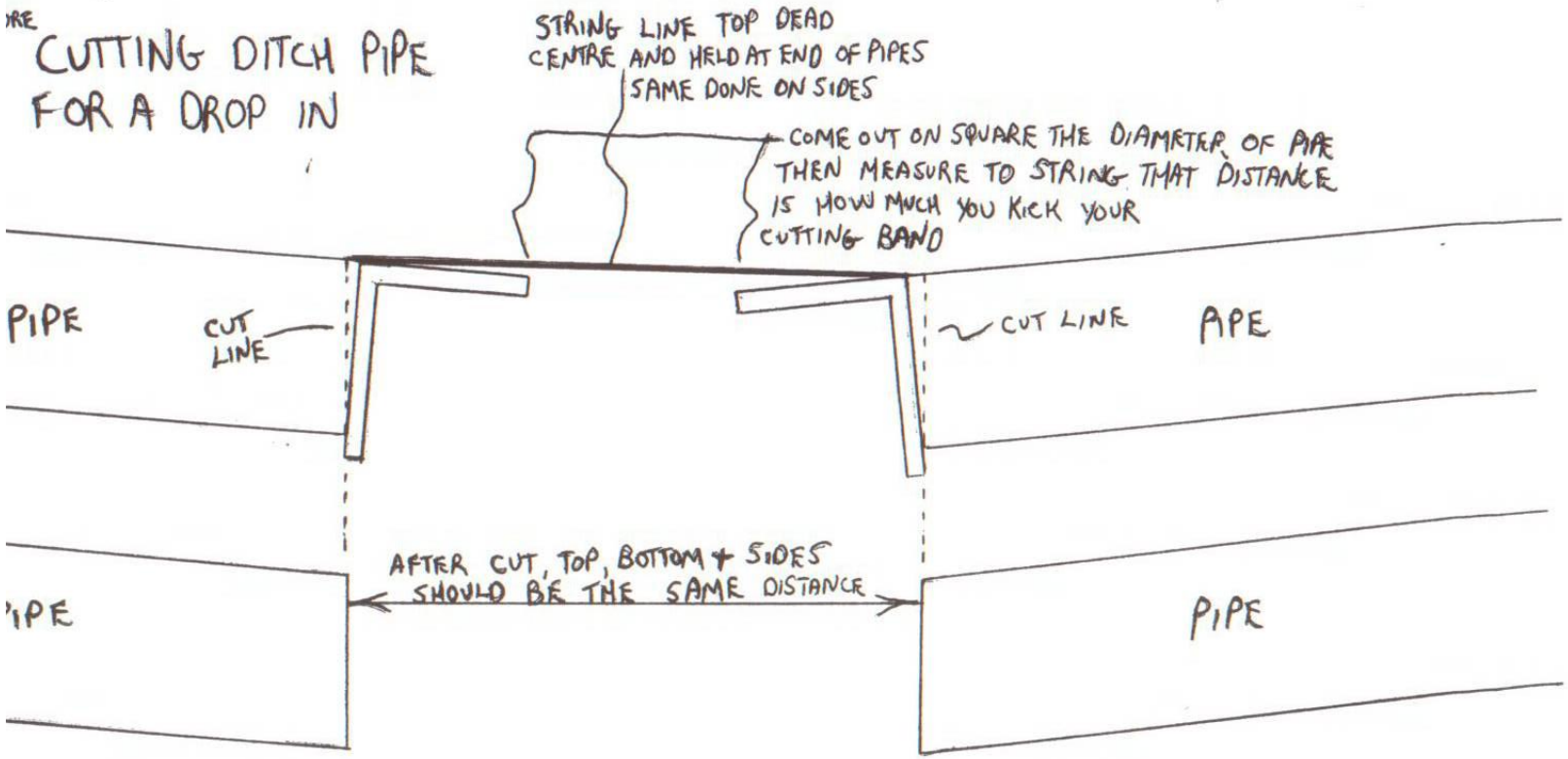
3° DEFLECTION MAXIMUM ALOUD



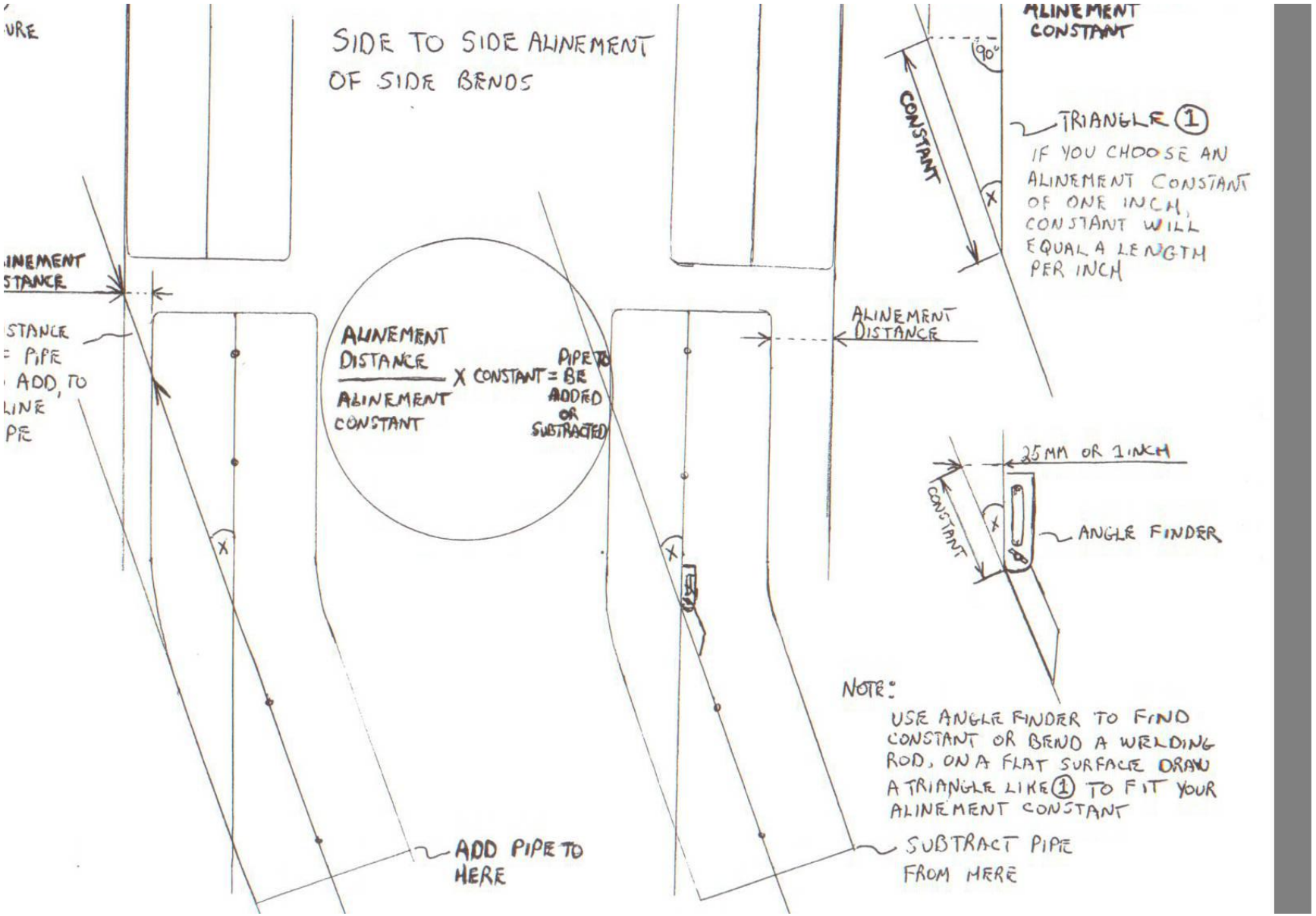
3° MITRE - PIPE WILL BE OUT OF SQUARE
60 MM FOR EACH 1000MM (1 METER)

016030

CUTTING DITCH PIPE FOR A DROP IN

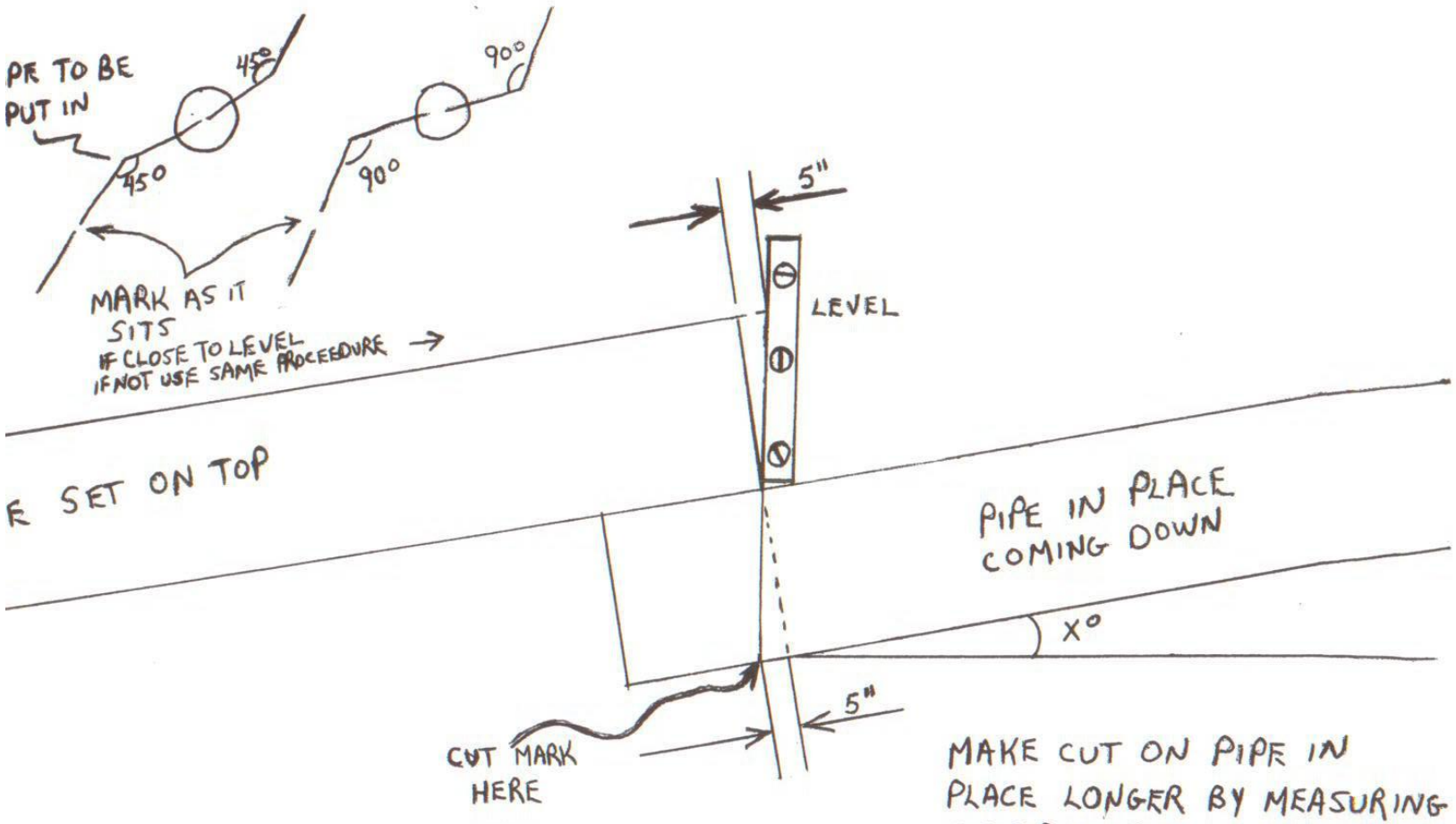


BAND CAN BE KICKED 12MM MAX. IF MORE IS TO BE CUT THEN CUT OFF PIECE TO BE WELDED IN.


SIDE TO SIDE ALINEMENT OF SIDE BENDS
ALINEMENT CONSTANT
90°
CONSTANT
X
TRIANGLE (1)
IF YOU CHOOSE AN ALINEMENT CONSTANT OF ONE INCH, CONSTANT WILL EQUAL A LENGTH PER INCH
ALINEMENT DISTANCE
ALINEMENT DISTANCE / ALINEMENT CONSTANT X CONSTANT = PIPE TO BE ADDED OR SUBTRACTED
25MM OR 1 INCH
CONSTANT
X
ANGLE FINDER
NOTE:
USE ANGLE FINDER TO FIND CONSTANT OR BEND A WELDING ROD, ON A FLAT SURFACE DRAW A TRIANGLE LIKE (1) TO FIT YOUR ALINEMENT CONSTANT
ADD PIPE TO HERE
SUBTRACT PIPE FROM HERE

MEASURING ROLLING 75

OFF SET OR STRAIGHT 90°

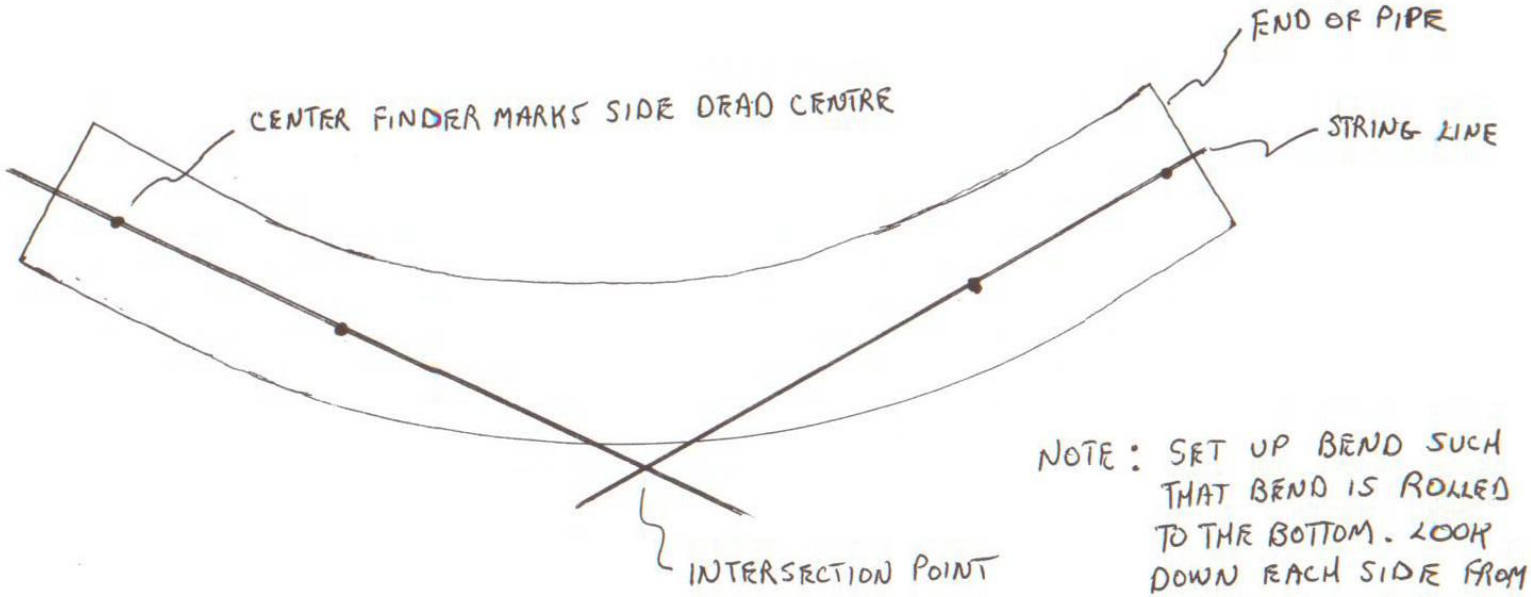


MAKE CUT ON PIPE IN PLACE LONGER BY MEASURING TOP PIPE FROM END TO LEVEL. MAKE CUT SHORTER IF PIPE IN PLACE IS LOOKING UP. (THIS IS NOT A MITRE CUT)

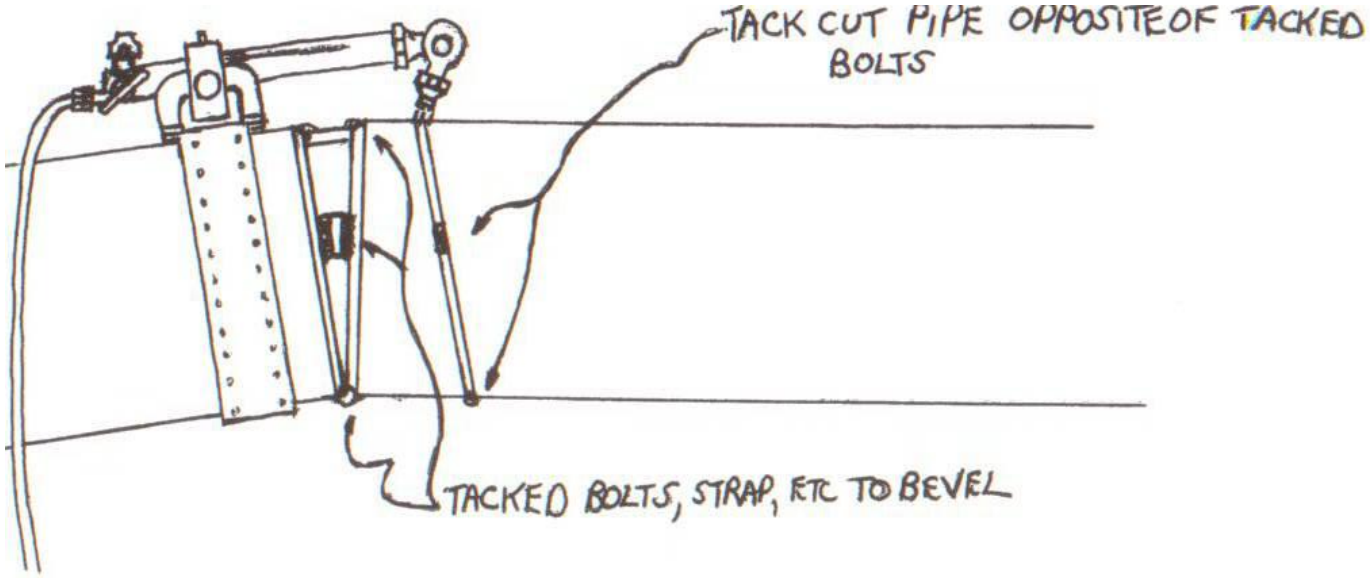
016033

URE

FIND CENTER OF BENDS MEASUREMENT

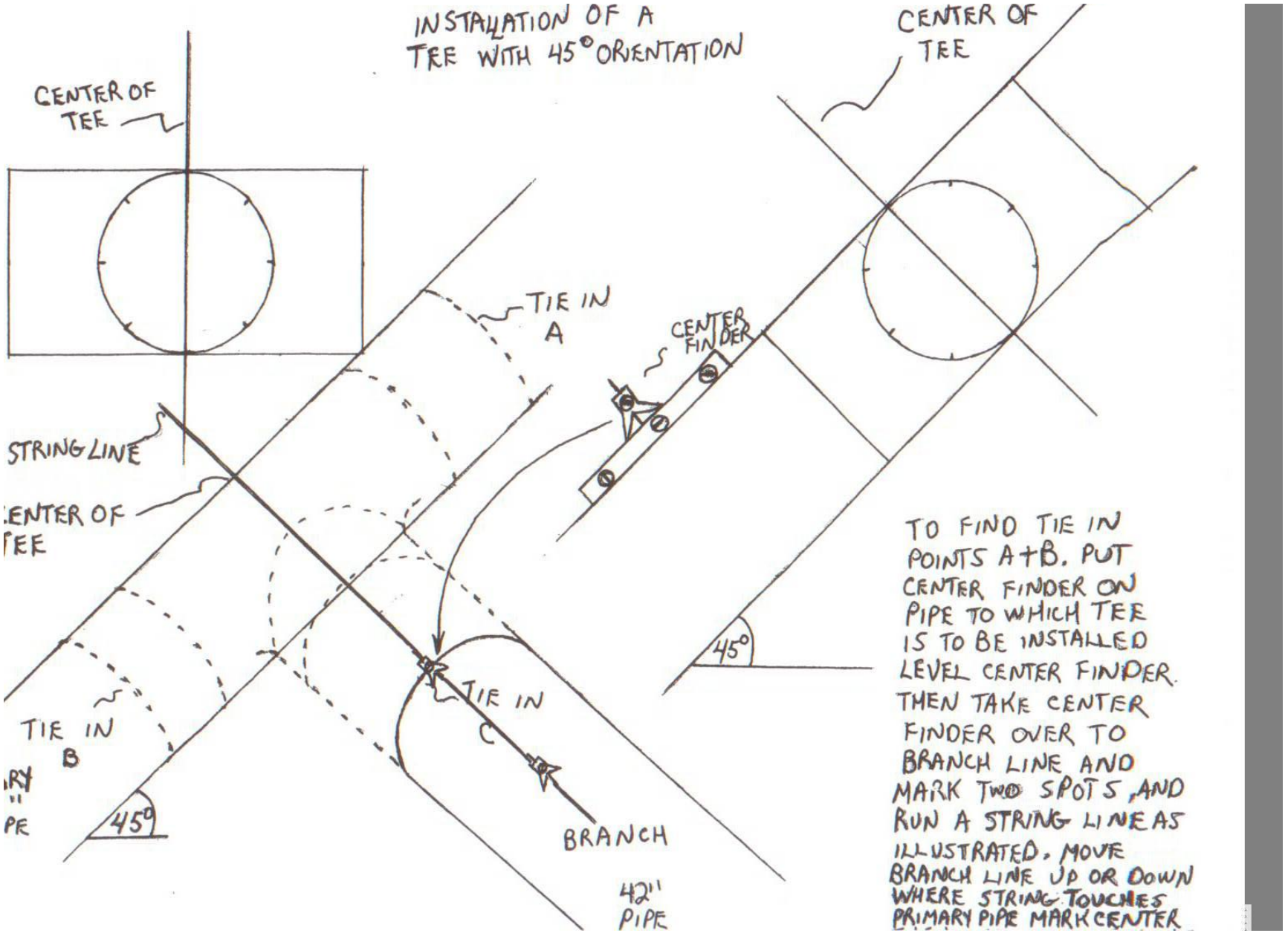


NOTE: SET UP BEND SUCH THAT BEND IS ROLLED TO THE BOTTOM. LOOK DOWN EACH SIDE FROM ONE END OF PIPE. PIPE WILL LOOK STRAIGHT ON BOTH SIDES IF BEND IS ROLLED COMPLETELY TO THE BOTTOM. PUNCH PIPE WITH CENTER FINDER, AND RUN STRING LINES. MEASURE END OF PIPE TO INTERSECTION POINT



BACK BEVELING WHEN KICKING
BEVELING BAND IS NOT ENOUGH.
BEFORE CUTTING PUT PIPE IN CLAMPS
AND ALINE TO WHERE NEEDED.
TACK ALINED PIPE IN FOUR EQUAL
QUADRANTS. REMOVE CLAMPS. CUT
AROUND PIPE AND TACK CUT BACK
TOGETHER OPPOSITE OF TACKED BOLTS.
ONCE CUT REMOVE BAND + TORCH AND
GRIND OUT TACKS, PREP BEVELS,
FIT UP AND WELD

INSTALLATION OF A TEE WITH 45° ORIENTATION



TO FIND TIE IN POINTS A+B. PUT CENTER FINDER ON PIPE TO WHICH TEE IS TO BE INSTALLED LEVEL CENTER FINDER. THEN TAKE CENTER FINDER OVER TO BRANCH LINE AND MARK TWO SPOTS, AND RUN A STRING LINE AS ILLUSTRATED. MOVE BRANCH LINE UP OR DOWN WHERE STRING TOUCHES PRIMARY PIPE MARK CENTER

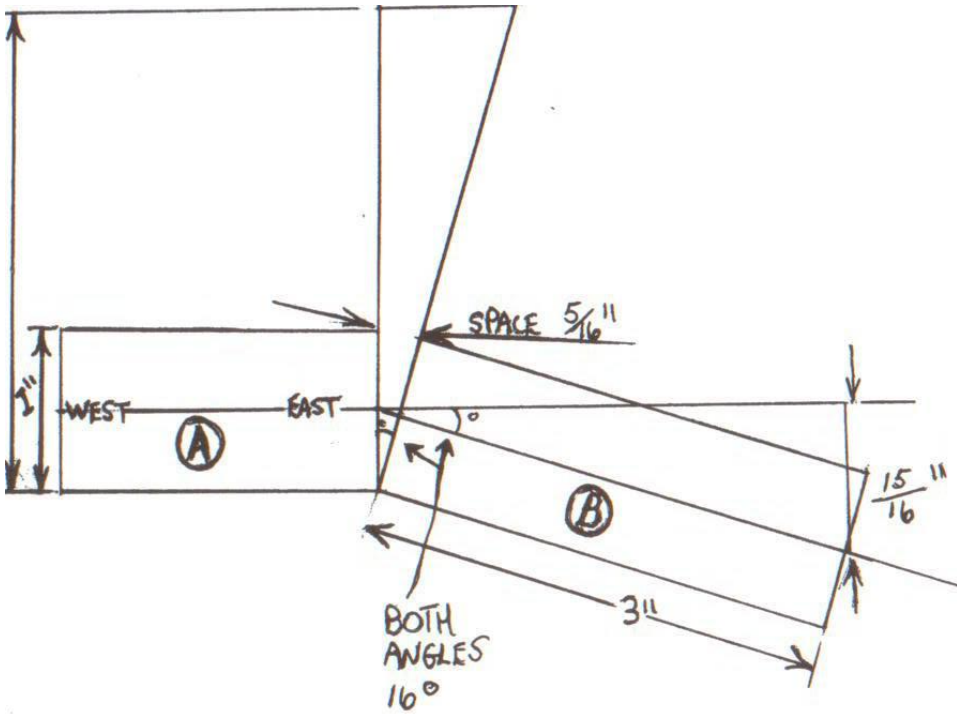
016036

(T)= H X 1.414

(T)= H X 2

(T)= H X 1.1547

DETERMINING TRAVEL FOR 45° 30° AND 60° ANGLES WITH HEIGHT ONLY



$(3 \div 1) \times \text{SPACE} = \frac{15}{16}$

$(3)\,\text{SPACE} = .9375$

$\frac{1}{3}(3)\,\text{SPACE} = .9375\left(\frac{1}{3}\right)$

$\text{SPACE} = .3125$

$\text{SPACE} = \frac{5}{16}$

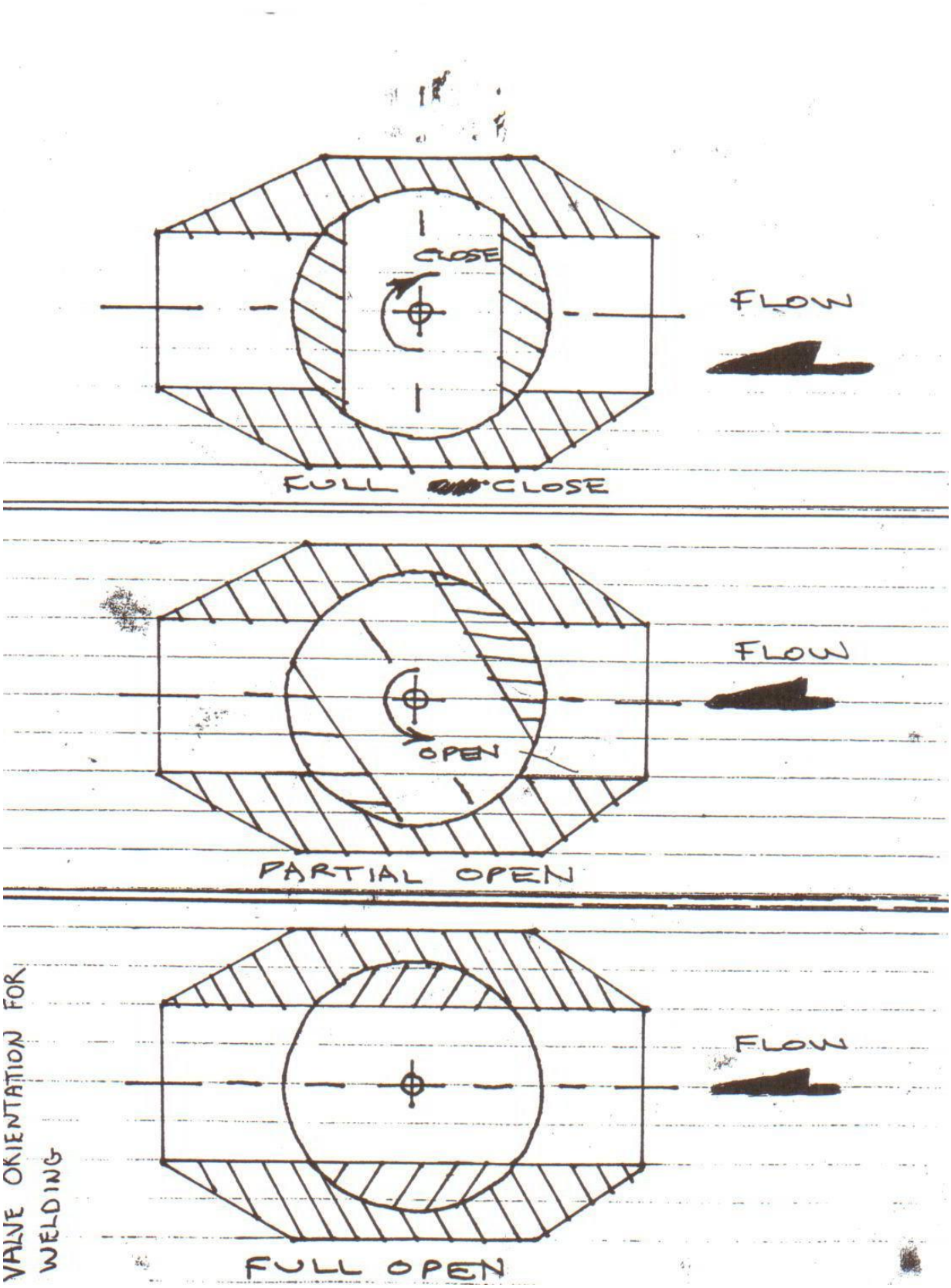
[A] CUT MUST BE LEVEL OR MITRE WILL VARY IN DEGREES.

IF THE EAST END OF PIPE (A) IS LOOKING UP THE MITRE ON PIPE (B) WILL BE GREATER. THE OPPOSITE IS TRUE WHEN PIPE (A) IS LOOKING DOWN.

TO MAKE PIPE (A) CUT LEVEL PUT CUTTING BAND ON FAIRLY LOOSE PUT A LEVEL ON THE EDGE OF THE CUTTING BAND AT THE THREE O'CLOCK POSITION. TAP THE BAND ON TOP AND BOTTOM UNTIL LEVEL. DOING A MITRE THIS WAY WILL USUALLY GET YOU A MAXIMUM DIFFERENCE FROM TOP TO BOTTOM OF 12 MM ($\frac{1}{2}$") (TAPING BAND TOP + BOTTOM)

016038

016039


CLOSE
FLOW
FULL CLOSE
FLOW
OPEN
PARTIAL OPEN
FLOW
FULL OPEN
VALVE ORIENTATION FOR WELDING

40°	ELBOW	SHORT	RADIUS	CENTER =	DIAMETER
90°	ELBOW	LONG	RADIUS	CENTER =	DIAMETER X 1.5
90°	ELBOW	3D	RADIUS	CENTER =	DIAMETER X 3
45°	ELBOW	LONG	RADIUS	CENTER =	DIAMETER X .625
45°	ELBOW	3D	RADIUS	CENTER =	DIAMETER X 1.2425
30°	ELBOW	3D	RADIUS	CENTER =	DIAMETER X 0.803
60°	ELBOW	3D	RADIUS	CENTER =	DIAMETER X 1.73

} 16" AND UP ¢CAN VARY UP TO 2" DEPENDING ON MANUFACTERS SPECS

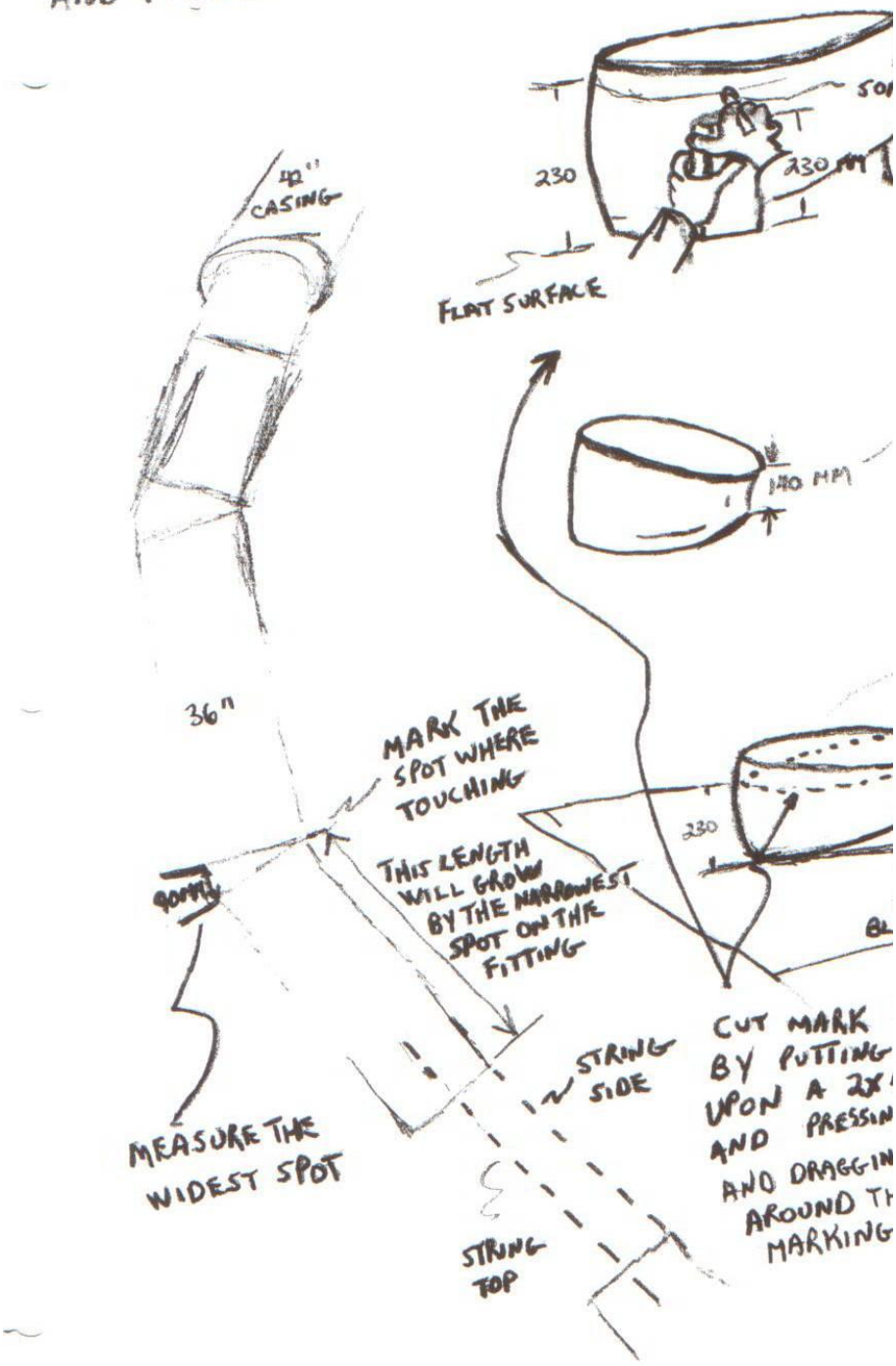
STRUCTURAL WELDING
ONE PASS FILET WELD

ONE WELDER CUTTING AND FITTING CAN WELD 45 LINEAL INCHES IN ONE HOUR IF IT IS NEW STURCTURAL WELDING TO BE DONE WITH NO ENGINEERING TO BE DONE

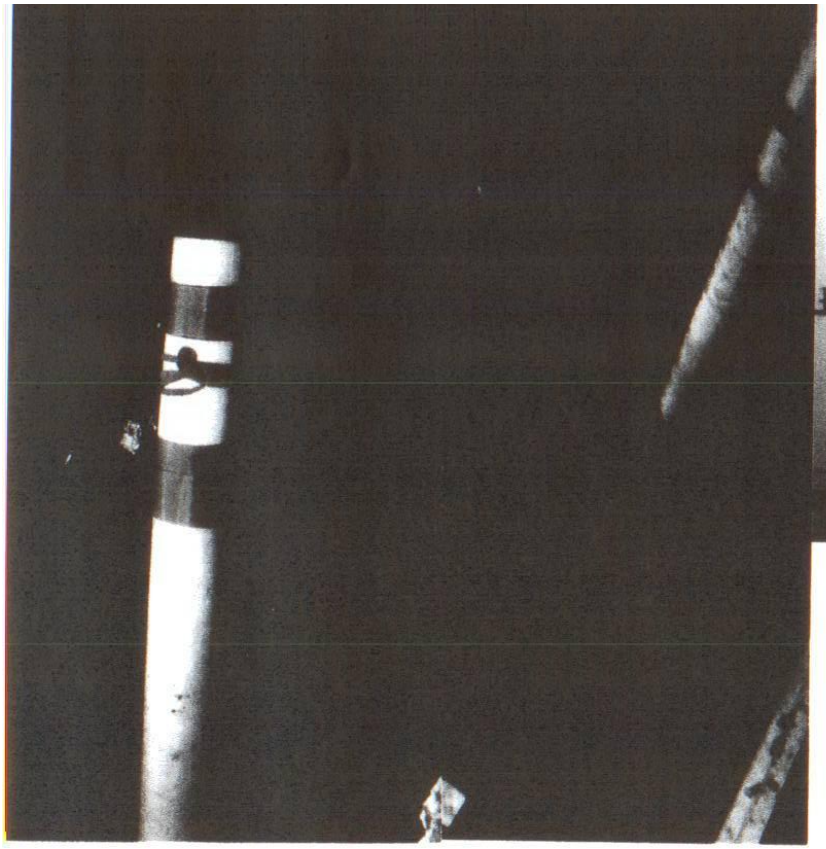
FLANGE BOLT SIZE CAN BE DETERMINED BY MEASURING THE WIDTH OF THE NUT TO FIT IT

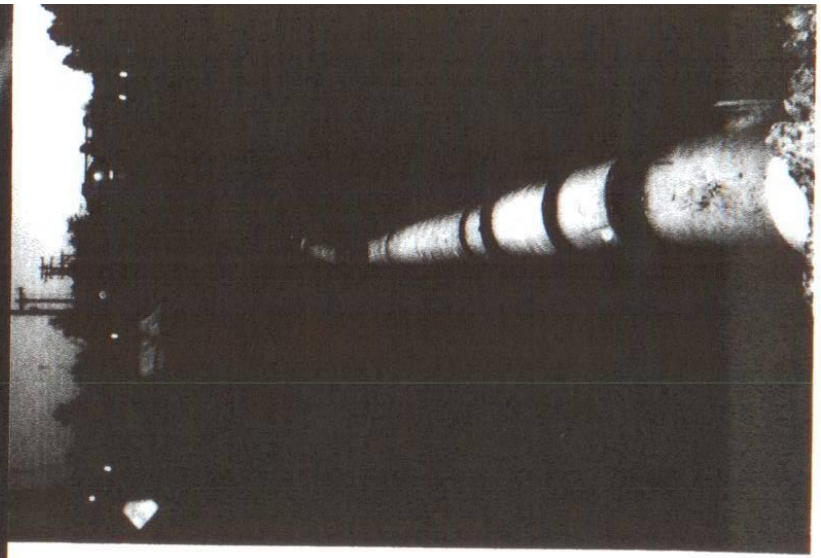
COMPOUND MITERS
AND FITTINGS

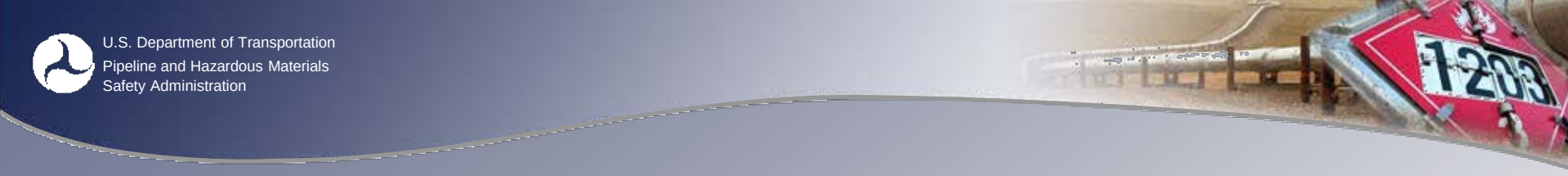
STRATHCONA COUNTY
2010 92AVE & 34 ST. ED



016041







PHMSA
Office of Pipeline Safety

2012 API – AGA Joint Committee
Oil & Gas Pipeline Welding Practices

811
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Engineering & Research Division
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President signs Pipeline Safety Act

Ray LaHood
Secretary of Transportation

Cynthia Quarterman
PHMSA Administrator

President Obama

Pipeline Safety, Regulatory Certainty, and Job Creation Act

- Drafted by Congress and signed into law by the President on January 3, 2012
- Reauthorization of Pipeline Safety Program
  - Stronger enforcement tools
  - Increases civil penalties
- http://thomas.loc.gov/home/gpoxmlc112/h2845_enr.xml

Recent Girth Weld Incidents

Interactive Girth Weld Threat

Girth Welds with
Low Tensile Strain Capacity

+

High Axial Tensile Strain

Girth Welds with Low Tensile Strain Capacity

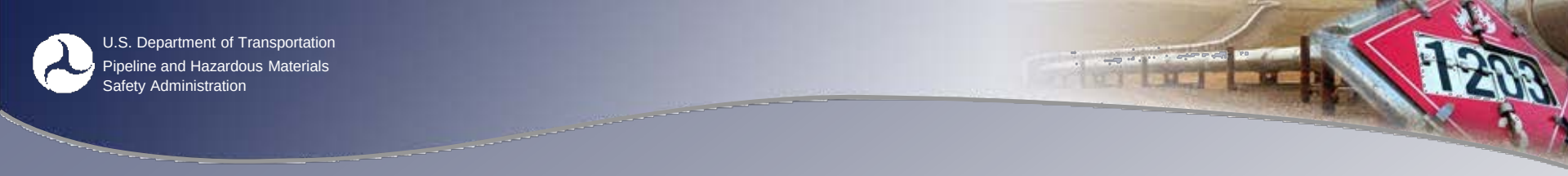
- Recent incidents:
  - Vintage girth welds
  - Pre-existing hydrogen-assisted WM/HAZ cracks
  - Evidence of little or no plastic deformation
- Codes have no requirement for girth weld tensile strain capacity

High Axial Tensile Strain

- Recent incidents:
  - Ground movement
  - Slopes with wet clay soils
  - Rising water table & pipe buoyancy
- Pipeline operators should evaluate and mitigate this risk. Methods may include:
  - Preventing pipeline movement
  - Monitoring pipeline movement
  - Removing/reinforcing girth welds with low strain capacity

Low Strength Fittings

Hydrotest failure at 80% of test pressure



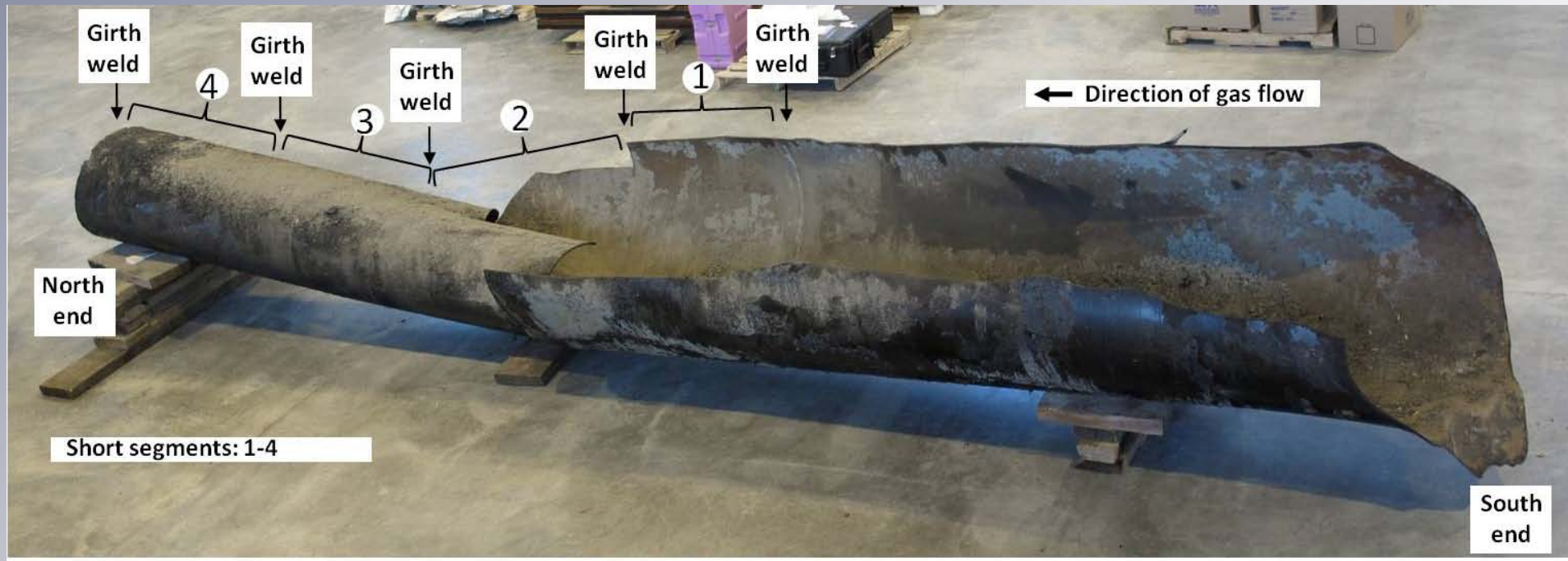
Low Strength Fittings

Coating cracks from expansion of fitting during hydrotest

016051

NTSB completes San Bruno Investigation

- NTSB Board Meeting August 30, 2011
- http://www.ntsb.gov/investigations/2010/sanbruno_ca.html

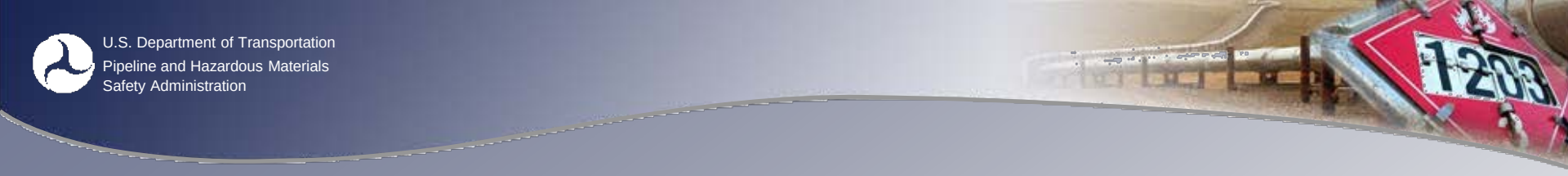


Photograph of the 28-foot-long ruptured section of pipeline

Recent PHMSA Events

- National Pipeline Safety Forum (April 18, 2011)
  - http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/National%20Pipeline%20Safety%20Forum%20Record%2004-18-2011.pdf
- Managing Challenges with Pipeline Seam Welds Workshop (July 20, 2011)
  - http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=71
- Improving Pipeline Risk Assessments & Recordkeeping Workshop (July 21, 2011)
  - http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=70
- **Thank you, all who participated**

Managing Challenges with Pipeline Seam Welds - July 20, 2011 Workshop



Pipe Seam Failures (2002-2010)

Seam Type	Natural Gas	Hazardous Liquid	TOTAL	% of Total
DSAW	9	5	14	18%
Flash Weld	1	5	6	8%
HF-ERW	2	14	16	22%
LF-ERW	5	21	26	35%
Lap Weld	1	2	3	4%
SAW	1	3	4	5%
Other	4	2	6	8%
TOTAL	23	52	75	100%

Pipe Seam Failures

Low Frequency Electric Resistance Weld (LF-ERW)

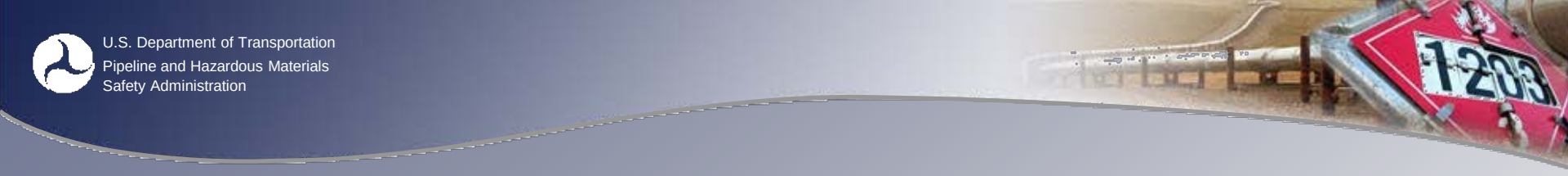
Submerged Arc Weld (SAW)

LF-ERW

016056

Upcoming 2012 PHMSA Events

- Leak Detection Workshop
- Automatic/Remote Controlled Valve Workshop
- Government/Industry Pipeline R&D Forum
- Details will be posted on below web-page:
  - http://primis.phmsa.dot.gov/meetings/Home.mtg



PHMSA funded Research

- Projects completed in 2011 include:
  - Advanced Technology/Methods for AUT Systems Quantification
  - Validation of Assessment Methods for Girth Welding of High Strength Pipelines
  - Update of Weld Design, Testing, and Assessment Procedures for High Strength Pipelines
  - Development of Optimized Welding Solutions for X100
  - In-Situ Hydrogen Analysis for Weld Inspection
- http://primis.phmsa.dot.gov/matrix

PHMSA – links

- Pipeline Safety Guidance – Advisory Bulletins, Low Strength Pipe Guidelines, MAOP Rule FAQs
  - http://www.phmsa.dot.gov/pipeline/guidance
- Pipeline Construction
  - http://primis.phmsa.dot.gov/construction/index.htm
- Pipeline Safety Awareness
  - http://opsweb.phmsa.dot.gov/pipelineforum

Thank you

Kenneth Y. Lee
Office: (202) 366-2694
E-mail: kenneth.lee@dot.gov

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7.9.16.8
For localized stress relieving, temperatures shall be monitored by using thermocouple pyrometers or other suitable devices.

7.10 Arc and gas welding — Inspection and testing of production welds

7.10.1 General

7.10.1.1
Inspectors shall be competent and their qualifications shall be approved by the company.
Note: *CSA W178.2 provides an example of welding inspector training and competency requirements.*

7.10.1.2
Except as allowed by Clause 7.10.1.4, production welds that are not required to be nondestructively inspected (see Clause 7.10.3) shall be inspected visually or by a combination of visual and nondestructive methods to determine compliance with the applicable acceptance criteria. The inspection method or methods to be used shall be at the option of the company and as specified in Clauses 7.10.2 and 7.10.4.

7.10.1.3
Welds that are nondestructively inspected using ultrasonic methods shall be visually inspected as specified in Clause 7.10.2.

7.10.1.4
The company shall have the right to inspect production welds nondestructively or by removing them and conducting mechanical tests. Such inspections may be made during or after welding, or both.

7.10.2 Visual inspection

7.10.2.1
The completed welds on the outside surface of the piping shall be visually inspected for 100% of the weld length for any imperfections that are not detectable by nondestructive inspection, in accordance with documented procedures approved by the company. Such procedures shall include requirements for extent and frequency of visual inspection, personnel qualification and visual acuity, maximum viewing distance and angle, lighting conditions, evaluation tools, and reporting.

7.10.2.2
Surface imperfections detected by visual inspection shall be evaluated on the basis of the applicable requirements of Clause 7.11.

7.10.2.3
Results of the visual inspection of completed welds shall be reported in a format approved by the company. Reports of defective welds shall include
(a) weld identification;
(b) description, position, and length of defects;
(c) date; and
(d) signature of qualified visual inspector.

7.10.2.4
Visual inspection records shall be kept until the piping is abandoned.
Note: *Consideration should be given to maintaining such records for any abandoned piping that can be returned to service.*

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7.10.3 Mandatory nondestructive inspection

7.10.3.1

All welds within the limits of uncased road and railway crossings, all welds within the limits of water crossings, all pressure-retaining welds that will not be pressure tested in place, and a minimum of 15% of all other production welds made each day shall be nondestructively inspected

(a) for 100% of their lengths;
(b) as specified in Clause 7.10.4; and
(c) where such welds are butt welds, using radiographic or ultrasonic methods, or a combination of such methods.

Where the daily results of the nondestructive inspection are unacceptable to the company, more nondestructive inspection or remedial actions shall be required.

Note: *Welds that are inspected should be reasonably representative of the daily production.*

7.10.3.2

For carbon dioxide pipeline systems, all butt welds shall be inspected by radiographic or ultrasonic methods, or a combination of such methods, for 100% of their circumferences, as specified in Clause 7.10.4.

7.10.3.3

Partial-penetration butt welds shall be radiographically inspected for 100% of their circumferences, as specified in Clauses 7.10.4 and 7.11.1.3.

7.10.4 Nondestructive inspection

7.10.4.1 Methods

In selecting methods of nondestructive inspection, the company shall consider the

(a) nature of imperfections that can result from the welding processes to be used;
(b) capability of the nondestructive inspection methods to detect such imperfections; and
(c) accuracy of indication, interpretation, and evaluation possible with such nondestructive inspection methods.

The nondestructive inspection procedures used shall be documented and approved by the company.

Note: *The company can require personnel responsible for nondestructive inspection to demonstrate the capability of the procedure to detect imperfections and to demonstrate their ability to correctly interpret indications.*

7.10.4.2 Evaluation of results

Except as allowed by Clause 7.10.4.3, welds inspected nondestructively shall be evaluated on the basis of the requirements of Clauses 7.11 or 7.15.10, whichever is applicable.

7.10.4.3 Alternative evaluation of results

At the option of the company, as an alternative to the requirements of Clauses 7.11 and 7.15.10, Annex K may be used for the evaluation of circumferential butt welds in designated portions of lines that

(a) are made using a welding procedure qualified as specified in Annex K;
(b) are inspected as specified in Annex K;
(c) join pipes of equal nominal wall thickness and grade;
(d) are intended for other than sour service as defined in Clause 16.2;
(e) are located in other than pump stations, compressor stations, measuring stations, or pressure-regulating stations, or other assembly piping; and
(f) are located where significant imperfection growth in service is not anticipated.

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7.10.5 Destructive testing

7.10.5.1
Destructive testing shall consist of removing completed welds, sectioning them into test specimens, and testing the specimens as specified in Clauses 7.7.2 to 7.7.10. The company shall have the right to disqualify from further work, or to require further testing of, welders making welds that are not in accordance with such requirements.

7.10.5.2
Trepanning methods of testing shall not be used.

7.10.6 Disposition of defective welds

7.10.6.1
Except as allowed by Clause 7.10.6.2, welds that are unacceptable on the basis of Clause 7.11, Clause 7.15.10, or Annex K, whichever is applicable, shall be removed, or repaired as specified in Clause 7.12.

7.10.6.2
Welds that have previously been accepted and are subsequently found to be unacceptable on the basis of Clauses 7.11.3 to 7.11.17, Clause 7.15.10, or Annex K, whichever is applicable, shall be

(a) accepted, provided that the weld imperfections are found to be acceptable on the basis of an engineering critical assessment involving consideration of service history and loading, anticipated service conditions (including the effects of corrosive and chemical attack), accurately established dimensions and location of the imperfections, and weld properties (including fracture toughness);
(b) repaired as specified in Clause 7.12; or
(c) removed.

Note: *A recommended practice for determining the acceptability of imperfections in fusion welds in pipeline systems using engineering critical assessment is included in Annex J.*

7.11 Arc and gas welding — Standards of acceptability for nondestructive inspection

7.11.1 General

7.11.1.1 Applicability
These standards of acceptability shall apply to the determination of the acceptability of indications of imperfections of the size and type located by radiography and other nondestructive inspection methods other than ultrasonic inspection. Requirements specified for welds made using pipe shall also apply to welds made using components and where applicable, shall be governed by the component nominal wall thickness at the bevel and by the outside diameter of the matching pipe. Such standards of acceptability are intended as a measure of adequate welding competence, as performed in accordance with qualified welding procedure specifications.

Notes:

(1) *The company has the option of using alternative standards of acceptability as specified in Clause 7.10.4.3.*
(2) *Additional standards of acceptability for sour service pipelines are specified in Clause 16.9.3.3.*

7.11.1.2 Rights of rejection
Since nondestructive inspection methods generally give only two-dimensional results, the company may reject welds that appear to meet these standards of acceptability where, in its opinion, the depth, location, or orientation of imperfections can be significantly detrimental to the structural integrity of the welds.

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7.11.1.3 Partial-penetration butt welds

Radiographic inspection of partial-penetration butt welds shall require the use of the comparative radiograph(s) obtained during the welding procedure qualification (see Clause 7.7.10.1) for estimating incomplete penetration. The standards of acceptability for partial-penetration butt welds shall be as specified in Clauses 7.11.2 to 7.11.17, except that

(a) weld penetration shall be from 85 to 100% of the nominal wall thickness;
(b) internal projection shall not be allowed;
(c) individual indications of burn-through areas shall not be allowed; and
(d) indications of incomplete fusion in the root and hot passes shall not be allowed.

7.11.2 Weld crown

At no point shall the outside crown surface of welds be below the surface of the adjacent base metal or above it by more than the amount shown in Table 7.6, except that, at the option of the company, an additional 1.0 mm shall be allowed for localized deviations.

Table 7.6
Outside crown height
(See Clause 7.11.2 and Tables 7.8 and 7.9.)

Nominal wall thickness, mm	Outside crown height, maximum, mm
10.0 or less	2.5
Greater than 10.0	3.5

7.11.3 Incomplete penetration of the root bead

A schematic representation of incomplete penetration of the root bead (incomplete filling of the root of the joint) is shown in Figure 7.15. Except where partial-penetration welds are required by design, the following shall apply:

(a) Individual indications of incomplete penetration conditions shall not exceed 12 mm in length.
(b) The cumulative length of such indications in any 300 mm length of weld shall not exceed 25 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length.

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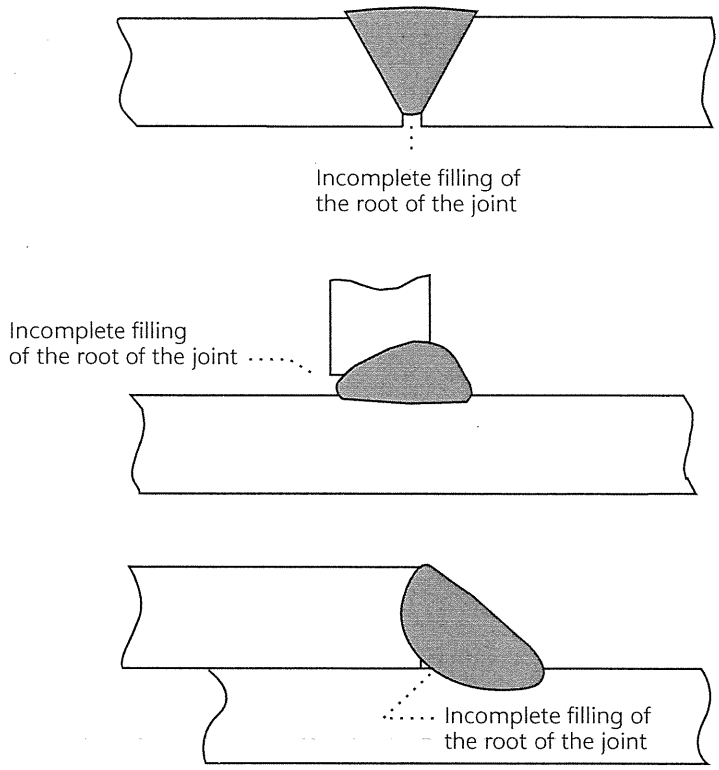

Figure 7.15
Incomplete penetration of the root bead
(See Clause 7.11.3.)

7.11.4 Incomplete fusion

A schematic representation of incomplete fusion (a lack of bond between the weld metal and the base metal at the root or top of the joint) is shown in Figure 7.16. Individual indications of incomplete fusion conditions shall not exceed 12 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 25 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length.

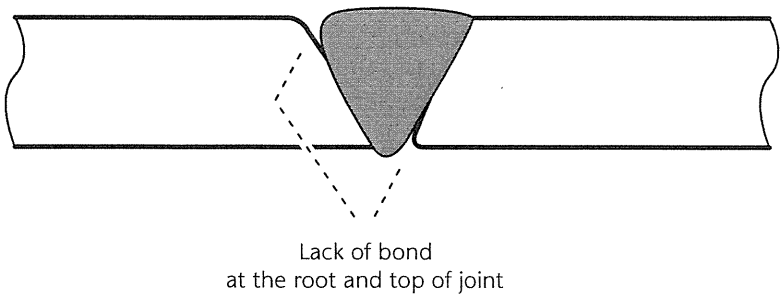

Figure 7.16
Incomplete fusion
(See Clause 7.11.4.)

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7.11.5 Internal concavity

A schematic representation of internal concavity (incomplete filling of the root of the joint, wherein the sides of the root are filled and the centre is not) is shown in Figure 7.17. This condition is acceptable regardless of length, provided that the minimum thickness of the weld metal exceeds the thickness of the adjacent base metal. Where the minimum thickness of the weld metal does not exceed that of the adjacent base metal, individual indications of internal concavity shall not exceed 50 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length.

Note: *Where radiography is used to evaluate internal concavity, this imperfection is acceptable regardless of length, provided that the density of its radiographic image does not exceed the density of the radiographic image of the adjacent base metal.*

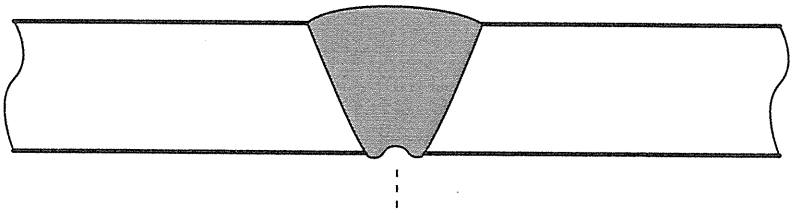

Figure 7.17
Internal concavity
(See Clause 7.11.5.)

7.11.6 Undercut

7.11.6.1

Undercut is a groove melted into the base metal adjacent to a weld toe at the root or top of the joint and left unfilled by the deposited weld metal.

7.11.6.2

Except as allowed by Clause 7.11.6.3, the following shall apply:

(a) Individual lengths of indications of undercut shall not exceed 50 mm.
(b) The cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length.
(c) For qualification of welders, the maximum depth of undercuts adjacent to the final test weld bead on the outside of the pipe or component shall not exceed 1 mm.

7.11.6.3

Undercut depths less than 0.5 mm or 6% of the nominal wall thickness, whichever is the lesser, shall be acceptable regardless of length, provided that a visual, mechanical, or nondestructive method of assessing the depth is used. Assessment of undercut depths using radiography is allowed only where comparator shims as described in Clause 7.13.7 and shown in Figure 7.18 are used.

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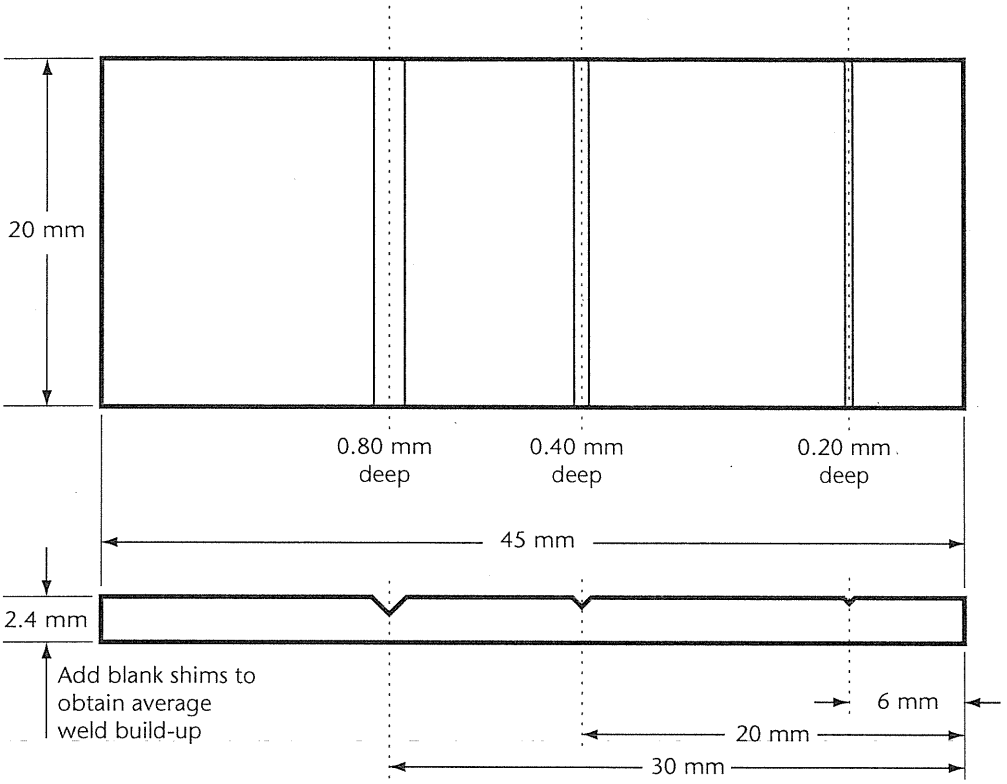

Notes:
(1) *Notch location tolerance shall be* ± 0.5 mm.
(2) *All notches are V-shaped with 45° included angles.*
(3) *Notch depth tolerance shall be* ± 0.025 mm.

Figure 7.18
Comparator shim
(See Clauses 7.11.6.3 and 7.13.7.)

7.11.7 Incomplete fusion due to cold lap

Incomplete fusion due to cold lap is a subsurface lack of bond between weld beads (cold lap) or between the weld metal and the base metal (lack of side wall fusion). A schematic representation of an example of this imperfection is shown in Figure 7.19. Individual indications of incomplete fusion due to cold lap conditions shall not exceed 50 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length.

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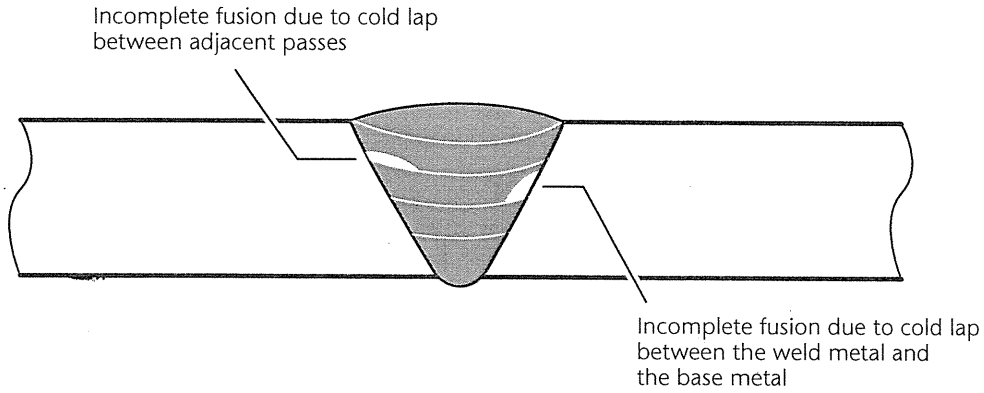

Note: *Incomplete fusion due to cold lap is not surface-connected.*

Figure 7.19
Incomplete fusion due to cold lap
(See Clause 7.11.7.)

7.11.8 Lack of cross-penetration

Lack of cross-penetration is a lack of penetration occurring at the weld interior where the joint preparation incorporates abutting surfaces. Such an imperfection occurs due to lack of penetration of the second weld pass. A schematic representation of an example of this imperfection is shown in Figure 7.20. Individual indications of lack of cross-penetration conditions shall not exceed 50 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length.

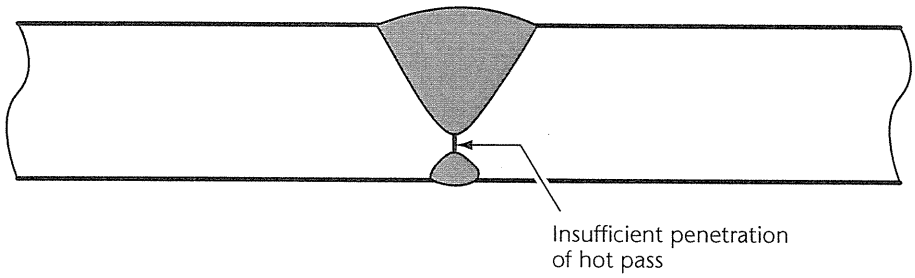

Figure 7.20
Lack of cross-penetration
(See Clause 7.11.8.)

7.11.9 Elongated slag inclusions

7.11.9.1

Elongated slag inclusions are nonmetallic solids that are entrapped in the weld metal or between the weld metal and the base metal and produce indications that are less than 1.5 mm in width.

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7.11.9.2
For pipe 60.3 mm OD or larger and components NPS 2 or larger, individual indications of elongated slag inclusions shall not exceed 50 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length. Indications of parallel slag lines shall be considered to be separate indications if the width of one or both of them exceeds 0.8 mm.

7.11.9.3
For pipe smaller than 60.3 mm OD and components smaller than NPS 2, individual indications of elongated slag inclusions and cumulative lengths of such indications shall not exceed 3 times the nominal wall thickness in length. Indications of parallel slag lines shall be considered to be separate indications if the width of one or both of them exceeds 0.8 mm.

7.11.10 Hollow bead
Hollow bead is linear porosity or cylindrical gas pockets occurring in the root bead. A schematic representation of an example of this imperfection is shown in Figure 7.21. Individual indications of hollow bead conditions shall not exceed 12 mm in length. The cumulative length of such indications in any 300 mm length of weld shall not exceed 25 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length.

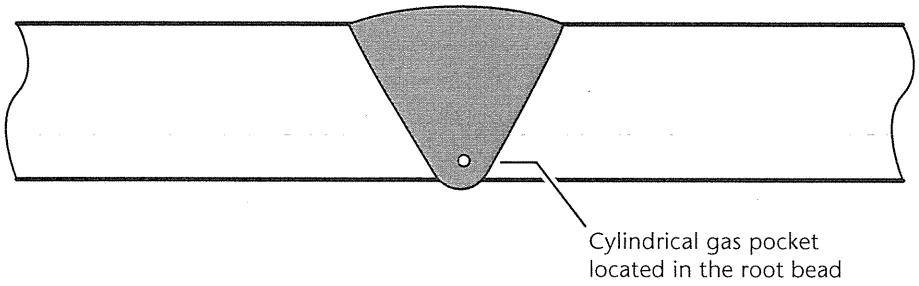

Figure 7.21
Hollow bead
(See Clause 7.11.10.)

7.11.11 Burn-through areas

7.11.11.1
Burn-through areas are those portions of root beads where excessive arc penetration has caused the weld puddle to be blown into the insides of the parts joined.

7.11.11.2
For pipe 60.3 mm OD or larger and components NPS 2 or larger, individual indications of burn-through areas shall not exceed 5 mm or the thickness of the base metal, whichever is the lesser, in any dimension. The cumulative maximum dimensions of such indications in any 300 mm length of weld shall not exceed 12 mm.

7.11.11.3
For pipe smaller than 60.3 mm OD and components smaller than NPS 2, not more than one indication of burn-through area is acceptable, and it shall not exceed 6 mm or the thickness of the base metal, whichever is the lesser, in any dimension.

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7.11.11.4
Welds that contained burn-through areas shall be considered to have been properly repaired if the density of the radiographic image of the repaired area does not exceed that of the adjacent base metal.

7.11.12 Isolated slag inclusions

7.11.12.1
Isolated slag inclusions are nonmetallic solids that are entrapped in the weld metal or between the weld metal and the base metal and produce indications that are 1.5 mm or greater in width.

7.11.12.2
For pipe 60.3 mm OD or larger and components NPS 2 or larger, individual indications of isolated slag inclusions shall not exceed 2.5 mm or 0.33 times the nominal wall thickness of the base metal, whichever is the lesser, in any dimension. The cumulative maximum dimensions of such indications in any 300 mm length of weld shall not exceed 10 mm and there shall be no more than 4 such indications of the maximum dimension allowed in such 300 mm lengths. Adjacent indications of isolated slag inclusions shall be separated by a minimum of 50 mm of sound weld metal.

7.11.12.3
For pipe smaller than 60.3 mm OD and components smaller than NPS 2, individual indications of isolated slag inclusions shall not exceed 2.5 mm or 0.33 times the nominal wall thickness of the base metal, whichever is the lesser, in any dimension. The cumulative length of such indications shall not exceed 2 times the nominal wall thickness of the base metal.

7.11.13 Spherical porosity
Spherical porosity is gas pockets having a circular section and occurring in the weld metal. Individual indications of spherical gas pockets shall not exceed 3 mm or 25% of the nominal wall thickness of the base metal, whichever is the lesser, in any dimension. The cumulative amount of indications of spherical porosity in any 150 mm of weld length, expressed in terms of the projected area on the radiograph, shall not exceed the value given in Table 7.7. An example of each of such amounts of spherical porosity is shown in Figure 7.22.

Table 7.7
Maximum acceptable amount of spherical porosity
(See Clause 7.11.13.)

Weld thickness, mm	Maximum acceptable projected area on radiograph, %
Less than 14	3
14–18	4
Greater than 18	5

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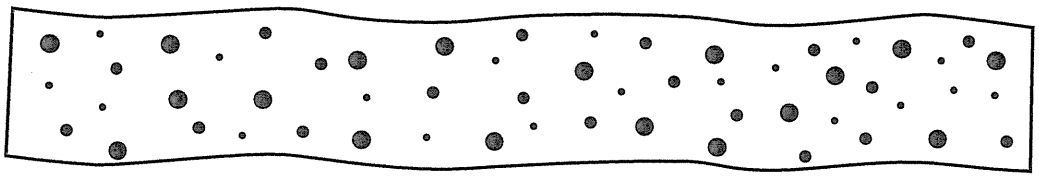
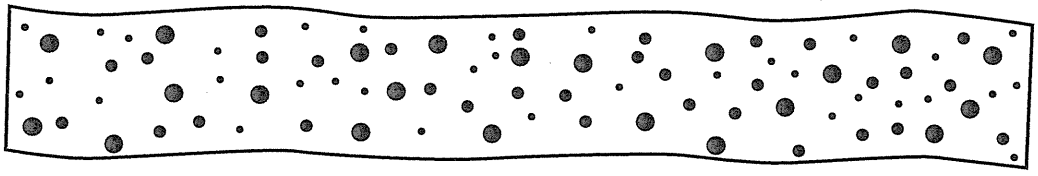
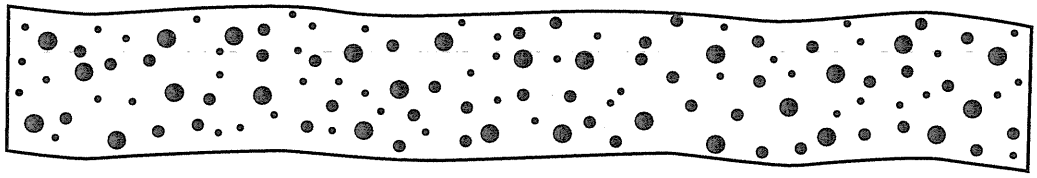


(a) 3% projected area



(b) 4% projected area



(c) 5% projected area

Figure 7.22
Spherical porosity
(See Clause 7.11.13.)

7.11.14 Wormhole porosity

Wormhole porosity is an elongated gas pocket, resulting from gas rising through the solidifying weld metal, that has an orientation that tends to be partly in the through-thickness direction. Individual indications of wormhole porosity shall not exceed 2.5 mm or 0.33 times the nominal wall thickness of the base metal, whichever is the lesser, in any dimension. The cumulative length of such indications in any 300 mm length of weld shall not exceed 10 mm and there shall be not more than 4 such imperfections of the maximum dimension allowed in such 300 mm lengths. Adjacent indications of wormhole porosity shall be separated by a minimum of 50 mm of sound weld metal. The orientation of wormhole porosity can substantially affect the density of its radiographic image; when applying these limits, consideration shall be given to the requirements of Clause 7.11.1.2.

7.11.15 Cracks and arc burns

7.11.15.1

Indications of cracks shall be unacceptable regardless of location (weld metal or HAZ).

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7.11.15.2
Indications of arc burns shall be unacceptable regardless of location.

7.11.16 Unequal leg length — Fillet welds
Except where required by design, there shall be not more than 3 mm difference between the leg lengths of each fillet weld.

7.11.17 Accumulation of imperfections

7.11.17.1
The cumulative length of the indications of all imperfections that are restricted by the requirements of Clauses 7.11.3, 7.11.4, 7.11.10, and 7.11.11 shall not exceed 25 mm in any 300 mm length of weld, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length. The cumulative length of the indications of all other imperfections that are restricted by the requirements of Clauses 7.11.5 to 7.11.9, and of the indications of those imperfections that are restricted by the requirements of Clauses 7.11.12 to 7.11.14, shall not exceed 50 mm in any 300 mm length of weld, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 16% of the weld length.

7.11.17.2
For partial-penetration welds, the cumulative length of the indications of all imperfections, other than those at the root, shall not exceed 25 mm in any 300 mm length of weld, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length.

7.11.18 Weld conditions limiting radiographic interpretation
Weld conditions that prevent proper interpretation of radiographs shall be cause for rejection of the welds, unless they can be inspected by other acceptable methods.

7.12 Arc and gas welding — Repair of welds containing repairable defects

7.12.1 Partial-penetration butt welds
Root defects in partial-penetration butt welds are nonrepairable and shall be removed by cutting out a cylinder of pipe containing the defect and rewelding.

7.12.2 Authorization for repairs
Without prior company authorization, welds containing defects other than cracks in the cover pass may be repaired. With prior company authorization, welds containing any type of repairable defect may be repaired.

7.12.3 Repair procedures

7.12.3.1
Before weld repairs are made, defects shall be entirely removed to expose clean metal. Slag and scale shall be removed by wire brushing.

7.12.3.2
Preheating to a temperature of at least 120 °C shall be used when performing repairs. Preheating shall extend to a distance of at least 150 mm from any point of the area to be repaired. Care shall be taken to prevent overheating, and no part of the area shall be heated to a temperature in excess of 200 °C unless the requirements of Clause 4.3.5.2 are met.

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7.12.3.3
The length of repair welds shall be at least 50 mm.

7.12.4 Removal of arc burns in weld areas
Arc burns shall be completely removed either by cutting out cylinders containing the arc burns or, where authorized by the company, by using repair procedures that include

(a) checking for complete removal of the altered metallurgical structure by etching the repair area with a 10% solution of ammonium persulphate or a 5% solution of nital; and

(b) measuring the wall thickness in the repaired area using mechanical or ultrasonic techniques, or both, to determine that the minimum wall thickness requirements are maintained.

Note: *The effectiveness of the etchant should be periodically tested by obtaining a positive indication from an arc burn, since lower metal temperatures and the age of the etchant can adversely affect the results obtained.*

7.12.5 Removal of cracks in circumferential butt welds and in fillet welds
Cracks in circumferential butt welds and in fillet welds shall be completely removed by cutting out cylinders containing such cracks, except that where authorized by the company, welds containing cracks may be repaired using a documented repair procedure that includes

(a) a requirement to establish the location of the crack;

(b) a specification of the crack removal method, which shall be for a crack originating at

  (i) an accessible surface, by grinding to remove the crack and to establish the repair welding groove contour; or

  (ii) the root and repaired from the outside surface, by grinding, drilling holes at the crack extremities, sawing through to form a new root bead opening, and grinding to establish the repair welding groove contour;

(c) a requirement that complete removal of the cracks be confirmed by liquid penetrant or wet magnetic particle inspection of the ground areas by inspectors qualified as specified in CAN/CGSB-48.9712; and

(d) a requirement that areas ground out be repaired by welding as specified in Clause 7.12 and in accordance with qualified welding procedure specifications.

Notes:

(1) *For new installations, welds containing cracks should be removed by cutting out cylinders; however, it is recognized that in some circumstances it can be more appropriate to repair such welds.*

(2) *Low-hydrogen welding practices should be used for repair welding; where such practices are not used, higher preheating and interpass temperatures should be considered.*

7.12.6 Inspection of repairs

7.12.6.1
Repaired areas of welds shall be inspected by the same means previously used. Where repairs are unacceptable, welds shall be completely removed by cutting out cylinders containing the repaired welds or, where authorized by the company, further repairs shall be made.

Notes:

(1) *For welds that contained cracks, consideration should be given to an additional inspection of the full weld by ultrasonic inspection, where this was not the means previously used.*

(2) *Consideration should be given to an additional inspection of the repaired areas in cases where the original inspection method may not be applicable to the welding process used for repairing the welds.*

7.12.6.2
The acceptability of repaired areas of welds shall be determined as specified in Clause 7.11 or 7.15.10, whichever is applicable.

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7.13 Arc and gas welding — Materials and equipment for radiographic inspection

7.13.1 General

Radiographic images shall be produced on film or other imaging media. The resulting radiographic images shall be in accordance with the applicable requirements of Clauses 7.13 and 7.14. Non-film radiographic techniques shall produce permanent radiographic image records that can be readily retrieved for viewings and the image data shall be stored in its original unaltered format.

7.13.2 Radiographic procedure

A written procedure shall be developed for each radiographic inspection technique used for both film and non-film imaging systems. The procedure shall detail the specifics of the radiographic technique, including such things as the type and thickness of material for which the procedure is suitable, the image collection and viewing system, radiation source, use of intensifying screens, film type, the type of image quality indicators, exposure geometry, and image storage practices.

7.13.3 Radiation sources

Sources of radiation shall be X-ray machines or radioisotopes.

7.13.4 Imaging media

7.13.4.1

For film radiography, radiographic films of high contrast and relatively fine grain shall be used.

7.13.4.2

Radiographic films shall be classified according to ISO 5579 as follows:

(a) GI: very fine-grained film, very slow speed;
(b) GII: fine-grained film, slow speed;
(c) GIII: medium-grained film, medium speed; and
(d) GIV: large-grained film, high speed.

Note: *The following schematic illustrates the relationship between film quality and film speed:*

Improving image quality→
GIV GIII GII GI
←Increasing film speed

7.13.4.3

The use of non-film radiography requires the use of alternative imaging media. Such imaging media shall be capable of consistently producing radiographic images in accordance with the applicable requirements of Clauses 7.13 and 7.14.

7.13.5 Screens

Where intensifying screens are used, the resulting radiographs shall clearly show the image quality indicators as specified in Clause 7.14.6.4.

Note: *Film holders should be backed with sheet lead wherever secondary or scattered radiation would detrimentally influence the results of radiography.*

7.13.6 Image quality indicators

7.13.6.1

Image quality indicators (IQIs) shall be used to measure the sensitivity of the radiographic image. Either standard hole-type or wire-type IQIs shall be used. Hole-type IQIs shall conform to ASTM E1025 and

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wire-type IQIs shall conform to ASTM E747 or ISO 19232-1. The size of the hole-type or wire-type IQI to be used depends on the thickness of the weld to be radiographed and shall be as given in Table 7.8 for X-ray radiography and Table 7.9 for radioisotope gamma radiography.

7.13.6.2

Where weld reinforcement has not been removed, hole-type IQIs require the use of a shim of radiographically similar material, so that the total thickness being radiographed under the IQI is approximately equal to the total weld thickness.

7.13.7 Comparator shims

Where comparator shims are used, the depth of internal undercut shall be estimated by comparing the density of the image of the internal undercut with the density of images of known notch depths in the comparator shims (see Figure 7.18). Shims shall be made of material that is radiographically similar to the material being inspected and the image of at least one shall appear on each radiograph.

Table 7.8
Image quality indicator selection criteria for X-ray radiography
(See Clauses 7.13.6.1 and 7.14.6.4.)

	Hole-type IQI			Wire-type IQI		
Weld thickness, mm	Thickness, mm	Designation	Essential hole	Essential wire diameter, maximum, mm	Wire number	ASTM set
up to 8	0.25	10	2T	0.16	14	A
> 8 up to 11	0.30	12	2T	0.20	13	A
>11 up to 14	0.38	15	2T	0.25	12	A or B
>14 up to 18	0.43	17	2T	0.32	11	B
>18 up to 25	0.51	20	2T	0.40	10	B
>25 up to 38	0.64	25	2T	0.50	9	B
>38 up to 44	0.76	30	2T	0.63	8	B

Notes:

(1) *For hole-type image quality indicators, a smaller hole in a thicker IQI, or a larger hole in a thinner IQI, may be substituted for any weld thickness given in this Table, provided that an equivalent or better sensitivity is achieved. Approximate equivalence between hole-type IQIs is given in the ASME* Boiler and Pressure Vessel Code, *Section V, Table T-283. Approximate equivalence between hole and wire type IQIs is given in Table 4 of ASTM E747.*

(2) *Wire number relates to the ISO wire-type IQIs.*

(3) *Weld thickness shall not exceed the sum of the nominal wall thickness plus the maximum permissible weld crown height, as defined in Table 7.6. For welds joining material of unequal thickness, the weld thickness shall not exceed the sum of* tw *in Figure 7.2 plus the maximum permissible weld crown height, as defined in Table 7.6.*

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Table 7.9
Image quality indicator selection criteria for gamma radiography
(See Clauses 7.13.6.1 and 7.14.6.4.)

Weld thickness, mm	Hole-type IQI			Wire-type IQI		
	Thickness, mm	Designation	Essential hole	Essential wire diameter, maximum, mm	Wire number	ASTM set
up to 8	0.30	12	2T	0.20	13	A
> 8 up to 11	0.38	15	2T	0.25	12	A or B
>11 up to 14	0.43	17	2T	0.32	11	B
>14 up to 18	0.51	20	2T	0.40	10	B
>18 up to 25	0.51	20	2T	0.40	10	B
>25 up to 38	0.64	25	2T	0.50	9	B
>38 up to 44	0.76	30	2T	0.63	8	B

Notes:

(1) *For hole-type image quality indicators, a smaller hole in a thicker IQI, or a larger hole in a thinner IQI, may be substituted for any weld thickness given in this Table, provided that an equivalent or better sensitivity is achieved. Approximate equivalence between hole-type IQIs is given in the ASME* Boiler and Pressure Vessel Code, *Section V, Table T-283. Approximate equivalence between hole and wire-type IQIs is given in Table 4 of ASTM E747.*

(2) *Wire number relates to the ISO wire-type IQIs.*

(3) *For pipe diameters* 114.3 mm *OD and smaller and components NPS 4 and smaller, a one size larger essential wire diameter may be used.*

(4) *Weld thickness shall not exceed the sum of the nominal wall thickness plus the maximum permissible weld crown height, as defined in Table 7.6. For welds joining material of unequal thickness, the weld thickness shall not exceed the sum of* t_w *in Figure 7.2 plus the maximum permissible weld crown height, as defined in Table 7.6.*

7.14 Arc and gas welding — Production of radiographs

7.14.1 Radiation source location

The radiation source shall be located either inside or outside the pipe or component. Where radiation sources are located on the outside, the image of one or both walls shall be acceptable for interpretation.

7.14.2 Geometric relationship

7.14.2.1

During exposure, film or other imaging media shall be as close to the surface of the weld as practical.

7.14.2.2

The distance between the source of radiation and the film or other imaging media shall be not less than 7 times the distance between the film or other imaging media and the weld surface farthest removed from it.

Note: *Preferably, the source-to-imaging media distance should be at least 10 times the distance between the imaging media and the weld surface farthest removed from it.*

7.14.2.3

Radiation sources shall not be offset by more than 5° from the plane of circumferential welds, except where necessary for elliptical projection. For elliptical projection, the offset angle shall be increased by the minimum amount required to separate the images of the opposite sides of the weld so that there is no superimposition of such images produced as specified in Clause 7.14.3.

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7.14.2.4
An elliptical double-wall viewing technique may be used for welds on pipe 88.9 mm OD or smaller and components NPS 3 or smaller, provided that the technique is applied as specified in Paragraph T271.2(b) of the ASME *Boiler and Pressure Vessel Code*, Section V.

7.14.3 Size of radiation field
Where both the radiation source and the imaging media are located outside the pipe or component and diametrically opposite each other, at least three equally spaced exposures shall be required to constitute 100% radiographic coverage of the weld, except that where an elliptical projection technique is used, at least two exposures shall be required, taken 90° apart.

7.14.4 Location of image quality indicators

7.14.4.1
For a panoramic single-wall exposure technique, at least three IQIs shall be spaced equally around the weld circumference.

7.14.4.2
For a double-wall exposure, single-wall view technique, IQIs shall be placed at both ends within 25 mm of the acceptable limits of coverage for each exposure. For pipe diameters 114.3 mm OD and smaller and components NPS 4 and smaller, an IQI may be used at one end of the acceptable limits of coverage for each exposure.

7.14.4.3
The IQI shall be placed on the source side for the double-wall exposure, double-wall view elliptical technique.

7.14.4.4
When a repaired weld is radiographed, at least one IQI shall be placed adjacent to each repair.

7.14.4.5
Hole-type IQIs shall be placed adjacent to the weld, using shims if necessary. Wire-type IQIs shall be placed across the weld, with the wires perpendicular to the weld direction.

7.14.5 Radiographic image identification markers

7.14.5.1
Radiographic images shall be clearly identified by the use of lead numbers, letters, or markers, or any combination thereof, so that the weld and any discontinuity in the weld can be quickly and accurately located. Where more than one image is used to inspect a complete circumferential weld, identification markers shall appear on each image and each weld section reference marker location shall be common to two successive images so as to establish that the entire weld has been examined.

7.14.5.2
Except as allowed by Clause 7.14.5.3, markers shall be placed on the joint on the downstream side of the weld so that they can be read clockwise when viewed from the upstream side.

7.14.5.3
The company may specify that markers be placed on the joint on either side of the weld. In such cases, records of the location and orientation of the markers shall be retained for a minimum of two years.

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7.14.6 Processing of radiographic images

7.14.6.1 General
Radiographs shall be processed in accordance with the applicable manufacturer's recommended practices.

7.14.6.2 Image defects
Radiographs shall be free of mechanical and processing defects. Radiographic images containing artifacts that interfere with the interpretation of the radiograph shall be discarded, and the welds shall be re-radiographed.

7.14.6.3 Film density
Film shall be exposed so that the density is between 2.0 and 4.0 throughout the area of interest, except for small localized areas caused by irregular weld configurations. The density in such small localized areas shall be at least 1.5. The unexposed base density of the film shall not exceed 0.30.

7.14.6.4 Definition of the IQI image
The image of the essential hole or wire shall be clearly defined. The essential hole and wire for a given weld thickness shall be as given in Table 7.8 for X-ray radiography and Table 7.9 for radioisotope gamma radiography.

7.14.6.5 Film-viewing illuminators
Film-viewing illuminators shall be used that produce sufficient light intensity so that all portions of the radiograph of the weld and base metal transmit sufficient light to reveal the pertinent details of the radiograph.

7.14.7 Radiation protection

7.14.7.1
Every worker shall be informed of the hazards of working in an area where exposure to radiation is possible. Adequate precautions shall be taken to protect the radiographer and any other person in the vicinity. The radiographer shall be responsible for making sure that the area is properly posted.

7.14.7.2
Areas affected by radiation shall be surveyed and the limits of hazards posted.

7.14.8 Radiographers

7.14.8.1
Radiographers shall be qualified as specified in CAN/CGSB-48.9712. For radiographic image interpretation, radiographers shall be qualified as specified in CAN/CGSB-48.9712 to Level II or III.

7.14.8.2
The company may examine the qualifications of radiographers to determine that the requirements of Clause 7.14.8.1 are met and that radiographs are produced, processed, and interpreted only by experienced radiographers.

7.14.9 Retention of radiographic records
Records of the interpretation of radiographs shall be kept until the piping is abandoned. Radiographs shall be retained for a minimum of 2 years.
Note: *See also Clause 7.14.5.3.*

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7.15 Arc and gas welding — Ultrasonic inspection of circumferential butt welds in piping

7.15.1 Methods

Clause 7.15 describes the methods that shall be employed for ultrasonic inspection of circumferential butt welds in piping, other than partial-penetration butt welds.

Notes:

(1) *Ultrasonic inspection might not be appropriate for some combinations of diameter and wall thickness. Factors to consider in selecting methods of nondestructive inspection are specified in Clause 7.10.4.1.*

(2) *Visual inspection is a mandatory requirement with ultrasonic inspection (see Clause 7.10.1.3).*

7.15.2 Terminology

The definitions contained in Mandatory Appendix III of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 5, apply in Clause 7.15 of this Standard.

7.15.3 General

7.15.3.1

Ultrasonic inspection shall be performed in accordance with a documented procedure approved by the company. Such a procedure shall include the applicable information listed in Paragraph T-421 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4, and a description of the methodology used to investigate indications, to the extent that they can be evaluated in terms of the standards of acceptability.

7.15.3.2

The complete volume of weld metal and HAZ in the weld shall be inspected. Inspection requirements shall be as specified in Paragraph T-471 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4, except that the entire weld may be inspected using an array of search units operating in pulse-echo or tandem mode, each designed to inspect specific parts of the required inspection volume.

7.15.3.3

The length of imperfections shall be determined using the 6 dB drop technique.

7.15.4 Equipment and supplies — General

The equipment and supplies shall be as specified in Paragraphs T-431, T-432, T-461, and T-466 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4. For each search unit used for inspection, the signal to electronic noise ratio shall exceed 40 dB when the maximum response from the basic calibration reflector is set at 80% of full screen height. Under the same conditions, the signal-to-noise ratio of the ultrasonic system shall exceed

(a) 20 dB for search units other than creeping wave search units; or

(b) 16 dB for creeping wave search units.

7.15.5 Equipment and supplies — Additional requirements for mechanized inspection systems

7.15.5.1

In addition to the pulse-echo mode, the instrument shall be capable of operating in pitch-catch transmission mode.

7.15.5.2

The equipment shall include a means of displaying the weld and the position of imperfections in the weld.

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7.15.5.3
The equipment shall include a means of monitoring the effectiveness of the acoustic coupling.

7.15.5.4
The maximum temperature differential between the search units and the surface of the material (calibration block or piping, whichever is applicable) to be inspected, within which the required accuracy and resolution are to be maintained, shall be established.

7.15.5.5
The equipment shall be capable of measuring the position of indications with an accuracy of 10 mm and a resolution of 2 mm in the circumferential direction. The array of search units shall be centred within 1 mm of the pre-weld centreline of the joint. The effect of search unit beam width, pulse repetition frequency, scanning velocity, and weld shrinkage shall be considered in evaluating the accuracy and resolution of distance measurements. The equipment shall include a means of validating the accuracy of distance measurements.

7.15.5.6
The performance of search units shall be as specified in ESI 98-2. Search units shall have contact surfaces that have the same curvature as that of the surface of the material to be inspected. The search unit dimensions that necessitate the repair or replacement of the search unit shall be established by the manufacturer or the inspection company.

7.15.6 Qualification of ultrasonic inspectors
Ultrasonic inspectors shall be qualified as specified in CAN/CGSB-48.9712 for Level II or III. The company may require ultrasonic inspectors to demonstrate their competence in operating, and evaluating the results of, the inspection system.

7.15.7 Calibration

7.15.7.1
Except as required by Clause 7.15.7.2, the calibration block and reflectors shall be as specified in Paragraph T-434 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4.

7.15.7.2
Where welds are to be evaluated as specified in Annex K, a calibration block made of pipe material, with specific reflectors designed to simulate the expected imperfections, shall be used. The effect of variations in acoustic velocity in the pipe material shall be considered in the design of the calibration block.

7.15.7.3
Calibration blocks shall be identified with a unique serial number and shall be under the control of the inspection company. Records of serial number, pipe diameter, wall thickness, acoustic velocity, and reflector dimensions and positions shall be available when the calibrated blocks are used

7.15.7.4
The system calibration shall be performed as specified in Paragraphs T-462, T-463, T-464, and T-465 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4, except that the interval between calibration checks shall not exceed 1 h during a series of similar examinations, and the calibration block required by Clause 7.15.7.2 shall be used where applicable. Reference levels shall be set at 80% full screen height and recording levels shall be set at 40% full screen height (6 dB below the reference level).

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7.15.8 Inspection procedure for production welds

7.15.8.1
Except as allowed by Clause 7.15.8.3, the inspection of production welds shall be performed as specified in Paragraph T-472 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4.

7.15.8.2
Except where the calibration block required by Clause 7.15.7.2 is used, the reference reflector shall be the 2.4 mm diameter side-drilled hole in the calibration block (see Clause 7.15.7.1).

7.15.8.3
A distance amplitude correction (DAC) curve shall not be required for inspection of welds in materials with a wall thickness of 15 mm or less.

7.15.9 Inspection procedure for production welds — Additional requirements for mechanized inspection

7.15.9.1
The methodology used to interpret system output in terms of non-recordable indication, acceptable indication of an imperfection, or indication of a defect shall be described in the inspection procedure. Such methodology shall include the positioning of recording gates and the effects of conditions such as bead misalignment.

7.15.9.2
Circumferential distance references shall be marked onto the piping surface to allow the positioning of defects from the output of the inspection system.

7.15.9.3
Inspection sensitivity shall be measured using the calibration block at regular intervals not exceeding 1 h or every 10 welds, and when any part of the inspection system is changed, the result from the sensitivity measurements shall be recorded. Any decrease of more than 3 dB from the sensitivity established in the calibration required by Clause 7.15.7.4 for any search unit shall require recalibration and a reinspection of all welds inspected since the last acceptable sensitivity verification.

7.15.9.4
The temperature differential between the search units and the surface of the material being inspected shall be determined at regular intervals. Any deviation from the established maximum temperature differential (see Clause 7.15.5.4) shall be recorded and corrected and all welds inspected since the last acceptable verification shall be reinspected.

7.15.9.5
The circumferential position accuracy of the system output shall be validated at regular intervals by comparing it to the actual distance travelled around the piping. Any deviation from the requirements of Clause 7.15.5.5 shall be recorded and corrected.

7.15.9.6
Any change in search unit position shall be recorded and shall require a verification of recording gate positions and inspection sensitivity.

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7.15.9.7
Search units shall be examined for wear at regular intervals not exceeding 500 welds. Search units that have dimensions that necessitate repair or replacement (see Clause 7.15.5.6) shall be repaired or replaced.

7.15.9.8
A reinspection of the complete weld, or a supplementary manual inspection, shall be required for any of the following conditions:

(a) a coupling loss in a single channel over a circumferential distance not exceeding 12 mm, unless such loss is compensated by data from other inspection channels to maintain full volumetric inspection;
(b) concurrent coupling losses in two adjacent inspection channels; or
(c) a coupling loss over a circumferential distance exceeding 12 mm.

7.15.10 Standards of acceptability for ultrasonic inspection

7.15.10.1
These standards of acceptability shall apply to the determination of acceptability of indications of imperfections of the size and type located by ultrasonic inspection. Such standards of acceptability are intended as a measure of adequate welding competence, as performed in accordance with qualified welding procedure specifications.

Notes:

(1) *The company may use alternative standards of acceptability as specified in Clause 7.10.4.3.*
(2) *Additional standards of acceptability for sour service pipelines are specified in Clause 16.9.3.3.*

7.15.10.2
The company may reject welds that meet these standards of acceptability where, in its opinion, the depth, location, or orientation of imperfections can be significantly detrimental to the structural integrity of the welds.

Note: *Indications of imperfections having an acceptable length should be investigated to ensure that they do not create a potential leak path.*

7.15.10.3
The standards of acceptability for indications of imperfections recorded by ultrasonic inspection (i.e., weld imperfections giving indications that exceed the established recording level) shall be as follows:

(a) Indications of imperfections characterized as cracks shall be unacceptable regardless of length or location.
(b) Individual indications of imperfections (other than those characterized as cracks) that are identified as not extending into the weld beads closest to the piping surfaces shall not exceed 50 mm in length, and the cumulative length of such indications in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long, the cumulative length of such imperfections shall not exceed 16% of the weld length.
(c) Individual indications of imperfections other than those covered by Items (a) and (b) shall not exceed 12 mm in length and the cumulative length of such imperfections in any 300 mm length of weld shall not exceed 25 mm, except that for welds less than 300 mm long, the cumulative length of such indications shall not exceed 8% of the weld length.

7.15.10.4
Weld conditions that prevent proper interpretation of the ultrasonic indications shall be cause for rejection of the welds, unless they can be inspected by other acceptable methods.

7.15.11 Ultrasonic inspection reports and records

7.15.11.1
Reports and records shall be as specified in Paragraph T-492 of the ASME *Boiler and Pressure Vessel Code*, Section V, Article 4, except that the information may be recorded using a combination of project log books

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016082

TransCanada
In business to deliver

memo

date	January 26, 2011
attention	Peter Andre
location	TCT 15 floor
cc	Dave Toporowsky
from	David Taylor
subject	Cutbank Lateral Loop Project

TransCanada PipeLines Limited

tel 403-920-7228
fax 403-920-2319
email david_taylor@transcanada.com
web www.transcanada.com

Welding Procedures Datasheets & Supporting Procedure Qualification Records

As requested by the project, Materials Engineering has reviewed the welding procedures that were provided to the National Energy Board ("NEB") in compliance with condition 8 of Order XG-N081-19-2010 in detail and is satisfied the welding procedures listed below are complete and comply with CSA Z662-07 requirements. The review also addressed the e-mail comments from the NEB staff dated January 19 and January 25, 2011.

During our review of the welding procedures several were identified as being repeat procedures, redundant to the project or having supporting documents that were unclear in there intended use. These procedures have been removed from the submission.

The submission also includes the welding procedures for the branch connections (in-service hot taps) and for the assemblies that were completed in the fabrication facility.

The welding procedures listed below are for use during the installation of the pipe and prefabricated assemblies. The procedures identified as PLNEW are for application on the pipe to pipe joints (below ground welds), including the prefabricated assemblies (pipe to pipe). The procedures identified as PLASSE are for welding the NPS 12 cross over piping in the field. The PLFAB procedures were used by the fabrication facility for the pipe to component welds.

Assemblies – field welding

1. **PLASSE-01-ASSY (NPS 12 and below – assembly pipe to pipe – below ground)**
   - 2201, 2294, 2295, 2412, 2580, 2691
2. **PLASSE-02-ASSY (NPS 12 and below – assembly pipe to pipe – aboveground and repairs)**
   - 2167, 2154, 2691
3. **PLNEW-13-ML –NPS 16 – crossover - below ground pipe to pipe (5.6 mm – 7.1 mm wall thickness)**
   - 2357, 2460, 2470, 2471, 2484, 2486, 2487, 2492, 2493, 2771, 3077
4. **PLNEW-14-RP - NPS 16 -crossover - below ground repair**
   - 2395, 2495

Branch Connection welds (hot taps)

5. **WPDS-BRCH-03-Flow**
   - 2636, 2637, 2652

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Pipeline – field welding

6. **PLNEW-15-ML – below ground pipe to pipe (7.2 mm – 12.7 mm wall thickness)**
   - 2097, 2119, 2125, 2470, 2471, 2492, 2493, 2494
7. **PLNEW-16-RP – below ground repair**
   - 2152, 2473, 2495

Fabrication – shop welding

8. **PLFAB-01-ASSY – NPS 16 to 48 - rolled welds**
   - TL55, TL149, TL159, TL160, TL166, TL179, TL180, TL181, TL193, TL205
9. **PLFAB-02-ASSY – NPS 16 to 48 - position welds**
   - TL15, TL88, TL99, TL108, TL160, TL182, TL186, TL187, TL194, TL220
10. **PLFAB-03-ASSY – NPS 2 and larger - pipe to pipe, pipe to component**
    - TL84, TL85, TL188, TL189
11. **PLFAB-04-ASSY – NPS 2 -12 - pipe to component – position welds**
    - TL84, TL85, TL147, TL148, TL182, TL188, TL189, TL192
12. **PLFAB-05-ASSY – NPS 2 – 12 – pipe to component – rolled welds**
    - TL147, TL148, TL182, TL192, TL194, TL220
13. **PLFAB-08-ASSY – socket welds – NPS 2 and below**
    - TL84, TL85, TL188, TL189
14. **PLFAB-11-ASSY – NPS 2 and below – o'lets**
    - TL6, TL15, TL54, TL70, TL75, TL77, TL78, TL84, TL89, TL108
15. **PLFAB-15-ASSY – NPS 2 and larger – rolled welds**
    - TL31, TL39, TL40, TL175, TL176, TL177, TL178, TL188, TL189

If you have any questions please call.

Thank you

Sincerely,

David Taylor
Manager
Materials Engineering

016084

From: Evan Vokes
Sent: Tuesday, July 28, 2009 5:25 PM
To: David Taylor
Subject: FW: third party inspection
Attachments: 3PI infomation related to decision summary

From: Evan Vokes
Sent: Friday, July 24, 2009 1:39 PM
To: Gabe Nahas; Ron Curle; Rachel Lee; Dave Johnson
Cc: Trent Bertholet; Kevin Widenmaier; James Ferguson
Subject: third party inspection

Hello Everyone
Please forgive me for the long email. The point that I wanted to come around to yesterday that I think is the most important factor for quality control is control of Third Party Inspection. I believe the 3PI and NDE are the same process and must be treated as a holistic problem.
I have worked quite a bit on how 3PI is accomplished at TransCanada and I must say that we get very poor value for our money because we have failed to tell the 3PI what the expectations are. In engineering governance we see a lot of technical problems that are never logged in IIT by project managers. We have seen some interesting events that have come out of 3PI and it appears that many people do not understand what they do.

There are four major circumstances:
One of the problem is 3PI offering engineering opinion when they are not allowed too.
A second is when we pay for an inspection that was not adequate.
The third is the inspector has no technical background/training for the inspection.
The last is TransCanada requests an inspector but does not describe what to inspect; especially when inspection criteria is not dictated from TCPL (the classic EPCM failure).

For the Bison and Mexico projects, a root cause that truly affects these projects is the independence of inspections. In Canada, the independence of inspections is required under section 54 of the OPR. This independence of inspections does not apply in the USA but there are some learnings. Section 54 includes NDE as it is truly part and parcel of the 3PI process. I was hoping Meera would have attended as from my understanding KXL will be hiring NDE themselves. (Based on conversations with Dave Hodgkinson.)

If the contractor hires NDE, the NDE are often pressured to make calls that favour the contractor. We have had cases where we made the correct call to ask that piping be cut out after a NDE tech changed their call.
If TransCanada hires the NDE and audits the NDE we make a major increase in quality and control of costs. If the NDE over-calls the contractor can come back after us. If the NDE under-calls we are directly responsible to the regulator which is no different than the current situation. If we hire NDE, we can control inspection costs and quality at the same time.

Directly hiring NDE gives us the impetus to do have the job done correctly. Our NDE contractor on Keystone has complemented us on both the fact that it is easier to make the correct judgement on welds and how thorough the audits are. The NDE contractor on Buffalo West was shocked how we showed how poor their quality had become while working for welding contractors and this one came with a significant economic penalty. Our direct hire NDE contractors have worked closely with the welding contractors and it does not affect schedule as we drive the welding inspection and NDE through the chief welding inspector. As I audit the Canadian Keystone data it is very obvious that mainline repairs generally occur on same day which allows acceptance 24hrs later. To my knowledge, only one welding contractor has complained in recent times about our NDE contractor but this was expected with Midwest. The NDE was very responsive to work with as we were able to re-evaluate 4 HDDs in spring 2009 and make corrective actions in record time. (three of the incidences were caused by TCPL and one by a NDE company). The 24 hr delay issue has been dealt with very effectively by utilizing what is referred to as the prescanning rig. If anything additional shows up in the official 24hr scan it

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would likely result in a cut-out but the risks are low if the contractor is not doing something to aggravate a potential cracking problem.

The contractors will complain bitterly about losing control of NDE as they lose control of the inspection of their own work and of course the attendant administration fees. The advantage that most contractors do not recognise is that an independent inspection and audit cuts back on severity of repairs caused by delayed audit results. The REX experience could have been avoided by KinderMorgan and saved the contractor a lot of money if they had used an independent inspection process. This would have resulted in a higher initial cut-out rate for the contractor which would have been preferable to the end result of several hydrotest failures and the resulting PHMSA dig program. (the cellulosic SMAW repair method used is very crack prone and they did not delay inspection. The old TransCanada built one of these leaky pipes)

The suggestion to have the quality built in at the front end such as the stress free pipe example is impractical when all parties need production. Since a perfect pipe is impractical, we need to make time and accept as much risk as possible without jeopardising quality. This was the whole purpose of developing ECA and AUT programs where we can allow indications many times larger than work workmanship and have a better engineered pipe. This means we have high production rates and should be able to do a better inspection job with a few well trained inspectors. This is the time when owner companies have the economic leverage to change the status quo. If we are serious about quality, this is the time to get all forms of third party inspection correctly lined up as it is the shovel of quality.

The following matrix shows how different processes interact

Mainline	Poorboy	Tie-ins	Inspection	24hr delay
GMAW	GMAW	FCAW	AUT	no but delay on SMAW repairs
GMAW	GMAW	SMAW	AUT	yes on tie-ins
GMAW	SMAW	SMAW	AUT	yes on tie-ins and Poorboy
SMAW	SMAW	SMAW	AUT	yes on all
SMAW	SMAW	SMAW	RT	yes on all

Prescanning 24hr delay welds with AUT can really speed things up and allow the contractor to move on with their equipment.

The reason the SMAW RT is acceptable at TransCanada is it is very appropriate for small diameter(NPS 16 and less). It is not appropriate for large diameter high strength materials. The GMAW FCAW option is very suited to materials X80 and nigher. It makes more sense to understand the limitations of the material and the process and pick a process Fit For Purpose. If a contractor is well prepared, the FCAW tie-ins are very quick and of high quality. If you have a high water table you can close a ditch very fast with FCAW compared to an SMAW process. If I am recalling correctly, the FCAW repair rate at Fort Mac was zero with a couple of cut-outs for hi/lo. Other advantages include safety improvements but you need a slightly larger bell hole.

I was asked if AUT is permitted in Mexico. I checked and WeldSonix has worked for Pemex a few times so there is a precedent. In my mind, the big seller of AUT in a country that is working to increase employment is the better inspection offered by AUT as it does not miss root cracks.

As an FYI, attached is the rationalization for the development of the official 3PI program that is going out as a decision summary in the near future. The elements that you need to address in your project are contained in this attachment. I have the structure worked out and it would fit with the work being performed in North America. In the attachment I do not address field services which are a very important component of pipeline construction. The reason for this is we have a successful program that would need minor changes to be implemented under the same 3PI umbrella at a later date. If you want to see the start of the Engineering Directive document, come by and I will explain how it works and how it lines up with our current process that I have been working with SCM on.

Hope this helps
Evan

016086

From: Evan Vokes
Sent: Thursday, February 26, 2009 5:20 PM
To: David Taylor
Subject: RE: 3PI Agreement

Way to fast on changing windows so lets try this again
Hello Dave
This came out of last years work that everyone wanted to get on board with
They need help and they came to us so we need to support them
The agreement is to support commodities
You and me signed this decision summary to get funding
Marc Charland, Ed , myself and Vivian have been involved for some time but we had told them we did not have time to support it for a while

Hope this helps
Evan

From: Evan Vokes
Sent: Thursday, February 26, 2009 5:16 PM
To: David Taylor
Subject: RE: 3PI Agreement

This came out of last years work that everyone wanted to get on board with
They need help and they came to us so we need to support them
The agreement is to support commodities
You and me signed this decsum

From: David Taylor
Sent: Wednesday, February 25, 2009 9:07 AM
To: Evan Vokes; Vivian Liu
Cc: Kevin Widenmaier
Subject: RE: 3PI Agreement

Hello,
What is our commitment on this activity?

From: ED Salmon
Sent: Tuesday, February 24, 2009 8:29 AM
To: Evan Vokes; Vivian Liu
Cc: David Taylor; Dan MacInnes; Marc Charland; Kevin Widenmaier
Subject: 3PI Agreement

For us to meet the timelines and execute the proper agreements by June 1 (Moody contract is expiring on June1) the following schedule must be met:

1. March 16 - finish bid documents. (US and Canada)
2. March 18 - Issue bid documents to all bidders
3. March 31 - Close bid

016087

4. April 7 - Finish bid evaluation and recommendation
5. April 8 - Decision Summary
6. April 21 - May 15 Contract execution

Your assistance and adherence to the schedule is most appreciated.

Ed Salmon, C.P.P., C.P.M.
Senior Contract Analyst, Supply Chain Management
Operations & Engineering Services
TransCanada
450 - 1 St. SW
Calgary, AB T2P 5H1
Ph: (403) 920-6125
Cell: (403) 463-0448
Fax: (403) 920-5444
ed_salmon@transcanada.com

016088

From: Evan Vokes
Sent: Thursday, March 05, 2009 8:17 AM
To: Kevin Widenmaier
Cc: Niteesha Edwards; James Ferguson
Subject: RE: Surveillance Checklist: Agreement Number 3511

I will just add it to what we outlined in the proposed TED Simple duties but effective coverage I will work on it this weekend

-----Original Message-----
From: Kevin Widenmaier
Sent: Thursday, March 05, 2009 8:14 AM
To: Evan Vokes
Cc: Niteesha Edwards; James Ferguson
Subject: FW: Surveillance Checklist: Agreement Number 3511

Evan;

Are you our spokesperson on these issues? I can give my opinion, but don't have much time to commit. I believe this is a very important issue and would like to see some of our bare minimum concerns covered.

Kevin

Kevin Widenmaier, M.Eng., P.Eng.,
Senior Engineer,
Engineering Governance
TransCanada
(403) 920-5646
(403) 920-2393 fax

-----Original Message-----
From: ED Salmon
Sent: Tuesday, February 24, 2009 8:08 AM
To: Marc Charland; Kevin Widenmaier
Cc: Dan MacInnes
Subject: RE: Surveillance Checklist: Agreement Number 3511

In response to Kevin's concern:

The original contract with Moody was intended to be a generic MSA but utilized as a sole source due to the existing relationship with Moody and their familiarity with our requirements. Over time the increase in demand had prompted Moody to obtain the services of inspectors not usually employed by TC due to resource constraints. Current agreement 3511 has been in place for some time and has been extended twice to continue servicing TC's requirement while new agreements are put in place.

On the path forward the intention is tighten up the terms of the new agreements, improve the scope and service levels required. This can only be accomplished with Engineering's assistance. There is also intent to execute multiple agreements on both sides of the border.

016089

Ed Salmon, C.P.P., C.P.M.
Senior Contract Analyst, Supply Chain Management Operations & Engineering Services TransCanada
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ed_salmon@transcanada.com

-----Original Message-----
From: Marc Charland
Sent: Monday, February 23, 2009 4:52 PM
To: Dan MacInnes
Cc: Kevin Widenmaier; ED Salmon
Subject: Fw: Surveillance Checklist: Agreement Number 3511

Dan,
Could you address Kevin's question below regarding the Scope of Work for 3PI?

Marc Charland

----- Original Message -----
From: Kevin Widenmaier
To: Marc Charland
Sent: Mon Feb 23 16:22:32 2009
Subject: RE: Surveillance Checklist: Agreement Number 3511

Marc;

I looked over the scope of work you had attached to this email and I have a couple of comments.

While it seems to require that the inspectors be 'trained and qualified' it doesn't seem to require they be familiar either with the governing standards to which a component may be manufactured or even be familiar with our company specification. How can we ensure that they know what we are asking for in our PO's to the vendors?

I would appreciate your comments.

Thanks

Kevin

Kevin Widenmaier, M.Eng., P.Eng.,

Senior Engineer,

Engineering Governance

TransCanada

(403) 920-5646

(403) 920-2393 fax

From: Marc Charland
Sent: Thursday, January 29, 2009 2:37 PM
To: Dianne Rau
Cc: Vivian Liu; Kevin Widenmaier; Evan Vokes; Dan MacInnes; ED Salmon
Subject: Surveillance Checklist

Diane,

Could you kindly provide Vivian with the latest Surveillance Checklist for the following materials? Would it be possible to get this for Wednesday, Feb 4th? This information is required for the third part inspection Invitation to Bid which is slated to be issued in Q1 of 2009.

i Pipe;

ii Pipe and Assembly Coating;

iii Compression packages and associated equipment;

iv Valves and valve operators;

v Flanges and fittings;

vi Pressure vessels;

vii Electrical equipment;

viii Power-related and ancillary equipment; and

ix Fabricated assemblies/spooling.

016091

Marc Charland <mailto:Marc_Charland@TransCanada.Com>

TransCanada

Supply Chain Operations

Commercial Lead, Materials

403.920.5916

From: Dan MacInnes
Sent: Wednesday, January 28, 2009 7:36 AM
To: Vivian Liu; Evan Vokes
Cc: Marc Charland; ED Salmon
Subject: Scope of Work for Moody Contract #3511

Hello All,

Attached is the Scope of Work for the existing Contract with Moody that I promised I would send.

Regards,

Dan

Dan MacInnes

TCPL, Contract Analyst Supply Chain Services

Phone: (403) 920-5404

Cell Phone: (403) 835-2789

Fax: (403) 920-5444

016092

TES-ENG-POE **Practice of Engineering within TransCanada**		Document Type: Specification
Effective Date: 2008/01/11	Revision: 4	Status: Work in Progress
Classification Code: DE-16	Document Owner: Asset Reliability	
Reviewer: Dan King, Asset Reliability		Signature/Date (signed copy on file)
Reviewer: James Baggs, Vice President, Field Operations and Engineering		Signature/Date (signed copy on file)
Reviewer: Steve Schock, Vice President, Project Management		Signature/Date (signed copy on file)
Reviewer: David Montemurro, Vice President, Engineering and Operations Services - USPC		Signature/Date (signed copy on file)
Reviewer: Steve Emond, Vice President, System Design & Commercial Operations		Signature/Date (signed copy on file)

PURPOSE

This document addresses the requirements for the Practice of Engineering within TransCanada Pipelines Limited (TransCanada). The intent of the document is to ensure engineering work is prepared, revised, reviewed and approved in accordance with TransCanada policies and procedures.

SCOPE

This document covers all activities within TransCanada defined as the Practice of Engineering and applies to all such activities that are performed or are to be implemented for all TransCanada facilities.

BRIEF DESCRIPTION OF CHANGE

Updated to reflect the increased scope of work in the U.S. and the increased presence of engineers located in other states and provinces.

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1 PURPOSE

This document addresses the requirements for the Practice of Engineering within TransCanada PipeLines Limited (TransCanada). The intent of the document is to ensure engineering work is prepared, revised, reviewed, and approved consistently and in accordance with TransCanada policies and procedures whether performed internally or externally and in accordance with local rules and regulations. TransCanada holds a Permit to Practice for the Province of Alberta. Some special requirements are required to maintain this permit and are also included in this document.

2 SCOPE

2.1 This document covers all activities within TransCanada defined as the Practice of Engineering and applies to all such activities that are performed or are to be implemented for TransCanada's regulated and non-regulated facilities. Work performed internally and externally, though handled differently, is all included in the scope of this document.

2.2 The Practice of Engineering within TransCanada shall be, at a minimum:

a) Consistent and in compliance with the TransCanada Policies, Guidelines / Principles as described in Section 4.
b) For non federally regulated engineering work completed in the province of Alberta, where TransCanada holds a Permit to Practice engineering, consistent and in compliance with the latest approved version of the Government of The Province of Alberta, Engineering, Geological and Geophysical Professions (EGGP) Act and Regulations, as well as the APEGGA Code of Ethics, By-Laws and the intent of related published guidelines.
c) For federally and non federally regulated facilities, consistent and compliant with the latest approved version of the laws and regulations of the appropriate jurisdiction.

2.3 The Practice of Engineering within TransCanada includes all engineering work completed by TransCanada core (permanent) employees.

2.4 The Practice of Engineering within TransCanada includes all engineering work completed by an In House Contractor. In all cases when the In House Contractor is the Designer, they shall be the Responsible Engineer (See Section 3 Definitions) and shall sign, (and/or stamp), in accordance with Section 4 and Appendix A, all engineering documents that are produced as a result of their Practice of Engineering.

2.5 Although this Practice of Engineering document does not cover specific procedures to be followed by external companies performing engineering work for TransCanada, only companies having comparable standards, procedures and quality assurance processes will be engaged to complete this work. Engineering work prepared by external companies shall be signed and stamped (as required by the applicable jurisdiction) by the responsible Professional Engineer and include the company's Permit to Practice / Certificate of Authorization (as applicable) for the province or state where the engineering work is to be implemented. TransCanada staff will ensure that sufficient controls are in place to ensure that the work done by external companies conforms to this standard. TransCanada staff must implement adequate quality control procedures for external companies.

2.6 Nothing in this Practice of Engineering document is intended to prevent a qualified person, such as an Engineering Technologist, from assisting in the performance of any professional service or work of the kind described in the definition of Practice of Engineering if a Responsible Engineer directly supervises and assumes full responsibility for the service or work.

2.7 Nothing in this Practice of Engineering document is intended to overrule or place less stringent requirements than those required by the appropriate rules and regulation for that jurisdiction. In all cases the Responsible Engineer shall be accountable for ensuring that they are complying with the applicable rules and regulations for the location in which the work is to be implemented when they sign and date Engineering Documents.

2.8 This Practice of Engineering document includes the general process procedures for design and engineering document preparation, revision, checking, and approval. Specific detailed process area procedures required to complete each of the general process steps are not included.

2.9 This Practice of Engineering document does not include specific quality assurance procedures with respect to preparation, revision, review and approval of engineering documents. Those procedures are included in the Quality Management Systems documents. (Section 5, Ref. 8)

3 DEFINITIONS

Accountabilities and responsibilities are identified in Appendix A – Approval Matrix for Engineering Documents for the preparation, revision, review and approval of Engineering Documents. Samples of completed title blocks for approved drawings are indicated in Appendix B – Approved Drawing Border Samples.

The terms used in this document are as follows:

Act — Act, laws or regulations governing the practice of engineering in the respective provincial or state jurisdiction in which the work is being performed.

Active Controller — Person or persons designated to act on behalf of TransCanada to manage the scope of work performed by Contractors for facilities maintenance and construction in conformance with company Health, Safety and Environmental policies, standards, and procedures and in compliance with TransCanada and legislative requirements. Active control covers work by pre-approved contractors and does not involve contract management. Responsible for ensuring as-built mark-ups reflect final construction changes.

As-Built Drawing — Drawings produced by or for TransCanada from information provided by TransCanada's Construction Manager, Contractor and TransCanada's construction surveyor, recording changes during construction. Record Drawings are a subset of the As-Built Drawings. These drawings contain Engineering Revisions (see definition below).

Construction Manager	An individual responsible for management of the project construction. Responsible for ensuring that adequate technical inspection is carried out and construction conforms to drawings and specifications. Responsible for obtaining approval, as required, from the Responsible Engineer/RPT when initiating Engineering Revisions. Responsible for ensuring as-built mark-ups reflect final construction changes.
Data Sheets	An information sheet which specifies design parameters, operating conditions and other data required to enable the supplier to provide a product or service which meets the conditions intended. Does not include Purchase Orders when such information is included on the Purchase Order and that information has been derived from an Engineering Document.
Design Discipline Checker	A Professional Engineer or Engineering Technologist responsible for performing an independent check on the portions of the design that relate to the Design Discipline Checker's technical training and area of expertise. Responsible for ensuring that the design conforms to applicable codes, TransCanada's guiding principles, design standards and standard designs and incorporates due diligence and Health, Safety, Environment and Risk requirements, as applicable. Design discipline checks shall not be conducted by the Designer.
Designer	A qualified individual who prepared the design. Responsible for reviewing and accepting responsibility for use of appropriate standards and / or standard designs, and for preparing engineering designs, bills of materials, specifications, reports and other Engineering Documents.
Design Notes	Documentation of the calculations, governing codes, standards and/or procedures used to calculate the design parameters which fulfill the requirements of a particular design or part of a design. Design Notes may include formal or informal written notes or addendum on assumptions, philosophies, references and decisions which contribute to the final design and form part of the overall calculations. Design Notes are intended to document details and particulars essential to the design process and end product.
Design Standards	Internal engineering documents that provide the rationale and guidelines for repetitive engineering work. Specific documents include philosophies, directives, procedures, specifications, standard drawing lists, data sheets and drawings. These documents also define the applicability of industry standards, codes, acts and regulations.
Drafter	An individual (internal or external) who prepared drawings, drawing revisions (which include Engineering Revisions), As-Built Drawings and Record Drawings in accordance with the Design Notes, the sketches provided by the Designer, the as-built information or the record information.

Drafter Checker /Drafting Coordinator	An individual responsible for performing checks on the portions of the engineering drawings that relate only to the Drafter Checker's technical training and area of expertise. Responsible to review drawings for dimensional accuracy and conformance to TransCanada drafting standards. The requirements for an independent drafting check shall be determined by the specific process area. Drafting coordinators also act as the liaison between the drafter and the engineer or Project Manager.
Engineering Document	Letters and / or instructions, designs, drawings, studies, reports, manuals, specifications and / or data sheets, technical agreements, standard design addendum, produced as a result of the Practice of Engineering. Refer to the various types of Engineering Documents identified in Appendix A – Approval Matrix for Engineering Documents.
Engineering Revision	A modification or addition to an existing physical asset or approved design for such an asset where the change impacts the sizing or selection of materials or components and/or affects the safety/design of the system or sub-systems forming the asset. These changes would normally require a change to the engineering drawings, specifications, or other Engineering Documents. The documentation and control process for engineering revisions constitutes part of the management of change process.
Engineering Technologist	A person who: a) has received and engineering technology diploma or equivalent training, b) who engages in the Practice of Engineering, c) prepares engineering designs for which a Responsible Engineer accepts responsibility, d) whose engineering practice is subject to such supervision and controls as the Responsible Engineer considers appropriate in the circumstances e) may be registered in a local Engineering Technologists association.
Final Drawings	Final Drawings for the purposes of this document and the approval matrix are as follows: a) IFC – issued for construction b) IFB – issued for bid or standard drawings that are intended for use in fabrication / construction c) Any subsequent drawings after release of the above drawings
In House Contract Engineer	A Professional Engineer or otherwise qualified person who is not a TransCanada core (permanent) employee and is engaged in the Practice of Engineering under TransCanada's Permit to Practice or who is engaged in the Practice of Engineering for TransCanada, when the engineering work is completed "in house".
Issue for Bid (IFB) Document	An Engineering Document issued for tender. Should be signed, (stamped), and dated by the Responsible Engineer/RPT only if considered "final" and/or will be used for construction.
Issue for Construction (IFC)Document	An Engineering Document issued for construction. Should be signed, (stamped), and dated by the Responsible Engineer/RPT.

Manager / Discipline Leader	An individual responsible for ensuring the engineering work processes conform with TransCanada practices, procedures, engineering standards, due diligence and Health, Safety, Environment and Risk requirements. Also accountable for ensuring that personnel carrying out those processes are qualified to do so for the location where the work is to be implemented.
Permit Holder (Alberta)	A corporation, partnership or other entity that holds a Permit to Practice pursuant to the Alberta Act. (Section 5, Ref. 6, Appendix A)
Permit Number	TransCanada's assigned number under the Alberta Engineering, Geological and Geophysical Professions Act. TransCanada's defined scope of engineering under this permit is: the prepare designs, specifications and plans, conduct evaluation and make recommendations for the construction, inspection, maintenance and operation of natural gas transmission and power generation facilities. When placed on Engineering documents shall appear as "APEGGA P07100" and shall be applied whenever an Alberta Professional Member's stamp is applied
Permit to Practice	The authority to engage in the Practice of Engineering as represented by a permit certificate issued by the local state or provincial authority. This is only relevant in certain jurisdictions such as Alberta.
Practice of Engineering	Engineering work as defined in this document.
Professional Engineer	For the Practice of Engineering where the work is performed or when Engineering Documents are required to be stamped, signed and dated for: **Alberta**: An individual who holds a certificate of registration to engage in the Practice of Engineering under the Act. (Section 5, Ref. 5, Act, Section 1(r)). **Other Provinces and States**: As defined in the appropriate jurisdiction's act or regulations
Project Manager	An individual accountable for overall management of the project scope, cost, quality and schedule. Responsible for ensuring that the combination of approved documents comprising the total project reflects the scope. Responsible for ensuring that file copies of Engineering Documents are maintained as required.
Project Scoping Documents	A document developed by the project team which defines the scope of work, operating philosophy and design parameters for a project. Scoping documents include Design Concept Manuals (DCM), Design Basis Memorandums (DBM) and Front End Engineering Design (FEED).
Project Team	The individuals assigned to a project. The team will involve all required personnel including, but not limited to, design, procurement, construction, risk management, land and community.

Record Drawing	As-Built/Construction drawings produced by TransCanada that record engineering changes during construction. These drawings are considered to be documents that a professional member created to record design changes for which he or she is accepting responsibility and have to be reviewed and approved accordingly.
Responsible Member	For practice in Alberta, the Responsible Engineer authorized in the Permit to Practice (Professional Engineer) to assume accountability for TransCanada's permit held in accordance with the Alberta Act. The Responsible Member is accountable for quality control procedures to reasonably preclude errors or omissions in the technical content, resulting in a complete and accurate Engineering Document. Outside of Alberta, Responsible Members have the same accountability, but are not registered with APEGGA.
Responsible Engineer	The Responsible Engineer is the Professional Engineer, or person otherwise qualified by code or regulation to perform engineering tasks, professionally and legally accountable for quality control procedures to reasonably preclude errors or omissions in the technical content, resulting in a complete and accurate Engineering Document.
Specifications	A TransCanada Engineering Document which describes the technical requirements of a product or service, and may include the minimum requirements for design, manufacture, qualification, inspection and testing of an end product. Specifications can be site specific or a company standard that has pre approval by TransCanada as it pertains to this Practice.
Standard Design	A pre-engineered design of a component, assembly or system that requires completion of site specific work and confirmation that the standard design and scope applies, prior to use in a project. Includes approved, signed, (and stamped) Engineering Documents. These documents do not have to be resigned when they are reused.
Standard Design Addendum	A project/site specific modification to a Standard Design.

4 DESCRIPTIONS

4.1 Policies, Guidelines / Principles

4.1.1 A Manager / Discipline Leader shall be responsible for ensuring the engineering work processes conform to TransCanada practices, procedures, engineering standards, due diligence, health, safety, environment and risk requirements. They are accountable for ensuring that personnel carrying out those processes are competent and qualified to do so for the location where the work is to be implemented.

4.1.2 The Designer shall undertake only work that they are competent to perform by virtue of training and experience.

4.1.3 All "final" engineering work shall be reviewed by a Design Discipline Checker, in accordance with Appendix A – Approval Matrix for Engineering Documents. This independent check shall be conducted on the portions of the design that relate to the Design Discipline Checker's technical

training and area of expertise and shall be conducted for accuracy, technical content and to ensure project specific and TransCanada requirements are met.

4.1.4 The Project Manager shall organize or lead an interdisciplinary check (IDC), as applicable, for the "final" engineering work prepared by all relevant engineering disciplines.

4.1.5 All Engineering Documents that are complete and ready for use must be signed, (stamped) and dated in accordance with Section 4.2 (Requirements for Stamps and Signatures) and Appendix A – Approval Matrix for Engineering Documents.

4.1.6 The Responsible Engineer shall be accountable for and accept professional responsibility for the work as indicated by the signing and dating of the Engineering Documents. Signing and dating a document as the Responsible Engineer without stamping shall be considered equivalent to the Responsible Engineer applying their stamp, signing and dating. In the case of work prepared by others, the Responsible Engineer shall ensure supervision and control of the Designer is adequate such that they can accept professional responsibility for the work.

4.1.7 The Responsible Engineer shall only accept professional responsibility for portions of the work that relate to their technical training and area of expertise with respect to the location where the work is to be implemented. The Responsible Engineer may be registered in any province or state. However, for work on non federally regulated systems or facilities, the Responsible Engineer shall be registered with the appropriate engineering body.

4.1.8 The Responsible Member shall be accountable for quality control procedures and ensure that quality is managed by implementing the TransCanada's Professional Practice Management Plan (PPMP) and the requirements of this document. The quality control procedures shall be such as to reasonably preclude errors or omissions in the technical content, resulting in a complete and accurate Engineering Document. For work in Alberta, the Responsible Member shall be a Professional Engineer authorized in TransCanada's Permit to Practice to assume accountability for the permit.

4.1.9 Quality assurance shall be documented on the "final" engineering work through sign-off as identified by the accountabilities and responsibilities in Appendix A – Approval Matrix for Engineering Documents.

4.1.10 Approval of As-Built Drawings indicates the Engineering Revisions documented during construction meet the applicable design requirements.

4.1.11 Approval of Record Drawings indicates that all information relating to Engineering Revisions provided by a third party not under the approvers direction, supervision or control, has been accurately recorded on the drawings. Prior to approval the approver shall establish that a third party Professional Engineer is taking professional responsibility for Engineering Revisions recorded on the drawing.

4.2 Requirements for Stamps and Signatures

4.2.1 Signatures and Stamps for Federally Regulated Systems (See Appendix B)

a) The Drafter, Drafting Checker, Designer and Design Discipline Checker initial in the appropriate locations on the Engineering Document.

b) The Responsible Engineer must sign with a full signature; indicate their professional designation and date. **Stamping of documents is not required**. Such authentication indicates that professional responsibility is being taken for the document and shall be considered equivalent to the Responsible Engineer applying their stamp, signing and dating.

c) The Project Manager initials in the appropriate location on the Engineering Document.

Notes:

1) Many of TransCanada's facilities are federally regulated and therefore specific provincial and state **engineering stamps are not required**. However, all work will be governed by management systems as defined in this document, including qualifying elements. The signing and dating by the Responsible Engineer indicates that professional responsibility is being taken for the document and shall be considered equivalent to the Responsible Engineer applying their stamp, signing and dating. The engineer may apply their stamp should they so desire.

2) Some Engineering Documents for the federally regulated pipeline systems may require stamps to obtain permits or approvals from provincial jurisdictions (traditionally for development, building and drainage type permits). The Responsible Engineer, a provincially or state registered Engineer or Technologist licensed to complete this type of work, shall apply the relevant provincial or state engineering stamp, sign and date and take professional responsibility for the document in accordance with the provincial Act, Regulations, By-Laws and the intent of any related published guidelines for that province or state.

4.2.2 Signatures and Stamps for Non Federally Regulated Entities (See Appendix B)

a) The Drafter, Drafting Checker, Designer and Design Discipline Checker initial in the appropriate locations on the Engineering Document.

b) The Responsible Engineer must apply their stamp, sign with a full signature and date. Registration in the appropriate jurisdiction and **stamping of documents is required.**

c) The Project Manager initials in the appropriate location on the Engineering Document.

Notes:

1) In jurisdictions where it is necessary to obtain a Permit to Practice (or equivalent) in order to carry out engineering work on state or provincially regulated facilities, the Permit number or stamp must appear in proximity to the professional members stamp depending on the requirements of the specific jurisdiction. Note, for Alberta a permit stamp is not required, only the permit number.

4.3 Professional Practice and Use of Professional Seal or Stamp

4.3.1 Where Engineering Documents are required to be stamped as indicated above, the Responsible Engineer shall be accountable for ensuring that they are complying with the Acts, Regulations

and By-Laws for the province or state where the engineering work is performed and/or is to be applied/implemented when they apply their stamp, sign and date Engineering Documents.

4.3.2 Limitations on the accuracy of preliminary Engineering Documents may exist; therefore those documents should not be signed (and stamped). Instead, preliminary Engineering Documents should be marked "Preliminary - Not for Construction". Issue for Bid (IFB) documents should be signed, (stamped), and dated only if they are considered complete and/or will be used for construction.

4.3.3 All signatures (and stamps) shall be manually applied to engineering documents.

5 REFERENCES AND ADDITIONAL RELEVANT MATERIAL

The Practice of Engineering shall comply with the current edition of the following as well as other relevant documents (as applicable):

1. TransCanada Workplace Policies – Code of Business Ethics
2. TransCanada Engineering Professional Practice Management Plan (PPMP)
3. The Engineering, Geological and Geophysical Professions Act, Regulations and By-Laws (APEGGA)
4. Professional Standards for Authenticating Professional Documents (APEGGA)
5. Professional Practice - A Guideline (APEGGA)
6. Environmental Practice - A Guideline (APEGGA)
7. Guideline for the Use of Computer Software Tools by Professional Engineers and the Development of Computer Software Affecting Public Safety or Welfare (Association of Professional Engineers Ontario)
8. TransCanada internal Quality Management System documents.

APPENDIX A: APPROVAL MATRIX FOR ENGINEERING DOCUMENTS

Engineering Document	Drafter	Drafting Checker	Designer	Design Discipline Checker	Construction Manager	Project Manager	Responsible Engineer
Engineering Design Standards			R	R			A
Standard Designs			R	R			A
Project Scoping Documents Note 7			R	R		A	Note 7
Final Drawings (Standard Designs or Site Specific) Note 8	R	R	R	R		R*	A
Project Specifications Note 9			R	R		R*	A
Project Data Sheets Note 10			R	R			A Notes 1,2
Design Notes / Calculations Note 11			R	R			N/A Note 3
Studies, Reports and Manuals Note 12			R	R		R*	A
Engineering Revisions Note 13	R	R	R	R	R**	R*	A
As-Built Drawings Note 14	R	R			R**		A Note 5
Record Drawings	R	R				R	A Note 6
Direction Note 15				R			A
TOPS/Procedures Note 16				R			A
Control Software Note 4							A
Engineering Software (Creation) Note 17			R				A

A = Accountable — Individual who is ultimately accountable for the task. Full signature and date is required as well as a stamp if required in Section 4.2.

R = Responsible — Individual(s) who performs the task and initials the Engineering Document.

R* = Responsible — Individual(s) who ensures the combination of documents reflects the scope and verifies this by initialing the Engineering Document. Not required for Standard Designs.

R** = Responsible — Individual(s) who ensures that changes during construction including Engineering Revisions are accurately recorded and verifies this by initialing the redline marked up prints.

APPROVAL MATRIX FOR ENGINEERING DOCUMENTS NOTES:

1. Data Sheets that do not involve the Practice of Engineering are not signed (or stamped) as the responsibility for design and manufacturing of the final engineering product resides with others. Data Sheets involving the Practice of Engineering to specify the final product are to be signed (and stamped) to ensure the design parameters indicated in the data align with the calculations prepared or reviewed by the Responsible Engineer to specify the final product.

2. When multiple Data Sheets are packaged together, a cover sheet may be signed (and Permit Number applied). Individual Data Sheets do not require signing (or the Permit Number applied).

3. Design Notes are not required to be stamped. Instead, Design Notes are an input into the final design contained in the Engineering Documents which are to be signed (and stamped).

4. Includes control software development or major revisions to existing control software. Major revisions can be defined as changes that significantly alter the existing design. The management of changes shall adhere to the principles and procedures laid out in the "Guidelines for Software Management" document in use throughout Engineering and the Regions. The professional's stamp/signature shall be affixed to a copy of the revision log sheet as detailed in the above document. A copy of the software should be attached to the copy of the revision log sheet and stored for future reference. Quality assurance is achieved via testing / commissioning. NTD: The US TOP may require update to meet this requirement.

5. Designer's initial, Responsible Engineer' s signature (and stamp) and permit number (or stamp as applicable) are not required for an As-Built Drawing if there are no Engineering Revisions to the preceding drawing that was signed (stamped) and dated for construction purposes. If an As-Built Drawing contains Engineering Revisions it may be considered a Record Drawing.

6. A TransCanada Responsible Engineer's signature (stamp) and permit number (or stamp as applicable) should be applied to a Record Drawing and the project manager must initial the drawing as per Section 4.1.11.

7. Project Scoping documents that require approval, signature and possible stamp by the Professional Person are those that incorporate engineering calculations or other information based on engineering knowledge, skill or judgment in which the public takes a trust. Examples may include some Design Concept Manuals or Design Basis Memorandum depending on their complexity.

8. All Final Drawings are a record of engineering work and will be approved as per the approval matrix.

9. Specifications will follow the requirements of the approval matrix if the development of the specification requires the application of scientific principles to develop new or revised requirements for equipment, materials or processes. A specification to replace a piece of equipment with a "like kind" replacement is not an engineering specification and does not need to follow the requirements of the approval matrix.

10. Data Sheets that document engineering decisions, calculations, or other information based on engineering knowledge, skill or judgment in which the public takes a trust shall follow the approval requirements shown in the approval matrix.

11. Design Notes that include assumptions that form the basis of a design shall follow the requirements of the approval. Any original design calculations will also follow the requirements of the approval matrix.

12. Engineering Studies, Reports and Manuals shall follow the approval requirements of the approval matrix only if they document engineering aspects as defined elsewhere in the matrix.

13. Engineering revisions shall follow the requirements of the approval matrix if the revision impacts the safety of the construction activities, or will be placed into service before approval of the As-Built Drawing.

14. As Built Drawings document the final state of the facility and as such shall be approved as per the approval matrix. Only those drawings documenting engineering aspects of a project need to be as-built for this purpose; however drawings that facilitate maintenance may also be as-built.

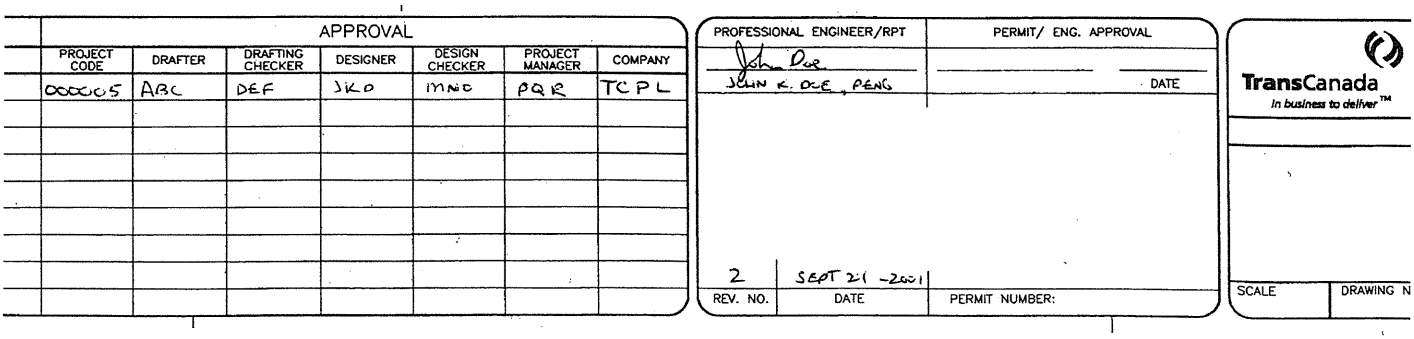
15. When direction is given to other people that involves aspects of engineering as described elsewhere in the approval matrix, a description of the direction should be generated, approved as per the matrix requirements and properly archived.

16. TOPS and procedures that contain aspects of engineering as described elsewhere in the approval matrix shall be reviewed and approved as per the matrix requirements. TOPS that contain engineering content are specifically identified.

17. The creation or modification of Engineering Software shall be reviewed and approved as per the matrix requirements. Engineering Software is a tool that automates engineering calculations or analysis for routine use. Routine use of the software is not usually considered and engineering function but is still subject to suitable quality assurance requirements.

APPENDIX B: APPROVED DRAWING BORDER SAMPLES

a) Approved Drawing Border for Federally Regulated Systems:



APPROVAL						
PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
000005	ABC	DEF	JKD	MNO	PQR	TCPL

PROFESSIONAL ENGINEER/RPT: John Doe — JOHN K. DOE, PENG

PERMIT/ ENG. APPROVAL — DATE

TransCanada — In business to deliver™

REV. NO.	DATE	PERMIT NUMBER:
2	SEPT 21 -2001	

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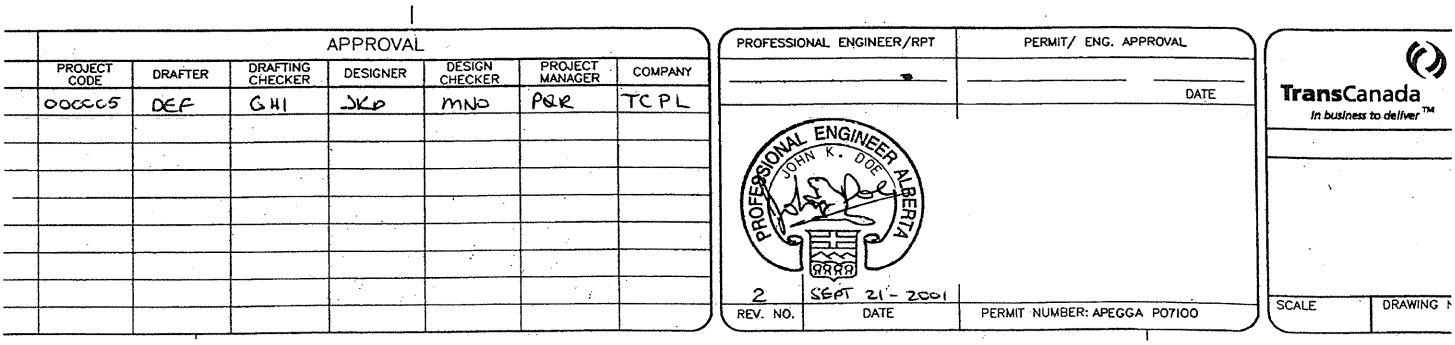
b) Approved Drawing Border for non Federally Regulated Systems:



APPROVAL						
PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
000005	DEF	GHI	JKD	MNO	PQR	TCPL

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER ALBERTA — JOHN K. DOE

TransCanada — In business to deliver™

REV. NO.	DATE	PERMIT NUMBER: APEGGA P07100
2	SEPT 21 - 2001	

SCALE | DRAWING N

Note: The appropriate state or provincial stamp and permit number (if applicable) shall be substituted for the Alberta stamp and number shown in the example above.

APPENDIX C: SUPERVISION AND CONTROL

In the practice of Engineering it is normal for Professional Engineers and Technologists to rely on the work or information prepared by others. A good guideline for this situation can be found in the APEGGA document "Guideline for Relying on Work Prepared by Others".

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Fax: (403) 920.2357
E-mail: Kevin_thrasher@transcanada.com

October 5, 2010

Filed via Fax

National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta
T2P 0X8

Attention: Ms. Anne-Marie Erickson, Secretary of the Board

Dear Ms. Erickson:

Re: TransCanada Keystone Pipeline GP Ltd. ("Keystone")
Cushing Expansion Project ("Project")
Order XO-T241-07-2008 ("XO-T241-07-2008")
Leave to Open Application ("LTO Application") for Pump Station 06 ("PS-06") at Lakesend, Alberta and LTO Application for Pump Station 08 ("PS-08") at Oyen, Alberta
NEB File: OF-Fac-Oil-T241-2007-01 01

Further to Keystone's September 17, 2010 letter to the National Energy Board ("Board"), Keystone provides the following explanation with regard to its request to withdraw the LTO Applications for PS-06 and PS-08 from consideration by the Board. On September 10, 2010, Keystone filed LTO Applications for PS-06 (NEB Filing ID: A26226) and PS-08 (NEB Filing ID: A26228) as part of its Board requirements to commence operations on the Project authorized under Order XO-T241-07-2008. After filing the LTO Applications, Keystone became aware of a verification issue relating to the pressure testing data and materials ("Data") that were filed with those applications.

More specifically, the Leave to Open Declarations ("Declaration") that are included in Keystone's LTO Applications generally state that, "This Declaration document has been prepared pursuant to *Guide T* of the *NEB Filing Manual*…". In turn, *Guide T* (also set out under *Onshore Pipeline Regulations, 1999*, section 25) directs that applicants are to confirm that pressure testing was performed under the direct supervision of a company representative. On September 16, 2010, Keystone confirmed that a company representative was, in fact, not present during off-site quality assurance hydrostatic testing relating to fabrication and welding of pipe components that were to be installed at PS-06 and PS-08. The company representative inspector ("CR") that was responsible for oversight and verification of this testing, which is commonly referred to as "shop testing", had mistakenly delegated his responsibilities to a Certified Engineering Technologist ("CET") and qualified inspector who was not, technically, a

representative of Keystone. Keystone's primary contractor for constructing pump unit additions in the Project is Whaler Industrial Contracting Inc. ("Whaler") and their fabrication sub-contractor responsible for producing pipe components for PS-06 and PS-08 is Rambler Fabrication Inc. ("Rambler"). The CR had requested that the CET, an employee of Whaler, verify the fabrication and hydrostatic testing of the components that were being constructed by Rambler while he was attending to some other of his Project responsibilities. The Whaler employee to whom the CR delegated inspection responsibility, in addition to being a CET, is an API Pressure Vessel Inspector as well as a Certified Welding Inspector. Keystone informs the Board that, prior to commencing construction of the Project, all Keystone inspectors were given thorough training on Keystone inspection procedures and were specifically instructed to follow Keystone's Hydrostatic Test Specification 017617-4000-46ES-0005 ("Specification"). Under the Specification, section 3.2, "All testing operations shall be performed under the direct supervision of the TCPL's representative or qualified inspector." It is Keystone's understanding that the CR believed that the oversight and verification of the hydrostatic shop testing had to be undertaken by a qualified inspector but was not aware that the overseer must also be a company representative. Unfortunately, the Project Manager for PS-06 and PS-08 was not aware of this oversight when he signed the Declaration for the LTO Applications, which were originally filed with the Board on September 10, 2010.

Immediately following the discovery of this issue, Keystone took steps to rectify the situation, requesting the withdrawal of the LTO Applications from Board consideration on September 17, 2010, and reviewed its instruction procedures for its inspectors. Most importantly, Keystone informed the Board that it would be undertaking new hydrostatic testing at PS-06 and PS-08 for all components that were not tested in the presence of a Keystone company representative.

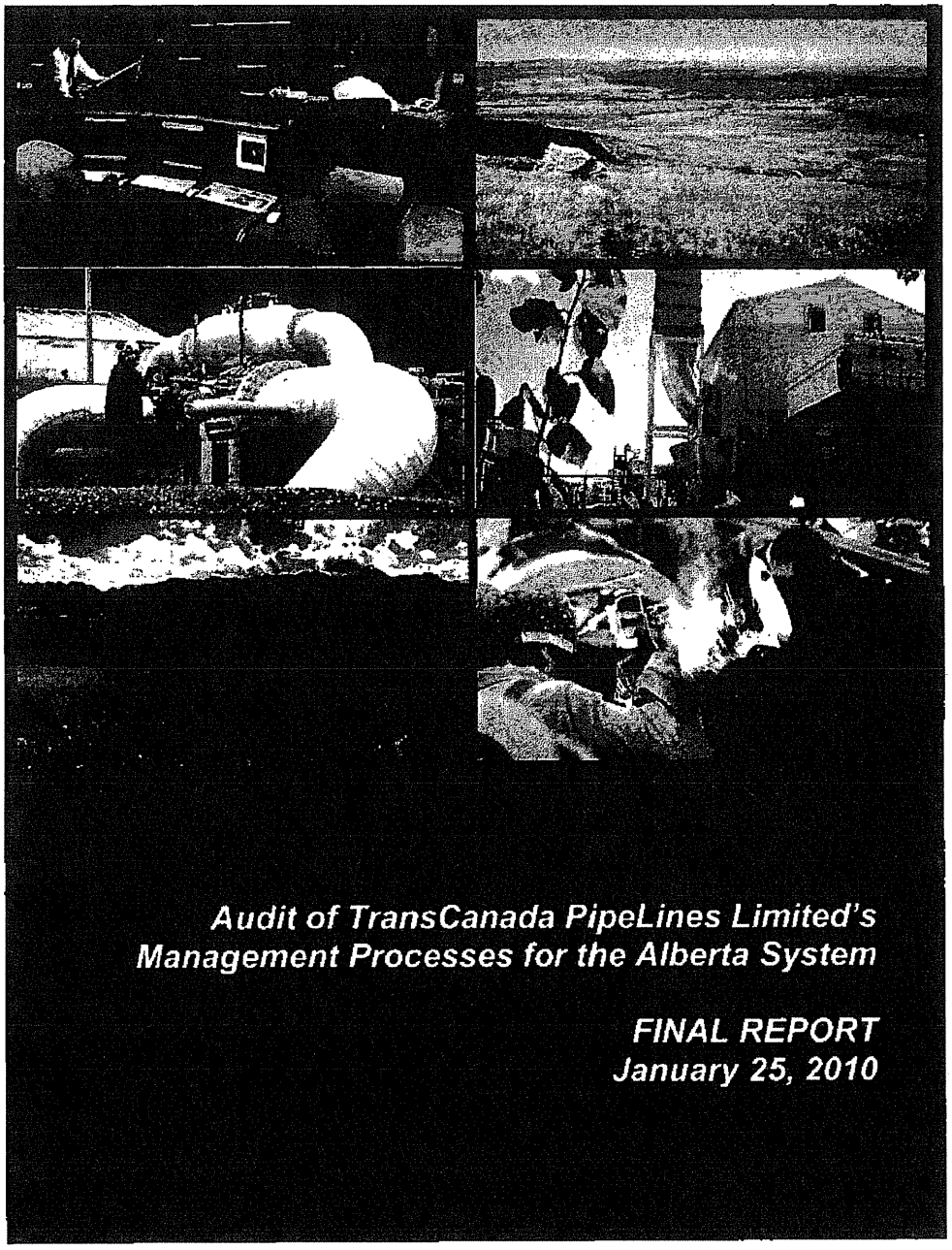
Subsequent to discovery of this issue, Keystone has instructed all of its CRs that the Specification must align with the *Guide T* requirement for a company representative to be present for all testing. The Specification means that a company representative or *company representative that is a qualified inspector* must be present for all hydrostatic testing. Additionally, Keystone has confirmed that all CRs responsible for overseeing hydrostatic testing relating to the construction of any facilities authorized by XO-T241-07-2008, personally witnessed the hydrostatic testing carried out either in the field or at fabrication shops. This hydrostatic testing includes all of the new pump stations or additional pump units for stations previously authorized. Keystone has further confirmed that CRs will be present for any future hydrostatic testing that will be undertaken for new construction authorized under XO-T241-07-2008.

Keystone trusts that the above explanation and go-forward strategy addresses any outstanding matters concerning its request to withdraw its LTO Applications for PS-06 and PS-08. Please note that, as indicated previously, new pressure testing for PS-06 and PS-08 for affected piping has been completed and will be re-filed with the LTO Applications for those facilities under section 47 of the *National Energy Board Act*, R.S.C. 1985, c-N-7 and subject to the conditions prescribed by XO-T241-07-2008. Supporting Data for the LTO Applications will be compliant with *Guide T* of the Board's *Filing Manual*. The LTO Applications for PS-06 and PS-08 will be filed separate from this submission and no later than October 8, 2010.

Should the Board have any additional questions, please contact Kevin Thrasher at (403) 920-7838 (kevin_thrasher@transcanada.com). Alternatively, you may contact Mark Manning at (403) 920-6098 (mark_manning@transcanada.com).

Yours truly,
TransCanada Keystone Pipeline GP Ltd.

Kevin Thrasher
Senior Legal Counsel
Law and Regulatory Research



Audit of TransCanada PipeLines Limited's Management Processes for the Alberta System

FINAL REPORT
January 25, 2010

PRICEWATERHOUSECOOPERS

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1 Introduction

1.1 About TransCanada and the Alberta System

1.1.1 TransCanada

TransCanada Corporation is a leading North American energy company focused on natural gas transmission, power generation, and gas marketing services. The company operates approximately 59,000 km (36,500 miles) of wholly owned pipeline with interest in another 7800 km (4800 mi), transporting a daily volume of roughly 15 billion cubic feet within Canada, the United States, and Mexico.

TransCanada owns and operates three main pipelines in Canada:

- The Alberta System (also occasionally referred to by its historic legal name NOVA Gas Transmission Limited or NGTL)
- The Canadian Mainline
- Foothills Pipeline

The company also operates the Trans Quebec & Maritimes Pipeline.

This audit report addresses the Alberta System only and was prepared for TransCanada on behalf of NOVA Gas Transmission Limited.

1.1.2 The Alberta System

The Alberta System is a 23,500 kilometre (14,100 miles) pipeline network that gathers natural gas for use both in Alberta and for delivery to provincial border points for export to North American markets. It is one of the largest systems in North America and gathers 66 per cent of the natural gas produced in Western Canada. A map of the Alberta System is presented in Appendix 1.

1.2 Assignment Background

Prior to 2009, TransCanada's Alberta System was provincially regulated by the Alberta Utilities Commission (AUC). In June of 2008 TransCanada applied to the National Energy Board (NEB) to effect recognition that the Alberta System is by law properly within Canadian federal jurisdiction and subject to regulation by the Board as part of a single federal undertaking. On April 15, 2009, the NEB issued Certificate of Public Convenience and Necessity GC-113 (the "Certificate") for the continued operation of the Alberta System under federal jurisdiction. The Certificate was issued pursuant to the Board's determinations in Decision GH-5-2008 and was effective on April 29, 2009. The

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Alberta System on that date ceased to be under provincial jurisdiction, came under federal jurisdiction, and is now subject to regulation by the Board.

Condition 10 of the Certificate required TransCanada to engage a third party auditor to undertake an audit of the Alberta System within nine months of the effective date of the Certificate. In October 2009, TransCanada engaged PricewaterhouseCoopers LLP ("PwC") as the third party auditor.

1.3 Objective

The primary objective of the audit was to evaluate the implementation and effectiveness of the compliance management processes and systems within the Alberta System designed to achieve the goals of the *Onshore Pipeline Regulations (1999)* and other NEB requirements.

1.4 Scope

1.4.1 Organizational scope

Our audit was limited to the Alberta System. The Alberta System does not include the company's natural gas storage facilities near Edson, Alberta, or the Foothills Pipeline.

1.4.2 Regulatory Compliance Scope

The audit focused on the company's management systems and processes and evaluated those systems in the context of their effectiveness in achieving compliance with the following Acts, Regulations, and other NEB related requirements:

- National Energy Board Onshore Pipeline Requirements, 1999
- National Energy Board Pipeline Crossing Regulations Part II, 1988
- National Energy Board All-company letter – Security and Emergency; Preparedness and Response Programs, dated April 24, 2002
- National Energy Board Proposed Regulatory Change 2006-1 – Pipeline; Security Management Programs, dated May 24, 2006
- Canadian Standards Association Z662-07 – Oil and Gas Pipelines
- Canada Labour Code Part II, Jan 2008
- Canada Occupational Health & Safety Regulations, 2009
- Canadian Environmental Protection Act, 1999
- Environmental Emergency Regulations, 2003
- National Fire Code, 2005

- National Building Code, 2005
- Other federal regulations as applicable
- Selected provincial requirements where applicable

1.4.3 Functional Scope

The audit covered a number of functional areas within TransCanada. Responsibility for worker performance within certain areas such as workplace safety and environmental protection often spanned numerous levels and groups within the organization, whereas managerial responsibility and accountability tended to rest with certain departments and groups both in the field and at head office. The key functional areas were:

- O&E Project Management
  - Pipeline Projects
  - Project Facilities
- Engineering and Asset Reliability
  - Asset strategy and integrity
  - Pipeline integrity
  - Employee development
  - Integrated public awareness
  - Materials and standards
  - Facilities reliability – electrical, control, mechanical, and civil engineering
- Security
  - Physical security (gas control)
  - Cyber security (SCADA environment)
- Community, Safety & Environment
  - Environmental protection
  - Workplace safety
  - Emergency preparedness and response
  - Land services
- Canadian Pipeline Operations Compliance
  - Regulatory monitoring
  - Incident management & reporting
  - Operational audits
- Regulatory services
- Business management services

1.5 Audit Criteria

Our audit criteria consisted of a combination of the following:

- The requirements set out in the ISO 14001 Standard for Environmental Management Systems. Because the scope of the audit extended beyond just

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environment, the ISO requirements were adapted to be more generic and applicable to the functional areas listed in 1.4.3.

- Selected sections and clauses set out in the Acts, regulations, and codes listed in 1.4.2. Although the sections and clauses were ultimately chosen based on their relevance to TransCanada's operations and the practical constraints of the audit, an effort was made to ensure that the key requirements of the Onshore Pipeline Regulations 1999 and the recent NEB letters of notification were covered.

1.6 Methodology

Our audit was conducted in accordance with the ISO 19011 Guidelines for Auditing Management Systems. As such, our audit consisted of three main stages: planning, information collection, and reporting.

1.6.1 Planning

The planning stage of the audit consisted of several key steps, as follows:

- Introductory meeting with our TransCanada contacts to confirm the background and context of the audit, as well as the audit objectives, scope, criteria and timeline for completion
- Development of audit protocols. We developed two sets of audit protocols: an Interview and Document Review Guide for use primarily at head office, and a Site Inspection Guide for use at the field level. These protocols were submitted to the NEB for their review and comment prior to commencement of the audit as per the agreement between TransCanada and NEB.
- A one-hour kick off meeting and presentation to approximately twenty TransCanada personnel at TransCanada Corporate Office to review the audit objectives, scope, criteria and timeline.
- Assembly of the audit team and assignment of roles and responsibilities
- Scheduling of the document review, interviews, and field visits
- A meeting between representatives from the NEB, TransCanada, and PwC on November 10 to discuss the audit objectives and process, the timeline, and the final deliverables.

1.6.2 Information Collection

The information collection stage consisted of the following key steps:

- We interviewed approximately 75 TransCanada personnel at head office and at selected regional/area offices. The list of interviewees is presented in Appendix 2.

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- We reviewed a large sample of TransCanada internal documents and records (both hardcopy and electronic), including but not limited to program descriptions, operating procedures, and routine performance reports. A list of these documents is presented in Appendix 3.
- We reviewed, where applicable, TransCanada's electronic databases, information repositories, reporting systems, and other intranet-enabled tools.
- We visited a sample of TransCanada field offices, operating sites, and rights of way vantage points. The field visits included a combination of interviews, document reviews, and site inspections. A summary list of the sites visited is presented in Appendix 4.
- We held daily meetings with our TransCanada Audit Project Lead to review issues and concerns identified during each day's interviews and to discuss next steps.

1.6.3 Reporting

This report contains the key observations and conclusions from our audit. We have endeavoured to provide a fair and balanced view of the areas of strength and opportunities for improvement in TransCanada's management systems and processes. Neither TransCanada nor the NEB specified a format for our report.

Several draft reports were submitted to TransCanada for review starting in late December 2009. The goal of these reviews was to ensure that the report contained no factual errors or omissions. All final conclusions and judgments based on the audit evidence collected are the responsibility of PricewaterhouseCoopers LLP.

1.7 Audit Team

The audit team comprised seven experienced PwC auditors and one external contractor retained by PwC. Team members were selected on the basis of their management systems and audit experience and familiarity with energy company operations. The team members are listed below. All are PwC staff except where noted.

s.19(1)

- [redacted] PhD, P.Biol., CEA – Project Manager and Overall Lead Auditor
- [redacted] B.Sc., M.Ec., EMSLA – Audit Team Member
- [redacted] B.Sc. – Audit Team Member
- [redacted] P.Eng., M.E.Des., EMSA – Audit Team Member
- [redacted] B.Comm. – Audit Team Member
- [redacted] B.Sc. – Audit Team Member
- [redacted] B.Sc., MBA – Audit Team Member
- [redacted] P.Eng. (contractor) – Pipeline Engineering Specialist and Audit Team Member

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1.8 Limitations

Although we visited a sample of TransCanada operations, we did not visit all sites. Although we believe our sample of sites to be sufficiently representative from an audit perspective, we cannot be responsible for identifying weaknesses in the management processes at operations we did not visit.

The scope and nature of our assessment, including the selection of sample sites, were defined with and agreed upon with the TransCanada Audit Project Lead. Had we performed additional procedures, visited other sites, or visited the selected sites at other times, other matters might have come to our attention. Our report has been prepared based on the information made available to us. We have not audited or verified the source documentation (e.g., documents provided to us), except as otherwise noted. We have no means to determine the completeness of the information provided to us during interviews or the impact of any undisclosed material facts on our comments.

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2 Summary of Key Findings

During our assessment we had the opportunity to make many observations on TransCanada's management systems and practices relevant to the audit criteria. As such, we noted many areas of both effective management as well as areas where process enhancements could and should be made. We have condensed these to a series of *themes*, which have been grouped below into "Strengths" and "Opportunities for Improvement". A summary of our audit observations and findings is presented for each management system element in Section 3 of this report.

We have noted in Section 2.3 the areas where TransCanada has made or is in the process of making management process changes as a result of the change in regulatory authority from the AUC to the NEB.

2.1 Key Strengths

2.1.1 With very few minor exceptions, the management processes and systems used within TransCanada's Alberta System are the same processes used in the company's other NEB regulated pipeline operations.

Our interview and documented evidence indicates that, with few exceptions (see Section 2.3), TransCanada employs the same management programs and processes within its Alberta System as it does in its other pipeline operations. In particular, the TransCanada Operating Procedures (TOPs), which are relied on by management and field staff for planning and executing operational and maintenance activities, have been intentionally designed to meet the strictest regulatory requirements within their operating areas, and have been implemented across the company's entire operations. All other management processes – for example project management, pipeline integrity, and the audit program – are likewise universal rather than tailored to certain regions or operations. As a result, TransCanada management and staff have not experienced and do not anticipate any significant program changes or difficulties as a result of the change in regulatory authority from the AUC to the NEB.

2.1.2 There is a sound understanding of the regulatory requirements and standards across the company.

We noted during our interviews that management and staff had a high degree of familiarity with OPR 99 and other NEB requirements. Numerous TransCanada staff are in regular direct contact with the NEB on specific regulatory issues or are actively involved in the Canadian Energy Pipelines Association working groups which regularly meet to discuss the regulatory requirements. TransCanada's technical/engineering staff

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in particular are very familiar with the CSA Z662-07 standard, with numerous interviewees indicating they were members of the technical committees that either wrote the original standard or are in the process of reviewing and updating it.

2.1.3 TransCanada's management systems and programs have been specifically designed to comply with the NEB and other regulatory requirements.

During our interviews, program managers across all the functional areas frequently pointed to specific requirements within OPR 99 and/or the CSA Z662-07 as the basis for their programs and procedures. Also, as mentioned in 2.1.1, the process for developing and maintaining the TOPs involves a review of the applicable regulations in each jurisdiction where the company operates and selecting the strictest as the basis for the procedure.

2.1.4 The company has developed an extensive inspection and audit program and culture

The company has developed a comprehensive multi-tiered program of inspections and audits for all its operations. The program is structured as follows:

Tier 4	Third party audits and inspections conducted by third parties, including regulators. Focus on regulatory compliance and management system effectiveness.	Company-wide every 3 to 5 years
Tier 3	HSE management system reviews conducted by internal TransCanada teams.	Every region and major facility every 2 to 3 years
Tier 2	Planned inspections and program reviews at operating facilities. "Major" inspections conducted at all compressor stations and exports sites; "minor" inspections conducted at a sample of smaller facilities (e.g., meter stations).	Annually
Tier 1	Various site, pre-job, construction, and equipment inspections at operating facilities by site staff.	Daily, Weekly, Monthly

Additional information on the audit and inspection program is presented in Appendix 5.

In addition to the above, in 2007 TransCanada initiated a "Consolidated Compliance Audit" program. The Consolidated Compliance Audits are extensive assessments of regulatory compliance, conformance with TOPs, and evaluation of risk management programs at major facilities every 3 to 4 years. The consolidated audits will include a verification of regulatory compliance and an assessment of the management systems at the facility level on a periodic basis.

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Interviews also indicated that the company has other specialized inspection and audit programs, such as:

- Quality audit program for gas control operations
- Quality audits of materials and equipment suppliers to ensure engineering specifications are met
- Project audits and inspections

All this inspection and audit activity has resulted in a strong audit "culture", in which both management and staff rely on audits as a means of ensuring and confirming regulatory compliance and satisfactory risk management. Numerous interviewees indicated that our audit was the second or third one they participated in 2009.

2.1.5 The company has developed a comprehensive emergency preparedness and response program.

TransCanada developed comprehensive emergency management system that includes, but is not restricted to the following elements:

- assignment of responsibilities regarding emergencies (i.e. coordination, emergency call-out, media contact, perimeter control)
- process for the identification of potential emergencies
- requirements for emergency planning zones
- requirements for all phases of an emergency, including discovery and alert, evacuation of personnel, containment and post emergency analyses
- maps of fixed facilities that show the location of medical and first aid facilities and equipment, fire control equipment, evacuation routes, gathering points, location and content of hazardous materials, location of emergency operations centers
- identification of requirements for outside assistance (i.e. local fire departments, police departments, industrial co-operatives, area mapping, hospitals)
- requirements for liaison with government and other agencies
- process for establishing emergency operation centers
- information system to record emergency data
- emergency training program and process for planning and conducting exercises

The company has documented its emergency management system within an Emergency Management System Manual ("IMS Manual") that is annually updated and filed with the NEB. Site specific emergency plans are developed for TransCanada's operational regions and individual compressor stations and selected critical meter stations according to the guidance provided by the IMS Manual (Section 10 Forms and Templates). These plans include site identifiers, detailed listing of contacts (i.e. internal company emergency contacts, provincial disaster services contacts, local emergency response agencies), location of hazardous chemicals on site, list of residents in proximity, local emergency

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equipment, local hazards / natural disaster assessments, and action plans developed for hazards identified (at minimum each site has evacuation plan, isolation and shut-off procedure, on site spill handling and containment plan).

2.1.6 The company has developed a comprehensive pipeline integrity program.

As part of our audit we interviewed the team responsible for the pipeline integrity program and reviewed their program documents and procedures. The goal of this program is to identify and prioritize potential areas of weakness within the pipeline system and to take effective preventative maintenance actions as appropriate. We noted that the integrity program is based on a comprehensive risk-based approach employing a combination of risk assessment software analysis and technical review by staff. Our pipeline engineering specialist indicated that the TransCanada program was one of the most thorough and comprehensive programs he has ever seen within the Calgary energy industry. An overview of the TransCanada Pipeline Integrity Program is provided in Appendix 6. As mentioned previously, the same pipeline integrity management program is used within the Alberta System as within the company's mainline operations.

2.1.7 The company has developed comprehensive processes and tools for managing projects.

TransCanada has developed a Project Management System, consisting of 13 project management guides by knowledge area (integration, cost, schedule, scope, quality, risk, procurement, communication, human resources, safety, environment, regulatory, operations), and project playbooks (compression projects, measurement projects). Collectively these support the project manager and project team in initiating, planning, executing and closing out projects.

TransCanada's approach to project management generally follows a plan-do-check-act management system. For example:

- As projects progress through a typical life cycle, stage gates serve as decision points to stop or proceed, or to ensure transition to ongoing operations. Project stage gates include deliverables and approvals.
- Predefined Project Control Levels (light, moderate, comprehensive) provide the project team with clear expectations on the standard project controls expected for each knowledge area during each project phase. With project team members drawn from various parts of the company, these processes and associated tools enhance project consistency and support understanding of how specific project controls align with key business drivers.
- Project oversight includes a variety of management reporting and checkpoints such as regular project reviews, detailed and summary level reporting, performance metric reporting, and scorecard metrics. Reporting typically

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addresses lessons learned/ future opportunities and recognition/ highlights as well as project risk management.

2.1.8 The company has developed an extensive process for managing the competency and training requirements for field staff.

TransCanada's Employee Development Group has developed a comprehensive internal program and database (the "Performance Development System" or PDS) for identifying technical competency requirements for field staff, designing and delivering the training, assessing knowledge, and tracking employee training. requirements and records. Verification of training is accomplished using performance reviews and documented skills testing. Training requirements and completion is tracked in PDS for each employee and contractor, and the system allows audit reports to be created that show planned training compared to completed training. Monthly reports are created by the Regional Training Coordinator and reviewed by TransCanada management.

Approximately 15 Qualification Programs have been developed for identified high risk work. The development of these programs is completed by a team of Employee Development staff and internal/external Subject Matter Experts (SMEs) on the topic, as required.

2.1.9 The company has an effective process for monitoring and analyzing changes in regulatory requirements and modifying programs and procedures accordingly.

TransCanada has developed a process for monitoring proposed and actual changes in relevant regulations and government policies, reviewing and assessing these changes in terms of impact to the company's operations and procedures, and incorporating these changes into their programs and procedures as appropriate.

The company has established a Legislative Monitoring Team with representatives from a number of business areas including Field Operations and Engineering, Engineering and Asset Reliability, Energy Operations and Community, Safety and Environment. Through routine monitoring of applicable regulatory requirements, as well as industry best practices and other requirements, changes that may affect the company's operations are identified. Impacts of these changes are analyzed and communicated through the company using the Regulatory Requirement Analysis Statement. Any affected procedures or documentation are revised and circulated for comment as appropriate, and final revisions are completed and approved by management. Revised documentation is issued for use with appropriate personnel notified of changes.

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2.2 Key Opportunities for Improvement

2.2.1 The company's site inspection program is not effective.

During our field visits we noted numerous deficiencies at the operating sites, ranging from insufficient signage to inadequate chemical and waste storage. Only at one site did we identify a relatively high risk legacy situation – the improper installation of electrical transformers in the basement of a compressor station (estimated to date back to the 1960s). See Appendix 7 for a detailed inventory of site visit findings.

Our findings suggest the company's site inspection program needs to be improved. We believe that most if not all of our findings should have been identified and addressed during the regular internal site inspections. Based on our discussions, we do not believe this weakness is a result of inadequate training or awareness of field staff; instead we believe it may be a result of one or more of the following factors:

- Inspection findings are not shared between sites
- Inspection findings are not aggregated to identify trends, patterns, and root causes
- Inadequate or out of date inspection checklists
- Site staff unable to objectively assess their own facilities, potentially resulting in shortcutting of the inspection process or continuous oversight or "acceptance" of deficiencies

Note: while our findings relate to a sample of Alberta System facilities, interviews suggest that the same planned inspection process is used across all pipeline operations.

2.2.2 TransCanada's Security Management System components does not meet all the NEB's requirements for physical security programs

TransCanada is currently in transition to fully comply with NEB Pipeline Security Change Notification (2006). For example, the Notification requires that the company implement a process of evaluating security risks to facilities and operations, including evaluating vulnerabilities of facilities and operations. TransCanada's Gas Control and Operations Planning groups completed the identification of critical infrastructure in 2002; however, vulnerability of facilities and operations (physical and IT systems) was not included at the time of assessment. TransCanada is currently establishing a new documented process for Physical Security and Incident Reporting that addresses Security Vulnerability Assessments and Security Reviews and Critical Facility Screening (DRAFT – Physical Security and Incident Reporting Procedure and Critical Facility Screening Procedure) in response to the NEB Pipeline Security Change Notification (2006).

2.2.3 *The NEB's requirements for enhancements to the cyber-security system have not yet been fully addressed.*

Interviews with representatives from the group responsible for design and management of the company's SCADA system indicated that while there are numerous programs and initiatives in place to ensure the security of the SCADA system, the group has not yet fully met all the requirements set out in the NEB's Pipeline Security Change Notification, 2006. Specifically we noted:

- There is no SCADA specific security policy
- There is no formalized process for evaluating security risk regarding SCADA and other relevant control systems implemented
- There is no comprehensive definition of what constitutes a security incident related to process control or SCADA systems
- There are no documented roles and responsibilities regarding SCADA security
- There is no formal security training defined for automation integrity staff related to their security responsibilities
- Security monitoring is fragmented and there is a risk of being incomplete
- It is not clear what cyber-security events should be tracked in IIT, the company preferred tool for managing physical security incidents, or by other means
- There are no key metrics defined to assist in summarizing and analyzing security incidents

It is important to point out that the representatives from the SCADA group did indicate that they will be embarking on an initiative in the near future to more rigorously document their cyber-security programs for TransCanada's power operations in the US, and that this program will be extended at a later date to include the company's pipeline operations.

2.2.4 *The NEB's requirements for enhancements to the emergency preparedness and response program have not yet been fully addressed.*

Interviews with representatives from TransCanada's Emergency Preparedness and Response (EPR) Group and a review of associated documents indicated that while the company has developed a comprehensive EPR program, it does not yet meet all the requirements set out in the NEB's All-company letter "Security & Emergency Preparedness and Response Programs" (2002), in particular:

- The requirement to keep up-to-date, readily accessible contact lists of all persons potentially involved in an emergency;
- The requirement to have a continuing education program for all appropriate agencies and organizations (including all potential First Responders, i.e., fire,

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police, and medical services), and the public adjacent to the pipeline to inform them of the location of the pipeline and the facilities, and to inform them of potential emergency situations and emergency procedures to be followed.
- The requirement to develop, regularly review and update as required, and to submit the emergency procedures manual and any updates that are made to it to the Board.

Interviews with TransCanada personnel indicate that the reason for non-compliance with these requirements is simply one of practicality:

- A small portion of the company's pipelines are located in populated areas, such as Metro Toronto, and maintaining an up to date list of local citizens would be impractical.
- Because the company's pipelines are in proximity to so many communities across Canada, coordination of emergency response training with all possible external emergency services providers would require TransCanada to plan, coordinate, and evaluate approximately 1000 such training sessions per year.
- The company annually submits its IMS – Emergency Management System Manual to the Board. This manual provides guidance and assistance in preparing for and responding to emergencies. The document is not a comprehensive manual as defined by NEB All-company letter re: Security & EPR Programs (2002) as it does not includes site specific emergency response procedures and information, list of persons in emergency planning zones, environmental or other areas requiring special consideration, area maps etc. To complement the IMS document, TransCanada has developed regional and site specific emergency plans for all major facilities, compressor stations and critical meter stations using the "General Emergency Plan Template"; this follows the company's internal guidance (Emergency Management System Section 10). However, these additional plans are not submitted and filed with the Board because of the high number of these plans as well as confidentiality concerns around the information provided.

Audit evidence indicates that in the past TransCanada has raised these concerns with the NEB both directly and through the Canadian Energy Pipeline Association and these parties have been in discussion on the best resolution.

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2.2.5 There is a relatively large backlog of outstanding issues in IIT

We noted during our field visits that there is a relatively large backlog of issues in the IIT. These items consist of follow up actions from incidents and issues raised during internal inspections and audits. We noted that some of the issues were more than twelve months old. It is our understanding that the issues tagged as "regulatory" take priority for attention before issues tagged as "best practice".

In our view, the relatively large accumulation of older issues is of concern for two reasons. First, management's tolerance of the large volume of issues, over time, sends a message that delayed action on issues is acceptable. Second, a lack of timely action on identified deficiencies can jeopardize a "due diligence" defence in the event of an issue-related incident in the future.

There are at least four potential factors that could be contributing to the large backlog of issues:

- clear guidelines for the management of the backlog, including target tolerances (quantity of issues, types of issues, and length of time outstanding), assignment of accountabilities, escalation of outstanding issues, and timely retirement of issues, have not been established
- overloading of the issue identification process because of the relatively high number of internal inspections and audits
- insufficient resources (e.g., people, budget, etc) at the field level to handle the volume of requests
- the management of change process is deficient in that accountability for action items is not transferred when there is an organizational or personnel change

We also noted that TransCanada has not established formal procedures for monitoring and management of the IIT backlog in order to help ensure items are resolved appropriately and in a timely manner. Such procedures could include guidance on management's expectations on resolving backlog issues, and escalating or removing long-standing issues.

2.2.6 Consolidation of exemptions and waivers from regulatory requirements

During our interviews we noted that TransCanada occasionally negotiates unique interpretations, exemptions, and waivers to certain regulatory requirements with the NEB and other regulatory stakeholders during projects and operational changes. It is our understanding that representatives from numerous TransCanada departments provide advice and input into the negotiations, but the final agreement is maintained with the specific project or operations file. This creates a risk that these agreements could be misplaced or forgotten during organizational changes. We suggest that copies of these

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agreements be maintained in a central file in the Regulatory Services or the Legal Department to ensure they are always readily available in a timely manner.

2.3 Management Process Changes Resulting from the Shift to NEB Regulation

Although we noted that most of the company's management processes are unaffected by the change in regulatory authority from the AUC to the NEB, during our audit we noted several areas where TransCanada has modified or is in the process of modifying its management processes and procedures. The interviewees indicated that these changes have or are being addressed by the company' internal specialists through the company's regulatory change management processes.

2.3.1 Incident reporting changes

All right-of-way related incidents – e.g., unauthorized excavations by third parties, pipeline exposures, identified leaks, etc – formerly reported to the AUC will now be reported first to the Transportation Safety Board and the NEB. Interviews with relevant TransCanada personnel indicate that the changes have been made to the company's documented reporting process. Incidents involving employee injuries will still be reported to Alberta Labour, and incidents resulting in impairment to the environment will still be reported to Alberta Environment.

2.3.2 Application of "Safety Zone" in Alberta

Under the AUC regulation, TransCanada required that all third parties (including landowners) must notify the company of any cultivation deeper than 45 cm (18 inches), or any ground disturbance (excavating, digging, trenching, drilling) deeper than 30 cm, and within 30 metres of the actual pipe. Under the NEB, TransCanada must require all third parties to notify the company of all activities or ground disturbances (excavating, digging, trenching, drilling) deeper than 30 cm (1 foot),and/or blasting, on or within 30 metres (98 feet) of the edge of the pipeline right-of-way (the "safety" zone). TransCanada has initiated a program to communicate this information to all Alberta-based landowners affected by TransCanada's right-of-way.

2.3.3 Boiler safety

The Alberta Boiler Safety Association (ABSA), under authority of the Alberta government, required that all provincially regulated companies meet the ABSA Safety Code and associated requirements, including the requirement to be inspected by a qualified external inspector once per year. TransCanada's pressurized vessels specialists are in discussion with the province to see whether these requirements remain in place

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now that the pipeline system is under NEB authority. TransCanada owns and operates many pressurized vessels including boilers, air compressors, and pressure relief valves.

2.3.4 Storage/process tanks

TransCanada has approximately 1500 above and underground "process tanks" installed at its meter stations in Alberta. These tanks are approx 1.2 m^3 in size and are designed to collect scrubbed liquids from the natural gas stream received from suppliers. When the Alberta System was under AUC authority, these tanks were required to meet the Energy Resources Conservation Board's (ERCB) Directive 55: Storage Requirements for the Upstream Petroleum Industry, not Alberta Environment's Waste Control Regulation 192/96. TransCanada has since determined that Waste Control Regulation 192/96 does not apply to the Alberta meter stations, because OPR 1999, Section 11(c) clearly gives federal oversight of these tanks to the NEB, as it states that a station (including meter stations) must be equipped with facilities for the containment, handling and disposal of wastes incidental to the station's operations.

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3 Summary of Observations and Findings by Management Element

3.1 Our Assessment Criteria

Our prime audit objective was to evaluate the implementation and effectiveness of the management systems and TransCanada has implemented to ensure regulatory compliance within the Alberta System. For this reason, we used the ISO 14001 (2004) Standard for Environmental Management Systems as our core evaluation criteria. We chose ISO 14001 for several reasons:

- It is the foundation for TransCanada's Health, Safety and Environmental management system.
- It is the basis for the NEB's Safety and Environmental Management System.
- It is widely recognized within Canada and internationally as a robust management system standard.

The management elements within the ISO 14001standard are:

- Corporate Policy
- Aspects/Risk Identification
- Legal and Other Requirements
- Objectives, Targets and Programs
- Resources, Roles, Responsibility and Authority
- Competence, Training and Awareness
- Communication
- Documentation
- Control of Documents
- Operational Control
- Emergency Preparedness and Response
- Monitoring and Measurement
- Evaluation of Compliance
- Nonconformity, Corrective Action and Preventive Action
- Control of Records
- Internal Audit
- Management Review

We adapted the guidance set out in the ISO 14001 Standard to make it applicable to other functional areas besides environmental management.

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3.2 Assessment Results

The following sections set our key audit findings and observations for each management element using the following template:

Management Element

ISO 14001 Guidance (adapted) *Adaptation of the requirements in ISO 14001 so that they apply to the other functional areas in addition to environmental management.*	
Relevant regulatory requirements considered during the audit: ▪ The specific regulations (including sections and subsections) referenced in our audit protocols and incorporated into our interviews, document reviews, and site visits	
	Auditor observations
Strengths	▪ Observations of effective management practices identified during the audit
Opportunities for improvement	▪ Areas identified during the audit where TransCanada could enhance its management practices. Where these relate to specific regulatory requirements, citations are provided; otherwise they are identified as "voluntary management practice".

3.2.1 Corporate Policy

ISO 14001 Guidance (adapted) *Top management shall define the organization's policies and ensure that, within the defined scope of its management systems, the policies* *a) are appropriate to the nature, scale and impacts of its activities, products and services,* *b) include a commitment to continual improvement and prevention of pollution,* *c) include a commitment to comply with applicable legal requirements and with other requirements to which the organization subscribes which relate to its aspects,* *d) provide a framework for setting and reviewing objectives and targets,* *e) are documented, implemented and maintained,* *f) are communicated to all persons working for or on behalf of the organization, and* *g) are available to the public.*	
Relevant regulatory requirements considered during the audit: ▪ *Canada Labour Code, Part II, Section 122.1 and 124* ▪ *NEB Pipeline Security Change Notification, 2006*	
	Auditor observations
Strengths	▪ Health, Safety, and Environmental (HS&E) policy developed and found posted in area offices. ▪ HS&E, Aboriginal Relations, and Public Safety policies (or "Commitment Statement") are publicly available on TransCanada's website. ▪ Policies appear to be comprehensive and supported by senior management.

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Opportunities for improvement	▪ The company has not developed a policy relating to physical and cyber-security.

3.2.2 Risk Identification

ISO 14001 Guidance (adapted)

The organization shall establish, implement and maintain a procedure(s) to identify the environmental, safety, and other risks associated with its activities, products and services within the defined scope of the management system that it can control and those that it can influence taking into account planned or new developments, or new or modified activities, products and services.

The organization shall document this information and keep it up to date. The organization shall ensure that the significant environmental aspects are taken into account in establishing, implementing and maintaining its management system.

Relevant regulatory requirements considered during the audit:

- *NEB Pipeline Security Change Notification, 2006*
- *NEB Onshore Pipeline Regulations, 1999, Section 10(1)*
- *NEB Onshore Pipeline Regulations, 1999, Section 48*
- *Canada Labour Code, Part II, Section 122.2*
- *Canada Labour Code, Part II, Section 124*
- *CSA Z662-07, Annex B*

Auditor observations	
Strengths	▪ TransCanada uses a risk management framework consistent with CSA Z662-07, Annex B for managing pipeline integrity. ▪ Risk assessment is an element of the company's HS&E management system. ▪ TransCanada requires work authorizations and job hazard analyses (JSA) to be completed for all high risk activities, as defined in the TransCanada Occupational Health, Safety and Environmental (HS&E) Management System. As a part of the JSA and job planning process, each work team decides and documents what measures are to be taken to eliminate hazards (PPE, fall protection, securing area etc). ▪ Project management teams regularly monitor status of project-related incidents, evaluate trends and communicate lessons learned. ▪ TransCanada provides workers with required tools, equipment and guidance to ensure they have everything required as per results of JSA ▪ The company develops detailed Environmental Protection Plans for each construction project it undertakes. Monitoring and inspection activities appear appropriate. ▪ Risk registers and response plans are developed for all projects; appropriate level of risk management controls are mandatory to satisfy stage requirements to progress through the project life cycle.
Opportunities for improvement	▪ The company has not formally identified and assessed the cyber-security risks associated with its SCADA system as required in the NEB Pipeline Security Change Notification, 2006. – see Section 2.2.3.

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3.2.3 Legal and Other Requirements

ISO 14001 Guidance (adapted)

The organization shall establish, implement and maintain a procedure(s)

a) to identify and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its operations, and

b) to determine how these requirements apply to its operations.

The organization shall ensure that these applicable legal requirements and other requirements to which the organization subscribes are taken into account in establishing, implementing and maintaining its management systems.

Relevant regulatory requirements considered during the audit:

- *NEB Onshore Pipeline Regulations, 1999, Sections 4, 6*

	Auditor observations
Strengths	▪ TransCanada has developed a Legislative Monitoring Process that includes routine monitoring of applicable regulatory requirements or best practices. Any changes are raised in IIT or is tracked by designated representatives (i.e., CSE department "Triage" process) enabling broad communication of potential impacts on the company's operations. ▪ Any affected procedure (TOPs) or other documentation identified as part of the Regulatory Requirement Analysis Statement process is revised, circulated for comment as appropriate, finalized and approved by management. ▪ Legal and other requirements are built into individual TOPs; adherence to these requirements is monitored through the tiered inspection and audit program. ▪ The Regulatory Services group has prepared a concise process flow diagram and a filing checklist for internal use clearly outlining regulatory filing requirements to assist in guiding TransCanada's Projects or O&M managers. A designated member of the Regulatory Services group is an integral part of all Projects and O&M teams.
Opportunities for improvement	▪ Although electronic copies of correspondence with regulators is maintained for each project file, the company does not maintain a centralized consolidated file of interpretations, exemptions, and waivers from regulations as agreed upon with regulators (voluntary management practice). – see Section 2.2.6.

3.2.4 Objectives, Targets and Programs

ISO 14001 Guidance (adapted)

The organization shall establish, implement and maintain documented performance objectives and targets, at relevant functions and levels within the organization.

The objectives and targets shall be measurable, where practicable, and consistent with the corporate policies, including the commitments to prevention of pollution, to compliance with applicable legal requirements and with other requirements to which the organization subscribes, and to continual improvement.

When establishing and reviewing its objectives and targets, an organization shall take into account the legal

and other requirements to which the organization subscribes, and its significant risks and aspects. It shall also consider its technological options, its financial, operational and business requirements, and the views of interested parties. *The organization shall establish, implement and maintain a program(s) for achieving its objectives and targets. Program(s) shall include* *a) designation of responsibility for achieving objectives and targets at relevant functions and levels of the organization, and* *b) the means and time-frame by which they are to be achieved.*
Relevant regulatory requirements considered during the audit: ▪ None identified

Auditor observations	
Strengths	▪ The company sets annual corporate performance objectives and targets. These are supported by Area-level objectives and targets.
Opportunities for improvement	▪ In some cases, performance goals or targets may have been established without regard to the underlying specific risks and without a practical means of prioritizing. As a result, some managers may have difficulty assessing whether under-achievement against targets poses a particular operational or other risk.

3.2.5 *Resources, Roles, Responsibility and Authority*

ISO 14001 Guidance *Management shall ensure the availability of resources essential to establish, implement, maintain and improve the management system. Resources include human resources and specialized skills, organizational infrastructure, technology and financial resources.* *Roles, responsibilities and authorities shall be defined, documented and communicated in order to facilitate effective management.*
Relevant regulatory requirements considered during the audit: ▪ *Canada Labour Code, Sections 126, 134, and 135* ▪ *NEB Pipeline Security Change Notification, 2006*

Auditor observations	
Strengths	▪ The company has assigned roles and responsibilities for HS&E, security, asset integrity, projects and other relevant areas across the company. Typically responsibilities are detailed within various management system guidance documents (e.g., playbooks, manuals, activity charts). ▪ Field related responsibilities are described in TOPs and relevant procedures are provided to contractors. Responsibilities are also communicated through orientations and training, project-specific Safety Management Plans as well as various web pages, reports and safety meetings. ▪ For all staff levels at TransCanada, RACI (responsibility, accountability, consult, inform) matrices are employed.

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Opportunities for improvement	▪ Roles and responsibilities regarding SCADA security have not been documented. – see Section 2.2.3

3.2.6 Competence, Training and Awareness

ISO 14001 Guidance (adapted)

The organization shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant impact(s) identified by the organization is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.

The organization shall identify training needs associated with its risks and aspects and its management systems. It shall provide training or take other action to meet these needs, and shall retain associated records.

The organization shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of

a) the importance of conformity with the corporate policies and procedures and with the requirements of the management systems,
b) the significant operations and related actual or potential impacts associated with their work, and the benefits of improved personal performance,
c) their roles and responsibilities in achieving conformity with the requirements of the management system, and
d) the potential consequences of departure from specified procedures.

Relevant regulatory requirements considered during the audit:

- *TDG Regulations, Part 6*
- *Canada Labour Code, Section 125*
- *NEB Onshore Pipeline Regulations, 1999, Section 46*
- *NEB All-company letter re: Security & EPR Programs, 2002, Section 2.1*
- *NEB Onshore Pipeline Regulations, 1999, Sections 18 (1c, 2); 29 (1c, 2), 54(2)*
- *NEB Onshore Pipeline Regulations, 1999, Section 28*

Auditor observations	
Strengths	▪ The company has a comprehensive competency and training management program which makes use of an electronic database (Performance Development System) for designing, delivering, and monitoring technical training. This system is in place for field personnel including key contractors. ▪ The company has a thorough HS&E orientation process for all contractors and consultants who visit TransCanada sites. ▪ TransCanada conducts regular emergency response training sessions across the company.
Opportunities for improvement	None identified.

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3.2.7 Communication

ISO 14001 Guidance

With regard to its risks and aspects and management system, the organization shall establish, implement and maintain a procedure(s) for

a) internal communication among the various levels and functions of the organization,

b) receiving, documenting and responding to relevant communication from external interested parties.

The organization shall decide whether to communicate externally about its significant risks and aspects, and shall document its decision. If the decision is to communicate, the organization shall establish and implement a method(s) for this external communication.

Relevant regulatory requirements considered during the audit:

- *NEB Pipeline Crossing Regulation, Part II, Section 9*
- *CSA Z662-07 Clause 10.3.11*
- *Canada Labour Code, Part II, Section 122.2*

Auditor observations	
Strengths	▪ The company has developed an Integrated Public Awareness program to communicate information on TransCanada's operations to affected communities and landowners. ▪ The company has an effective process for responding to landowner inquiries and third party crossing requests. In Alberta, TransCanada directs everyone to use the province's One Call system.
Opportunities for improvement	None identified.

3.2.8 Documentation

ISO 14001 Guidance (adapted)

The management system documentation shall include

a) the relevant policies, objectives and targets,

b) description of the scope of the management systems,

c) description of the main elements of the management system and their interaction, and reference to related documents,

d) documents, including records, determined by the organization to be necessary to ensure the effective planning, operation and control of processes that relate to its significant risks and aspects.

Relevant regulatory requirements considered during the audit:

- *NEB Onshore Pipeline Regulations, 1999, Section 20 (1 & 2)*
- *NEB Onshore Pipeline Regulations, 1999, Section 31 (1&2), Section 27*
- *NEB Pipeline Crossing Regulation, Part II, Section 11*
- *NEB Onshore Pipeline Regulations, 1999, Sections 42, 43, 44, 45, 50*
- *CSA Z662-07 Clause 10.4*
- *CSA Z662-07 Clause 9.9*

Auditor observations

Strengths	▪ TransCanada has an extensive library of technical operation procedures (TOPs) which form the backbone of the company's management systems. ▪ TransCanada's HSE management system and associated procedures is well documented according to management system requirements. ▪ A variety of databases are used to contain information necessary to plan, operate and control TransCanada processes. Records of pipeline and facility technical data are kept with the project files. TransCanada also uses the Geofind database to keep all information regarding geographical and physical attributes of pipelines and associated facilities, including alignment drawings, plot plans, site diagrams, and pipe specifications. The IIT database contains all incident related information. The CPM Collector database stores all GPS coordinates for pipe and cathodic protection equipment with records of annual surveys and evidence of completion. Avantis is the work order system that manages maintenance work and contains inspection and pressure test reports.
Opportunities for improvement	▪ The company's cyber-security management system is currently not well documented. Interviews with relevant personnel indicate that the company will document the SCADA and cyber-security management system and associated processes over the next few years, starting with TransCanada's Power division. – see Section 2.2.3

3.2.9 Control of Documents

ISO 14001 Guidance (adapted)

Documents required by the management system shall be controlled. Records are a special type of document and shall be controlled in accordance with the requirements given in 4.5.4.

The organization shall establish, implement and maintain a procedure(s) to

a) approve documents for adequacy prior to issue,

b) review and update as necessary and re-approve documents,

c) ensure that changes and the current revision status of documents are identified,

d) ensure that relevant versions of applicable documents are available at points of use,

e) ensure that documents remain legible and readily identifiable,

f) ensure that documents of external origin determined by the organization to be necessary for the planning and operation of the management system are identified and their distribution controlled, and

g) prevent the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

Relevant regulatory requirements considered during the audit:

- None identified

Auditor observations	
Strengths	▪ TransCanada has a robust information management system in place, governed by a variety of documented policies, programs, standards and schedules. TransCanada uses FileNet as their electronic document management system, and iRIMS to manage hard copy documentation and information in various physical forms. This is a decentralized system where individuals within each department have responsibilities with regards to information management. In addition to the

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	enterprise-wide program elements, each department develops, implements and manages their own business-specific information management policies, procedures and guidelines. Once information is acquired or created, its information value is determined by the identified Information Owner, and it is indexed to ensure effective management, retention and retrieval. Accurate indexing ensures that retention values reflect external governance legislation, standards, industry practice and internal operational requirements. Record retention requirements are managed as a schedule by Business Information. ▪ The Records Management group conducts training and acts as a resource for the organization to ensure consistency with regards to information management. ▪ Documents are controlled effectively, as each document is assigned a unique EDMS document item identification number. There is a standard format used for each document that identifies the title, status, effective date and revision number. The EDMS system allows consistent availability of documents at points of use as necessary, for employees and contractors. ▪ FileNet provides document version control. Each version of a document is saved as it is checked in and out of the system. ▪ All information is reviewed on a regular basis to determine its currency and relevancy, to ensure that personnel has access to the most current information, and to identify documents that have outlived their operational usefulness so that they can be discarded appropriately. ▪ Company personnel were all aware that only the EDMS copy of documents such as the TOPs could be considered the "official" version. All printed versions were considered "uncontrolled" and employees were instructed not to rely on them.
Opportunities for improvement	▪ We noted during our interviews that document control practices do not always cascade down to specific desk procedures and other departmental-specific guidance and protocols beyond the scope of the relevant "official" policy and procedure documents (version numbers, dates, owners, etc.)

3.2.10 Operational Control

ISO 14001 Guidance (adapted)

The organization shall identify and plan those operations that are associated with the identified significant risks and aspects consistent with its corporate policies, objectives and targets, in order to ensure that they are carried out under specified conditions, by

a) establishing, implementing and maintaining a documented procedure(s) to control situations where their absence could lead to deviation from the policies, objectives and targets, and

b) stipulating the operating criteria in the procedure(s), and

c) establishing, implementing and maintaining procedures related to the identified significant risks and aspects of goods and services used by the organization and communicating applicable procedures and requirements to suppliers, including contractors.

Relevant regulatory requirements considered during the audit

- *NEB Onshore Pipeline Regulations, 1999, Sections 14, 15, 18, 21, 23, 24, 25, 29, 37, 47, and 48*
- *CSA Z662-07, many sections throughout*
- *NEB Act, Sections 31, 32, 52 and 58*
- *NEB All-company letter re: Security & EPR Programs, 2002, Section 2.1*
- *NEB Pipeline Security Change Notification, 2006*

▪ *Canadian Environmental Assessment Act, Section 16* ▪ *Canada Labour Code, Section 125* ▪ *Fisheries Act, Section 35* ▪ *National Fire Code & Alberta Fire Code* ▪ *Transportation of Dangerous Goods Regulations, Sections 3.1, 3.11, 5.1, 5.2, and 6.1* ▪ *Alberta Building Code (2006), Section 2.2.9* ▪ *Alberta Water Regulation, Section 6, 35, and 26* ▪ *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing (Water Act), Sections 3, 6, 7, 8, 9* ▪ *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines (AEPE Act)* ▪ *Code of Practice for Compressor and Pumping Stations and Sweet Gas Processing Plants (AEPE Act), Sections 2, 4, 5, 7, and 8*

Auditor observations	
Strengths	▪ TransCanada maintains an extensive library of technical operation procedures (TOPs) that are based on the strictest applicable regulatory and CSA Z662-07 requirements. ▪ The company regularly reviews and updates its operational controls through a formal process that assigns ownership and accountability for different TOPs to different TransCanada managers. The goal of this process is to ensure that each electronic TOP in the database is up to date and reflects current regulatory requirements and best management practices.
Opportunities for improvement	▪ Some interviewees indicated that occasionally there can be temporary gaps in the ownership and accountability for managing certain TOPs following organizational and staff changes. These gaps can persist for some time, depending on the schedule for review and update of the particular TOP. However, we did not see evidence suggesting that these gaps were causing undue risk to operations.

3.2.11 Emergency Preparedness and Response

ISO 14001 Guidance (adapted) *The organization shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the people and the environment and how it will respond to them. The organization shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse impacts. The organization shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations. The organization shall also periodically test such procedures where practicable.*
Relevant regulatory requirements considered during the audit: ▪ *NEB All-company letter re: Security & EPR Programs, 2002* ▪ *NEB Onshore Pipeline Regulations, 1999, Section 32 (1&2), 33, 35* ▪ *NEB Pipeline Crossing Regulation, Part II, Section 4 (1)* ▪ *CSA Z662-07 Clause 10.3.2* ▪ *Canada Occupational Health and Safety Regulation, 17.4* ▪ *CEPA 1999, Section 95*

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- *Environmental Emergency Regulations (CEPA), Section 3, Schedule 2*
- *Alberta Occupational Heath & Safety Act, Section 18*
- *Alberta Fire Code, 2006, Sections 3.1.2.6 and 3.2.2.5*

	Auditor observations
Strengths	▪ TransCanada Emergency Management Team host an annual meeting with the Regional Emergency Preparedness Coordinators and the Support Departments to discuss changes to the emergency management system (EMS) process and procedures and emergency preparedness and response activities. ▪ TransCanada has comprehensive training program that includes several training modules. Core modules are EMS overview, first response and incident command, communication protocol, virtual emergency operation command, emergency exercise design. This training is supplemented by conducting three levels of exercises: table top (annually in each Area in a Region), external field (annually in each Region) and corporate emergency exercises (annually in selected Region). ▪ TransCanada has an Integrated Public Awareness (IPA) program that informs the public and emergency responders of pipeline locations, potential emergency situations and safety procedures in case of an emergency. As part of the IPA, every 2 years pipeline safety brochures are sent to the affected public and landowners adjacent to and just beyond the pipeline. This baseline program is completed across the entire TransCanada pipeline system. Individual regions extend this with supplemental and enhancement public awareness and safety programs to cater specifically to their required audience (e.g., open house information sessions).
Opportunities for improvement	▪ There is an opportunity to enhance the annual review process (EMS Manual, Section 1.7) for site specific emergency response plans. We noted during the site visits that the emergency response plans at several Compressor stations were partially out of date or incomplete. See Appendix 7 for details. ▪ The effectiveness of the IPA program is currently monitored through initiatives such as assessing feedback received from information mail-outs and surveys as well as quarterly tracking of the number of unauthorized crossings. Separate groups track the number of requests for crossing agreements and the number processed. The IPA program can be further enhanced by including these statistics as part of its review.

3.2.12 Monitoring and Measurement

ISO 14001 Guidance (adapted)

The organization shall establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of its operations that can have a significant risk or impact. The procedure(s) shall include the documenting of information to monitor performance, applicable operational controls and conformity with the organization's performance objectives and targets.

The organization shall ensure that calibrated or verified monitoring and measurement equipment is used and maintained and shall retain associated records.

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Relevant regulatory requirements:
▪ *NEB Onshore Pipeline Regulations, 1999, Section 36, 39, 40* ▪ *NEB Pipeline Crossing Regulation, Part II, Section 10 (a & b)* ▪ *CSA Z662-07 Clauses 9.1, 9.3, 9.9, 9.10, 10.6, 10.14* ▪ *Canada Occupational Health and Safety Regulation, 5.10 and subsequent clauses*

	Auditor observations
Strengths	▪ The company utilizes a comprehensive risk-based pipeline integrity program to identify, assess, and prioritize areas of risk. ▪ The company utilizes a program of regular (daily, weekly, and monthly) site inspections at its compressor stations and meter stations to identify areas of concern.
Opportunities for Improvement	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site inspection process is not effective. These are discussed in Section 2.2.1 and again in Appendix 7.

3.2.13 Evaluation of Compliance

ISO 14001 Guidance (adapted) *Consistent with its commitment to compliance, the organization shall establish, implement and maintain a procedure(s) for periodically evaluating compliance with applicable legal requirements. The organization shall keep records of the results of the periodic evaluations.* *The organization shall evaluate compliance with other requirements to which it subscribes. The organization may wish to combine this evaluation with the evaluation of legal compliance referred to in 4.5.2.1 or to establish a separate procedure(s). The organization shall keep records of the results of the periodic evaluations.*
Relevant regulatory requirements considered during the audit ▪ *NEB Onshore Pipeline Regulations, 1999, Sections 53 (1), 54(1 & 2)* ▪ *Canada Labour Code, Part 2* ▪ *Alberta Occupational Health and Safety Act, Regulation and Code* ▪ *Alberta Fire Code, 2006*

	Auditor observations
Strengths	▪ The company regularly reviews and updates its TOPs to ensure they comply with the strictest regulatory and CSA requirements. ▪ The company utilizes a comprehensive multi-tiered audit and inspection program to periodically assess regulatory compliance at its operating facilities.
Opportunities for Improvement	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site-level compliance evaluation processes are not effective. These are discussed in Section 2.2.1 and again in Appendix 7.

3.2.14 Nonconformity, Corrective Action and Preventive Action

ISO 14001 Guidance (adapted)

The organization shall establish, implement and maintain a procedure(s) for dealing with actual and potential nonconformity(ies) and for taking corrective action and preventive action. The procedure(s) shall define requirements for

a) identifying and correcting nonconformity(ies) and taking action(s) to mitigate their impacts,
b) investigating nonconformity(ies), determining their cause(s) and taking actions in order to avoid their recurrence,
c) evaluating the need for action(s) to prevent nonconformity(ies) and implementing appropriate actions designed to avoid their occurrence,
d) recording the results of corrective action(s) and preventive action(s) taken, and
e) reviewing the effectiveness of corrective action(s) and preventive action(s) taken.

Actions taken shall be appropriate to the magnitude of the problems and the impacts encountered. The organization shall ensure that any necessary changes are made to management system documentation.

Relevant regulatory requirements considered during the audit

- *NEB Onshore Pipeline Regulations, 1999, Section 41 (1)*
- *CSA Z662-07 Clause 9.1.7, 9.9.5*
- *NEB Onshore Pipeline Regulations, 1999, Section 52 (1)*
- *CEPA 1999, Section 95*
- *Canada Labour Code, Part II, Section 122.2*
- *NEB Pipeline Security Change Notification, 2006*

Auditor observations	
Strengths	▪ The company utilizes an extensive incident reporting and investigation process. ▪ The company utilizes its IIT and Avantis programs to manage and track findings from inspections, audits, and incident investigations.
Opportunities for improvement	▪ We noted during our site inspections that there were a relatively large backlog of issues and items in the IIT system. This is discussed further in Section 2.2.5.

3.2.15 Control of Records

ISO 14001 Guidance (adapted)

The organization shall establish and maintain records as necessary to demonstrate conformity to the requirements of its management system and the results achieved.

The organization shall establish, implement and maintain a procedure(s) for the identification, storage, protection, retrieval, retention and disposal of records. Records shall be and remain legible, identifiable and traceable.

Relevant regulatory requirements:

- *NEB Onshore Pipeline Regulations, 1999, Section 56*
- *NEB Pipeline Security Change Notification, 2006*
- *TDG Regulations, Part 6*
- *Alberta Occupational Health & Safety Code, Section 406*

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▪ *Canada Labour Code, Section 125* ▪ *Canada Occupational Health and Safety Regulation, Sections 5.17 and 5.18*

Auditor observations	
Strengths	See comments for control of documents in Section 3.2.9.
Opportunities for improvement	▪ TransCanada should consider enhancing its record keeping process for hard copies of records required to be kept at compressor stations. We noted during the site visits that certain records required to be kept on sites were not available for inspection. See Appendix 7 for details.

3.2.16 Internal Audit

ISO 14001 Guidance (adapted)

The organization shall ensure that internal audits of the management systems are conducted at planned intervals to

a) determine whether the management systems

1) conforms to planned arrangements for environmental management including the requirements of the company specific standards, and

2) has been properly implemented and is maintained, and

b) provide information on the results of audits to management.

Audit program (s) shall be planned, established, implemented and maintained by the organization, taking into consideration the risks associated with the operation(s) concerned and the results of previous audits.

Audit procedure(s) shall be established, implemented and maintained that address
— the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records,
— the determination of audit criteria, scope, frequency and methods.

Selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process.

Relevant regulatory requirements considered during the audit:

- *NEB Onshore Pipeline Regulations, 1999, Section 55 (1)*
- *NEB Pipeline Crossing Regulation, Part II, Section 4 (2)*
- *NEB Pipeline Security Change Notification, 2006*

Auditor observations	
Strengths	▪ The company has implemented a comprehensive multi-tiered audit and inspection program and culture. See Section 2.1.4.
Opportunities for improvement	▪ Although we have identified weaknesses in the company's site inspection program, we have not identified specific opportunities for improvement in the overall internal audit processes.

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3.2.17 Management Review

ISO 14001 Guidance (adapted)

Top management shall review the organization's management systems, at planned intervals, to ensure their continuing suitability, adequacy and effectiveness. Reviews shall include assessing opportunities for improvement and the need for changes to the management system, including the corporate policy and performance objectives and targets. Records of the management reviews shall be retained.

Input to management reviews shall include

a) results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes,
b) communication(s) from external interested parties, including complaints,
c) the performance of the organization,
d) the extent to which objectives and targets have been met,
e) status of corrective and preventive actions,
f) follow-up actions from previous management reviews,
g) changing circumstances, including developments in legal and other requirements related to its risks and aspects, and
h) recommendations for improvement.

The outputs from management reviews shall include any decisions and actions related to possible changes to the corporate policies, objectives, targets and other elements of the management systems, consistent with the commitment to continual improvement.

Relevant regulatory requirements considered during the audit:

- None identified

Auditor observations	
Strengths	▪ TransCanada management meets monthly to review HSE, security, and other performance areas and incidents. Status of audit findings – including HSE management system audits - may also be discussed at these meetings depending on the nature and significance of the findings.
Opportunities for improvement	None identified.

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3.3 Summary of compliance management system OFIs

A summary of the opportunities for improvement (OFIs) identified during the audit is presented in the following table. We have categorized these OFIs under three classifications:

- **High** – significant deviation from regulatory requirements, company standards, or other practices of a substantial nature leading to significant requirements or concepts not addressed in implementation or TransCanada's documentation. This can include absence of required programs, management systems or processes; ineffective implementation or maintenance of a key requirement or procedure; potential liability issues; or repeat findings from previous audits.
- **Moderate** – moderate deviations from regulatory requirements, company standards or other practices leading to noticeable differences in structure and implementation or depth of coverage, but general alignment of main requirements and concepts. This can include gaps in formal programs, incomplete implementation of programs, lack of awareness of some requirements, or informality of management systems.
- **Low** – minor deviations from regulatory requirements, company standards or other practices in an otherwise good program leading to slight but noticeable differences in implementation. This includes opportunities to strengthen or fine-tune the management systems or processes, or can indicate potential for escalation in the future if not addressed.

Element	Opportunities for Improvement	Classification
Corporate Policy	▪ The company has not developed a policy relating to physical and cyber-security.	Moderate
Risk Identification	▪ The company has not formally identified and assessed the cyber-security risks associated with its SCADA system as required in the NEB Pipeline Security Change Notification, 2006. – see Section 2.2.3	Moderate
Legal and Other Requirements	▪ Although electronic copies of correspondence with regulators is maintained for each project or operations file, the company does not maintain a centralized consolidated file of interpretations, exemptions, and waivers from regulations as agreed upon with regulators (voluntary management practice). – see Section 2.2.6	Low
Objectives, Targets and Programs	▪ In some cases, performance goals or targets may have been established without regard to the underlying specific risks and without a practical means of prioritizing. As a result, some managers may have difficulty assessing whether under-achievement against targets poses a particular operational or other risk.	Low

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Element	Opportunities for Improvement	Classification
Resources, Roles, Responsibility and Authority	▪ Roles and responsibilities regarding SCADA security have not been documented. – see Section 2.2.3	Moderate
Competence, Training and Awareness	▪ None identified	Not applicable
Communication	▪ None identified	Not applicable
Documentation	▪ The company's cyber-security management system is currently not well documented. Interviews with relevant personnel indicate that the company will document the SCADA and cyber-security management system and associated processes over the next few years, starting with TransCanada's Power division. – see Section 2.2.3	Moderate
Control of Documents	▪ We noted during our interviews that document control practices do not always cascade down to specific desk procedures and other departmental-specific guidance and protocols beyond the scope of the relevant "official" policy and procedure documents (version numbers, dates, owners, etc.)	Low
Operational Control	▪ Some interviewees indicated that occasionally there can be temporary gaps in the ownership and accountability for managing certain TOPs following organizational and staff changes. These gaps can persist for some time, depending on the schedule for review and update of the particular TOP. However, we did not see evidence suggesting that these gaps were causing undue risk to operations.	Low
Emergency Preparedness and Response	▪ There is an opportunity to enhance the annual review process (EMS Manual, Section 1.7) for site specific emergency response plans. We noted during the site visits that the emergency response plans at several Compressor stations were partially out of date or incomplete. See Appendix 7 for details. ▪ The effectiveness of the IPA program is currently monitored through initiatives such as assessing feedback received from information mail-outs and surveys as well as quarterly tracking of the number of unauthorized crossings. Separate groups track the number of requests for crossing agreements and the number processed. The IPA program can be further enhanced by including these statistics as part of its review.	Moderate Low
Monitoring and Measurement	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site inspection process is not effective. These are discussed in Section 2.2.1 and again in Appendix 7.	High

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Element	Opportunities for Improvement	Classification
Evaluation of Compliance	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site-level compliance evaluation processes are not effective. These are discussed in Section 2.2.1 and again in Appendix 7.	High
Nonconformity, Corrective Action and Preventive Action	▪ We noted during our site inspections that there were a relatively large backlog of issues and items in the IIT system. This is discussed further in Section 2.2.5.	Moderate
Control of Records	▪ TransCanada should consider enhancing its record keeping process for hard copies of records required to be kept at compressor stations. We noted during the site visits that certain records required to be kept on sites were not available for inspection. See Appendix 7 for details.	Moderate
Internal Audit	▪ Although we have identified weaknesses in the company's site inspection program, we have not identified specific opportunities for improvement in the overall internal audit processes.	Not applicable
Management Review	▪ None identified.	Not applicable

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4 Conclusion

The audit identified numerous areas of strength as well as opportunities for improvement in the company's management processes. These can be summarized into the following three overarching conclusions:

1. The regulatory management processes implemented within the Alberta System are largely the same processes implemented by TransCanada in its other NEB regulated operations. For this reason, the shift of regulatory authority from AUC to NEB has a relatively minor impact on the design and implementation of the programs and processes within the Alberta System.
2. TransCanada program managers have a high degree of awareness and familiarity with the NEB regulations, requirements, and associated standards, and a concerted effort is made to ensure the company's management programs and processes meet those regulations, requirements, and standards.
3. Notwithstanding the above, opportunities were identified to enhance the management systems and processes at head office, in particular with respect to greater formalization of the cyber-security program. We also noted numerous deficiencies at the compressor stations and meter stations, suggesting there are weaknesses in the company's site inspection process. However, based on the information gathered, none of the deficiencies identified in the audit would be characterized as "high risk" from a pipeline integrity or public safety standpoint.

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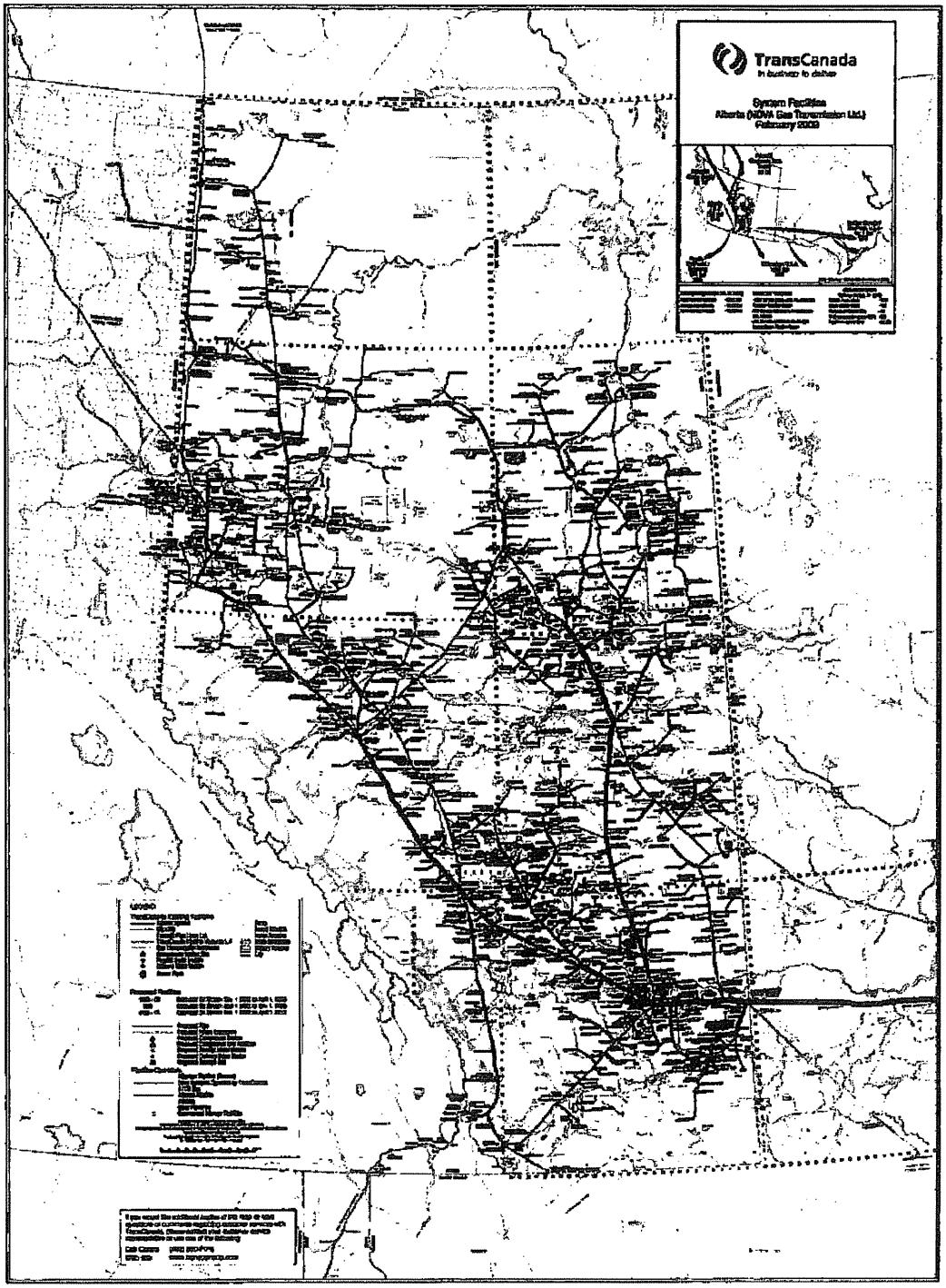
Appendix 1: Map of TransCanada's Alberta System



Appendix 2: List of Interviewees

TransCanada personnel interviewed during the audit, listed by date:

Name	Title	Department	Date of Interview
s.19(1)	Senior Emergency Management Specialist	Community, Safety & Environment	November 17, 2009
	Manager – Environment	Community, Safety & Environment	November 19, 2009
	Operations and Acquisitions Lead – Environment	Community, Safety & Environment	November 19, 2009
	Manager – Climate Change and Air Emissions	Community, Safety & Environment	November 19, 2009
	Environmental Engineer	Civil & Environmental Engineering	November 19, 2009
	Project Manager	Civil & Environmental Engineering	November 19, 2009
	Manager – Compliance	Canadian Pipeline Operations	November 19, 2009
	Manager	Gas Control	November 20, 2009
	Manager	Compression Projects	November 23, 2009
	Senior Regulatory Compliance Specialist	Canadian Pipeline Operations – Compliance	November 23, 2009
	Regulatory Compliance Specialist	Canadian Pipeline Operations – Compliance	November 23, 2009
	Director	Corporate Security	November 23, 2009
	Automation Engineer	Automation Integrity	November 24, 2009
	Director	Pipeline Integrity	November 24, 2009
	Manager, Program Planning	Pipeline Integrity, Engineering	November 24, 2009
	Manager – Safety	Community, Safety & Environment	November 24, 2009
	Senior Occupational Health & Safety Specialist	Community, Safety & Environment	November 24, 2009
	Manager	Mechanical & Civil Engineering	November 25, 2009
	Mechanical Engineer	Mechanical Engineering	November 25, 2009
	Measurement Specialist	Engineering	November 25, 2009
	Electrical Engineer	Measurement Engineering	November 25, 2009
	Manager - Land Services	Community, Safety & Environment	November 25, 2009
	Manager – Land Administration	Community, Safety & Environment	November 25, 2009
	Vice President	Canadian Pipeline Operations	November 26, 2009
	Vice President	Native American/ Aboriginal & Community Relations, Environment, Land Services, HSE Governance, Health & Safety	November 26, 2009
	Manager, Environmental Planning & Permitting	Community, Safety & Environment	November 27, 2009
	Senior Environmental Advisor	Community, Safety & Environment	November 27, 2009
	Senior Environmental Advisor	Community, Safety & Environment	November 27, 2009
	Vice President	Engineering and Asset Reliability	November 27, 2009
	Director	Pipeline Projects	November 27, 2009
	Project Manager	Pipelines Projects Management	November 27, 2009

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Name	Title	Department	Date of Interview
	Consultant Project Manager	Pipeline Projects	November 27, 2009
	Operational Lead, Information Management	Policy & Program, Business Information	November 27, 2009
	Information Analyst, Information Management	Policy & Program, Business Information	November 27, 2009
	Director	Asset Strategy and Integrity	November 30, 2009
	Manager	Automation Integrity, Engineering	November 30, 2009
	Director	Project Facilities	December 1, 2009
	Manager	Alberta Measurement Projects	December 1, 2009
	Senior Compliance Specialist	Canadian Pipeline Operations	December 2, 2009
	Manager	Engineering – Electrical & Controls	December 2, 2009
	Senior Engineer	Engineering – Electrical & Controls	December 2, 2009
	Senior Engineer	Engineering – Electrical & Controls	December 2, 2009
	Manager	Integrity Services and Support	December 2, 2009
	HS&E Coordinator	Wildrose Region	December 2, 2009
	Technician, Knight Compressor Station	Wildrose Region	December 2, 2009
	Manager, Edson Area Operations	Wildrose Region	December 2, 2009
	HS&E Coordinator	Wildrose Region	December 2, 2009
s.19(1)	Corrosion Engineer	Engineering – Corrosion Prevention	December 3, 2009
	Manager	Materials Engineering Governance & Quality	December 3, 2009
	Senior Materials Engineer	Materials Engineering Governance & Quality	December 3, 2009
	Senior Engineer	Materials Engineering Governance & Quality	December 3, 2009
	Manager, Employee Development	Engineering and Asset Reliability	December 3, 2009
	Analyst, Employee Development	Engineering and Asset Reliability	December 3, 2009
	Program Manager	Engineering	December 3, 2009
	Maintenance Scheduler	Wildrose Region	December 3, 2009
	Pipeline Technician	Wildrose Region	December 3, 2009
	Technician, Swartz Compressor Station	Wildrose Region	December 3, 2009
	Director, Field Operations	Wildrose Region	December 4, 2009
	Joint Health, Safety & Environment Committee Lead	Wildrose Region	December 4, 2009
	Regional Asset Reliability Manager	Wildrose Region	December 4, 2009
	Manager	Asset Management Improvement	December 4, 2009
	Director	Regulatory Services	December 4, 2009
	Regulatory Project Manager	Applications and Compliance Facilities	December 4, 2009
	Regulatory Project Manager	Regulatory Services	December 4, 2009

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Name	Title	Department	Date of Interview
	Manager, Vegreville Area	Wildrose Region	December 4, 2009
	Manager, Palliser Area	Central Region	December 7, 2009
	Pipeline/Measurement Technician	Central Region – Palliser Area	December 7, 2009
	Field Land Representative	Central Region – Regional Compliance	December 7, 2009
	Regional HSE Coordinator	Central Region	December 8, 2009
	Regional Asset Reliability Manager (Acting)	Rocky Mountain Region	December 9, 2009
	Manager, Airdrie South	Rocky Mountain Region	December 9, 2009
	Senior Field Representative	Land, Community and Aboriginal Relations, Rocky Mountain Region	December 9, 2009
	Joint Health, Safety & Environment Committee Lead	Rocky Mountain Region	December 9, 2009
	Controls Technician	Rocky Mountain Region	December 10, 2009
	H&S Coordinator	Regional Compliance, Rocky Mountain Region	December 10, 2009
	Director	Rocky Mountain Region	December 11, 2009

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Appendix 3: List of Documents Reviewed

TransCanada documents reviewed during the audit:

	Document name	Document date and revision #
1	Regulatory Compliance Incident Response Manual	11-Dec-08
2	Regulatory Compliance Incident Response Manual – Incident Management Classification Guide	31-Mar-09
3	Regulatory Compliance Incident Response Manual – Alberta Regulatory Reporting Requirements, EDMS #004269635	17-Jul-09
4	Regulatory Compliance Incident Response Manual – Regulatory Reporting Requirements for NEB Regulated Pipelines, EDMS #003834161	17-Jul-09
5	Incident reporting process, EDMS #003721577	1-Dec-08
6	Regulatory Compliance Incident Response Manual – IIT Regulatory Compliance Checklist EDMS #005767466	06-Nov-09
7	IMS – Emergency Management System Manual, EDMS #003671823	Nov 2008, Revision 11
8	IMS – Emergency Management System Manual, EDMS #003671823 – Section 10.18 Emergency Event Analyses	Nov 2008, Revision 11
9	IMS – Emergency Management System Manual, EDMS #003671823 – Section 3.5.6 Sensitive Areas / HCA	Nov 2008, Revision 11
10	Information Management and Security Policy, EDMS #003726541	2003/09/01
11	Corporate Security Policy	2007/05/31
12	Appendix 2d, Critical infrastructure – Criteria Ranking by Station	n/a
13	Crisis Management Plan Policy	2007/05/31
14	Incident Reporting and Management Program, EDMS #003721950	Rev 1, 2001/05/18
15	Physical Security and Incident Reporting (TOP), EDMS #003693114	Rev 3, 2007/06/01, OP01,
16	Emergency Management System (EMS) Maintenance EDMS #003849406	Rev 3, 2009/06/23
17	Foreign Crossing Procedures and 3rd party crossing request process	Not clearly controlled document
18	Crossing Agreement	September 2007
19	Major Project Work, Meter Station Work and PMP Work Process descriptions	Not clearly controlled document
20	Fish and Wildlife Protection Procedure (Canada)	Rev 00, 2009/05/28
21	Pre-Job / Planning procedure EDMS #003834914	Rev 3, 2009/03/10
21	Job Safety Analyses, EDMS #003773898	Rev 0, 2003/05/07

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	Document name	Document date and revision #
22	TOP – Critical Facility Screening Procedure DRAFT	Rev 01, 2008/08/01
23	Integrity Plans – Guidelines and Expectations, EDMS #004786600	Jan-09
24	Plant Integrity Management Process	Rev 1, 2005/12/01
25	Occupational Health, Safety and Environment Management System, EDMS #003721961, Manual	Rev 4, 2007/12/31
26	Waste and Hazardous Materials, Management Manual, EDMS #005486462	September 2009
27	Mainline and BC System Environmental Design Standard	Rev 0, 2003/08/15
28	Environmental Field Procedures Guide	Rev 1, Dec 19, 2003
29	HS&E Commitment Statement Guiding Principle	Last revision: 2009/07/31
30	SCADA & Automation Systems Security	3/14/2008, confidential document
31	Post construction reclamation and monitoring, EDMS #005300885	9-Apr-09
32	Vegetation Management and Control Procedure, EDMS #005518537	Rev 00, 2009/05/28
33	Wetland, Watercourse and Waterbody Protection Procedure, EDMS #005518290	Rev 00, 2009/06/12
34	Soil Management Procedure, EDMS #005518536	Rev 00, 2009/06/01
35	Charter of the Health, Safety and Environmental Committee	Approved Feb 2, 2009
36	Joint Health, Safety & Environment Committee (JHSEC) Roles & Responsibilities	Last revision: 2004/03/22
37	TransCanada Corporate HS&E Committee Meeting	July 29, 2009
38	Contractor Safety Management Program EDMS #003800125	Last revision: 2005/10/31
39	Smokey River Expansion (Shady Oak Section) Project # 2078735, Project Specific Safety Management Plant	29-Oct-09
40	Contractor Safety Handbook, EDMS #003798354	2008 Canadian Edition
41	Gas Controller (Calgary) Development and Qualification Program, EDMS #004504739	Rev 4, 2009/07/06
42	Gas Control Emergency Preparedness Plan, EDMS #003726869	Rev 25, 2009/10/09
43	Emergency Task Assignment Guidelines, EDMS #003741733	Rev 07, 2009/06/22
44	TransCanada Tower Operations Centre Evacuation Checklist, EDMS #003726586	Rev 09, 2009/06/09
45	TransCanada Tower Operations Centre Evacuation Procedure, EDMS #003726581	Rev 06, 2009/06/22
46	Alberta and Foothills System Overpressure Procedure, EDMS #003723302	Rev 12, 2009/08/26
47	Alberta and Foothills System, System Leak or Line Break Procedure, EDMS #003724014	Rev 09, 2009/08/26
48	TransCanada Integrity Management Process for Pipelines	Rev 2, 2009/11/6

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	Document name	Document date and revision #
49	Operations and engineering – Project Management System	Revision #3
49.1	Operations and engineering – Project Management System Section: Safety Guide, EDMS #003948267	April 17, 2006 Revision #1
49.2	Operations and engineering – Project Management System Section: Quality Guide, EDMS #003887967	March 27, 2006 Revision #1
49.3	Operations and engineering – Project Management System Section: Regulatory Guide, EDMS #003948260	April 12, 2006 Revision #1
49.4	Operations and engineering – Project Management System Section: Environment Guide, EDMS #003948124	May 26, 2006 Revision #1
50	Electrical Quality Management Plan	Aug. 17, 2009 Version#2
51	Field Operations and Engineering Practices and Procedures, EDMS #003696970	10/1/2007, Revision #2
52	Legislative Monitoring Process, EDMS #004238605	26-Jun-09
53	Management of Change Process, EDMS #004238604	Feb. 29, 2008 Revision #8
54	Consolidated Compliance Field Audit Procedure (TOP), EDMS #005364423	2009/10/02 Revision #3
55	Integrated Public Awareness Program (TOP), EDMS #003860909	2009/06/24 Revision #4
56	Integrated Public Awareness Program - Reference Manual	Date unknown
57	Design Basis Memorandum, EDMS #005595124 V2	11/03/09 Revision #0
58	Project Execution Plan, EDMS #005595178	11/03/09 Revision #0
59	Control System Software Control Procedure (TOP), EDMS #003671951	2009/08/12 Revision#7
60	Control System Software Modification Form (TOP), EMDS #003696227	2009/08/12 Revision#5
61	Explosive Blasting near TransCanada Facilities (TOP), EMDS #005376913	2009/07/08 Revision#1
62	Pipeline Crossing and Encroachment Procedure (TOP), EDMS #003674617	2009/06/30 Revision#9
63	One-Call/ Locating and Marking Procedures (TOP), EDMS #003671859	2009/06/26 Revision#3
64	Pipeline Right-of-Way (ROW) Procedures (TOP), EDMS #003672613	2009/03/25 Revision #2
65	Natural Gas Leak Detection Inspection (TOP), EDMS #003676665	2009/01/29 Revision#1
66	Deactivation or Abandonment of Pipeline Procedures (TOP), EDMS #003864117	2009/05/05 Revision#3
67	Brush Control Procedures (TOP), EDMS #003858592	2009/06/30 Revision#1
68	Aerial Pipeline Control (TOP), EDMS #003672387	2009/06/19 Revision#9
69	Excavation Procedure (TOP), EDMS #003672343	2009/06/25 Revision#14
70	Crane and Rigging Use Procedure (TOP), EDMS #003671305	2009/03/25 Revision#7

	Document name	Document date and revision #
71	Rigging Device Inspection (TOP), EDMS #004123561	2009/04/07 Revision#2
72	Facility Overhead Door Inspection (TOP), EDMS #004122181	2009/03/16 Revision#2
73	Tower Inspections (TOP), EDMS #003841265	2009/04/17 Revision#5
74	Facility Roof Inspections (TOP), EDMS #004122182	2009/03/17 Revision#3
75	Fall Protection Procedures (Canada) (TOP), EDMS #003780165	2009/05/20 Revision#3
76	Pile Driving and Screw Piling Procedure (TOP), EDMS #003864111	2009/05/28 Revision#3
77	National Energy Board Filing Manual	2004
78	NEB Regulated Facility Filings Check List	May 2009, Revision No. 3
90	Agreement No. 6993, Schedule "L" TransCanada Operating Procedure (TOP) Schedule	Bid issued April 2009
91	Agreement No. 5080, Schedule "N" TransCanada Operating Procedure (TOP) Schedule	Contract issued January 2008
92	Agreement No. 5080, Schedule "M" Specification Schedule	Contract issued March 2008
93	Alberta Regulatory Change Training Package	Presented May 6 - May 27, 2009
94	Field Performance Development System (FPDS) Program Guide	Date unknown
95	Product/Chemical Approval and Handling Procedure (TOP)	June 18, 2009 Revision #3
96	Chemical Inventory Inspection (TOP Task Package)	Date unknown
97	Information Management Policy, Program, Performance Standards, and Records Classification System and Retention Schedule	Policy: 2003/09/01 Rev 2.0 Program: 2003/09/01 Rev 1.0 Perf Standards: April 10, 2008 (no rev #) Records Classification System and Retention Schedule: various dates
98	PDS Regional Training Matrix for Emergency Management	Date unknown
99	Management/ Business Continuity Webpage	Printed 11/17/2009
100	Emergency Response Process	Created 11/17/2009, not controlled document
101	EMS- Core Emergency Exercise Design, Implementation and Debriefing	Date unknown
102	TransCanada Emergency Notification Directory	Date unknown
103	EMS Support Department List	2009/10/16

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	Document name	Document date and revision #
104	Calgary EOC Debrief Discussion - Linked to Incident #156550	2006/04/01
105	Retirement Review for 2009 Budget	2008/06/16
106	Project Decision Summary - 2009 Meter station and Lateral Retirement Program	2008/07/17 Version #0
107	Environmental Inspector's Daily Report (Example report for Nevis-Gadsby Project)	Sept. 28th, 2009
108	Decommissioning & Reclamation of Meter Stations & Lateral Pipelines Across Alberta and Saskatchewan - Project# TR8611-001	2009/11/01
109	Agreement No. 6059 between TCPL and Biogenie SRDC Inc. for 2008 Meter Station and Lateral Requirements	Date unknown
110	TCE Construction Assessment - Meikle River Compressor Station (Internal audit report on Meikle River Compressor Station construction.)	Date unknown
111	RFP - Meikle River and Woodenhouse	Date unknown
112	Compressor Project Example - Woodenhouse - Environment, Health, and Safety Execution Plan	Date unknown
113	Compressor Project Examples - Commissioning - Internal Leave to Open (ILTO) - Commissioning checklists (multiple for each component, signed (Examples viewed: Unit Mechanical/Instrument, Station controls, Unitl Controls, Safety and Environment permits)	Various examples
114	Guiding Principles for Land Services	Desk Procedures
115	Land Services - Document Support	Desk Procedures
116	Land Services - What to watch for when reviewing other company's agreements (grant of right-of-way, lease)	Desk Procedures
117	Land Services RACIs - Major Projects work, Meter Stations Work, PMP Work, 3rd party crossings	Desk Procedures
118	Land Services - Template for Lease	Desk Procedures
119	Land Services - Template fro Crossing Agreement	Desk Procedures
120	Land Services - Foreign Crossing procedures	Desk Procedures
121	Land Services - Temporary Agreements Checklist	Desk Procedures
122	Environment - Mainline Design Standard Binder	Desk Procedures
123	Professional Engineering Management Plan	EDMS - General
124	Project Leave to Open Procedure	EDMS - General
125	Primary Test Specification for Hydrostatic Testing	EDMS - General
126	Hydrostatic Testing Specification	EDMS - General
127	Engineer in charge listing	EDMS - General
128	Gas Control System and Operations Overview - presentation slides	Date unknown

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	Document name	Document date and revision #
129	Screen print of Gas Control home page	Printed 11/20/2009
130	Gas Control 2009 Internal Audit Report	2009 Report
131	Wildrose JHSEC Board posting guide	Date unknown
132	TransCanada's Occupational Health, Safety and Environmental (HS&E) Management System - training presentation	Date unknown
133	Audit Scoring Form EDMS #005401595	Date unknown
134	Contractor Safety Pre-Qualification Scoring Sheet, EDMS #003798363	Date unknown
135	Motor Vehicle Operation TOP - Published Document, EDMS #003721956	Date unknown
136	Regulatory Requirements Analysis Statement, Operations and Maintenance Manuals, EDMS #005378580	Date unknown
137	Organizational chart for CSE Committees (re-viewed onscreen)	Accessed on 11/24/2009
138	CSE Homepage: viewed Performance Statistics, which included contractors	Accessed on 11/24/2009
139	Drafting Records Management Procedure for New Original Drawings, EDMS # 003778593	Date unknown
140	Drafting Records Drawing QA, EDMS # 003775836	Date unknown
141	ISRC Project Process Document: Interim Process – Add User to FileNet and/or Group	Feb 9, 2009 Version 1.1.
142	TransCanada's Canadian Hardcopy Records Disposition Process, EDMS # 003768941	Date unknown
143	Regulatory Requirements Analysis Statement (RRAS) - Electronic vs Hard Copy O&M Manuals	Date unknown
144	Edson Area Team Meeting - October 20, 2009. (Minutes from weekly meeting attended by all Edson Team Members, reviewing action items, incident reviews, etc.)	October 20, 2009
145	Alberta One-Call - Daily Audit of Tickets	Date unknown
146	Field Gas Analysis Report sheets (Generic template)	Date unknown
147	Emergency Plan - Knight Compressor Station Critical Site	2009 version
148	Contractor Profile Form for LEDCOR Industrial Maintenance Ltd. (feedback form used to rate contractors after completion of project)	Date unknown
149	Potable Water Cistern and Well Maintenance Program (TOP), EDMS #003951142	Date unknown
150	Instructions for Posting Information at TransCanada Facilities (Regionally-specific list for items to be posted, length of posting time, and location (i.e.. Hazard advisories, JHSEC members, etc.)	Not controlled
151	Operations and Engineering Q3, Board of Directors Update – 5 Oct 2009	Oct 5, 2009
152	Letter of notification of amendments to the Industrial Waste Water information, Beiseker Compressor Station, Reg # 9967-02-01 (23 June 2008) sent by TransCanada to AENV.	2008/06/23
153	Registration form from AENV re: Code of Practice for Compressor and Pumping Stations and Sweet Gas Processing Plants Princess Sweet Compressor Station - Groundwater Monitoring	Date unknown

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	Document name	Document date and revision #
	Change NE 13-20-12-W4M	
154	DRAFT Field Operations Compliance Management Program	2009/11/03 Revision #1
155	TOP Procedure: Consolidated Compliance Field Audit Procedure, EDMS #005364423	2009/10/02 Revision #3
156	TOP Task Package: Consolidated Compliance Field Audit Tasks, EDMS #005364400	2009/10/02 Revision #3
157	Field Operations Consolidated Audit Eastern Region Station 148 Les Cedres, Oct 13 - 16, 2009, FINAL Report	n/a
158	Field Operations Compliance Audit Rocky Mountain Region PM Regulatory, Sep 11 - 29, 2006, FINAL Audit Report	n/a
159	Field Operations Consolidated Audit Wildrose Region Wolf Lake, Swartz Creek & Area, Jul 7 - 11, 2008, FINAL Report	n/a
160	A Tier 3 Assessment of Field Operations - Rocky Mountain Region, July 6 - 24, 2009, IIT 188317	n/a
161	Safety Management Plan - North Central Corridor: Northstar 2071686 & Red Earth 2077584; 17 Aug 2009	n/a
162	Louisbourg Pipelines Project Specific Safety Plan: TransCanada Pipelines Limited NPS 42" Pipe Wooden House Compressor Station to Shell access road 10-29-086-01W5 to 09-7-91-14W5, Rev 10	n/a
163	Audit/ Evaluation of Prime/ General Contractor (Louisbourg Pipelines) Project/ Site Specific Safety Plan (NCC North Star Pipeline Construction), 19 Jan 2009, conducted by Dorothy Lutzak	n/a
164	North Central Corridor Pipeline - North Star 2071686; Red Earth 2077584 - Phase Plan (Implementation)	October 2007
165	Dryden Creek 2009 Planned Inspection Form, 21 October 2009 Didsbury Compressor Station Planned Inspection Form, 26 May 2009 Swartz Creek Compressor Station Planned Inspection Form, 30 June 2009 Clearwater C/S Planned Inspection Form, 29 April 2009 Oakland Compressor Station Planned Inspection Form, 10 March 2009	Examples from work order system - Avantis
166	Capital Project Environmental Binder: Demmitt Area Expansion - Albright North Mainline 19.0 km X NPS 20 Project #2093934	Date unknown
167	Red Earth Nova Gas Transmission Ltd. North Central Corridor (File #2071686-TA410) Crossing Agreements (4 of 4 binders); prepared by Roy Northern Land and Environmental	October 2007
168	NCC – Red Earth Environmental Construction Project Binder 1, Nov 2009	November 2009
169	NCC – Red Earth Environmental Construction Project Binder 2, Nov 2009	November 2009
170	Pipeline Projects, Pipeline Committee Monthly Update, 30 October 2009	2009/10/30
171	NCC Red Earth Implementation Scorecard, 27 Nov 2009	2009/11/27

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	Document name	Document date and revision #
172	NCC Daily Pipeline Construction Summary, 9 Dec 2009	2009/12/09
173	Letter re: NPS 42 North Central Corridor Pipeline Aboriginal Consultation Summary from ASRD to Heather Bishop, 10 Jul 2008	2008/07/10
174	Letter re: NPS 42 North Central Corridor Pipeline Deliverables Review from ASRD to Heather Bishop, 30 Sep 2008	2008/09/30
175	Excerpt from NCC Meikle River Compressor Station Units C3 and C4 plan, 20 Nov 2007 - sections 11.1 General Public Consultation, 11.2 Aboriginal Consultation, 11.3 Industry Consultation, 11.4 Industry Concerns	2007/11/20
176	Aboriginal Consultation Tracking Sheet - NCC Project	Date unknown
177	NPS 42 North Central Corridor Pipeline Frac-Out Response Plan for the Horizontal Directional Drill of the Loon River, Sep 2009; prepared by TERA Environmental Consultants	September 2009
178	NPS 42 North Central Corridor Pipeline Water Quality Monitoring Plan for the Loon River Horizontal Directional Drill Watercourse Crossing, Sep 2009; prepared by TERA Environmental Consultants	September 2009
179	NCC daily mud monitoring report for the Little Cadotte River Crossing	Date unknown
180	Horizontal Directional Drilling: Gel Chemical Drilling Waste Management; Peace River Crossing Waste Disposal Plan; Nov 2008	November 2008
181	NCC Water Quality Monitoring of the Horizontal Directional Drill Crossing of the Peace River, June 2009, prepared by TERA Environmental Consultants	June 2009
182	Doe-Henderson project schedule	Reviewed on 12/1/2009
183	Louisbourg / TransCanada Meeting Minutes, 27 May 2009	2009/05/27
184	STEP 2007 & 2008 Summary of Project Learnings	Date unknown
185	NCC NorthStar 2071686 30 Day Compliance Binder	Date unknown
186	Compression Projects Project Management Playbook	Date unknown
187	Leave to Open Document: NCC NorthStar Section (140 km of NPS 42 Pipeline) Meikle River Compressor Station to Hunt Creek Lateral, Project #2071686, ILTO #012-2009, AUC File #1551990, Approval #19611	Date unknown
188	Measurement Projects Construction Binder - template version	Date unknown
189	Measurement Projects Management Operating System, 27 October 2008	2008/10/27
190	Measurement Projects Playbook - draft document - 27 Nov 2009	2009/11/27
191	templates: Measurement Project Final Clean-up Sign-Off Measurement Project Quality Assurance Sign-Off Measurement Project Closeout Sign-Off	Various dates

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	Document name	Document date and revision #
192	Doe Creek #2 Meter Station Expansion: a) Meter Station Expansion Commitment List, 21 Oct 2009 (last rev) b) 30 day Compliance Tracking c) At-a-glance Scorecard, 9 Nov 2009	Various dates and versions
193	Asset Management System Framework, EDMS #004102169	Date unknown
194	Control System Software Control Procedure (TOP), EDMS #003671951	Date unknown
195	TES-CORR-PMP Corrosion Pipeline Maintenance Plan Development (TOP)	Date unknown
196	TER-RISK-SWR System Wide Risk Assessment	Date unknown
197	TER-COR-RISK Risk Models for Corrosion using ILI Data	Date unknown
198	TER-RISK-CON Consequence Models within PRIME	Date unknown
199	NEB Reference Dox Binder for Pressure Equipment	Date unknown
200	Org Charts for the Canadian Pipeline Operations and Engineering Asset and Reliability business units	Date unknown
201	TransCanada Operating Procedures Management System (TOP MS) – Framework document	Date unknown
202	Asset Reliability Plant Integrity Management Process	Date unknown
203	Integrity Management Process for Pipelines	Date unknown

Appendix 4: List of Operational Sites Visited

1. Wildrose Region: Vegreville and Edson Areas, December 2 – 4, 2009

Office	▪ Regional head office, Spruce Grove ▪ Area office, Vegreville ▪ Area office, Edson
Compressor Stations	▪ Ben's Lake ▪ Smoky Lake ▪ Hanmore ▪ Knight ▪ Swartz Creek
Meter Stations	▪ Vegreville Sales ▪ Royal Park ▪ Hairy Hill ▪ Willington ▪ Andrew ▪ Pioneer ▪ Ansel ▪ Edson
Water crossings	▪ North Saskatchewan River crossing at Flat Lake ▪ North Saskatchewan River crossing south of Lodgepole

2. Rocky Mountain Region: South Airdrie, North Airdrie, and Rocky Mountain House Areas, December 9 – 11, 2009

Office	Regional head office, Airdrie
Compressor Stations	▪ Beiseker ▪ Hussar ▪ Schrader Creek ▪ Winchell Lake
Meter Stations	▪ Severn Creek ▪ Hussar North ▪ South Elkton – Harmatton Delivery
Water crossings	Bow River crossing in the town of Cochrane

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3. Central Region: Palliser Area, December 7 - 8, 2009

Office	Area office, Medicine Hat
Compressor Stations	Cavendish
Meter Stations	▪ Dunmore ▪ Medicine Hat East ▪ Empress East Sales ▪ McNeil
Water crossings	South Saskatchewan River crossing

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Appendix 5: Description of TransCanada's multi-tiered audit program

Below are excerpts from TransCanada's internal documentation describing the multi-tiered audit program

The Health, Safety and Environment Management System (HSE MS) has been developed to provide the company with a systematic and organized approach to ensure TransCanada's health, safety and environmental governance and the achievement of its HSE Commitment Statement. It enables the company to work towards defined HSE expectations and objectives. The management system sets an effective, well-defined structure which emphasizes the importance of continuous HSE improvement. Implementation of the management system is achieved via ongoing HSE programs, practices and procedures. The effectiveness and adequacy of implementation is assessed through 4 levels of governance activities that evaluate HSE performance.

Tier 1 Activities are the foundation of HSE governance. All activities that are driven from regulatory requirements, internal risk analysis and best practices are identified, planned and routinely conducted. They are proactive in nature and when well managed, minimize or eliminate the causes for findings in higher tiers. All of these activities are included in TransCanada's planned maintenance program and are scheduled through AVANTIS. Tier 1 activities can occur daily, weekly or monthly and are conducted on 100% of facilities, processes and activities. The purpose is to assess physical conditions and to ensure compliance to regulatory and procedural requirements. Tier 1 activities are planned, scheduled and tasked through Avantis. Progress is tracked by the Regional Manager and Director.

Tier 2: Planned Inspections include formal workplace and facility inspections in TransCanada Field Operations' Regions to identify hazards and findings that are corrected to eliminate and/or minimize injuries, property damage and substandard practices and conditions. Planned inspections are conducted on 50% of facilities, processes or activities on an annual basis.

- "Major" Planned Inspections are conducted on all compressor stations and export sites every year. Findings are tracked via Avantis, and work orders created by priority (low, medium and high). Outstanding action items not completed within the scheduled time frame are entered into IIT to ensure follow up.

- "Minor" Planned Inspection includes a sample of the listed facilities (valve sites and meter stations) in accordance with Tier 2 guidelines.

Tier 3 Audits (internal) are biennial to triennial internal assessments on the effectiveness and adequacy of TransCanada's HSE Management System. Tier 3 audits allow TransCanada to identify, assess, and communicate HSE risks and opportunities and then implement appropriate corrective action(s) to ensure the effectiveness, adequacy and continuous improvement of the HSE MS and its enabling tools (i.e., TransCanada HSE policies, programs, practices and procedures). Tier 3 audits are conducted utilizing recognized audit principles and company developed protocols. Tier 3 audits occur on 25% of facilities, processes or activities on an annual basis.

Tier 4 audits are audits and inspections conducted by third parties, including those procured by TransCanada as well as regulatory inspections. Tier 4 audits focus on regulatory compliance, HSE management system effectiveness and adequacy and due diligence. TransCanada conducts Tier 4 audits every 3 years as mandated by the HSE Committee of the Board. External (regulatory) inspections and audits occur on an infrequent and unplanned basis and are categorized as Tier 4.

Appendix 6: TransCanada's Pipeline Integrity Program

Below are excerpts from TransCanada's internal documentation describing the integrity management process for pipelines

OVERVIEW

TransCanada's overall approach to pipeline integrity management utilizes state-of-the-art advanced inspection and mitigation technologies applied within a comprehensive risk-based methodology. Risk assessment is used to identify potential integrity threats for initiation of inspection/mitigation activities, while results from advanced inspections for known or suspected integrity threats are used to develop specific integrity maintenance activities. The Integrity Management Process for Pipelines (IMPP) provides the basis for developing the annual Pipeline Maintenance Plan (PMP). In addition to projects initiated through risk assessment, the PMP also incorporates prescriptive provisions of applicable codes, regulations, special permit and waiver conditions, and projects initiated from input from the Regional Offices. The annual PMP summarizes the individual programs and activities planned for management of the major pipeline hazards and also ensures regulatory/code compliance.

The Pipe Integrity Group of the Engineering and Asset Reliability (E&AR) Department within Operations and Engineering (O&E) is responsible for developing the IMPP and producing the annual PMP. The IMPP document is aligned with the high level TransCanada Integrity Management System document (EDMS 3747299), which applies to management of integrity of all assets (pipeline and facilities) managed by O&E.

The scope of this IMPP includes all high pressure piping outside of the packaged equipment flanges, but is not intended to cover pressure vessels or associated pressure piping located within station structures. Management of integrity issues associated with packaged equipment within compressor stations, meter stations and controls facilities resides with the Asset Strategy & Integrity and Facilities Integrity within the E&AR Department.

The application of the IMPP addresses the entire life cycle of the pipeline system, from design, construction, and operation through to retirement.

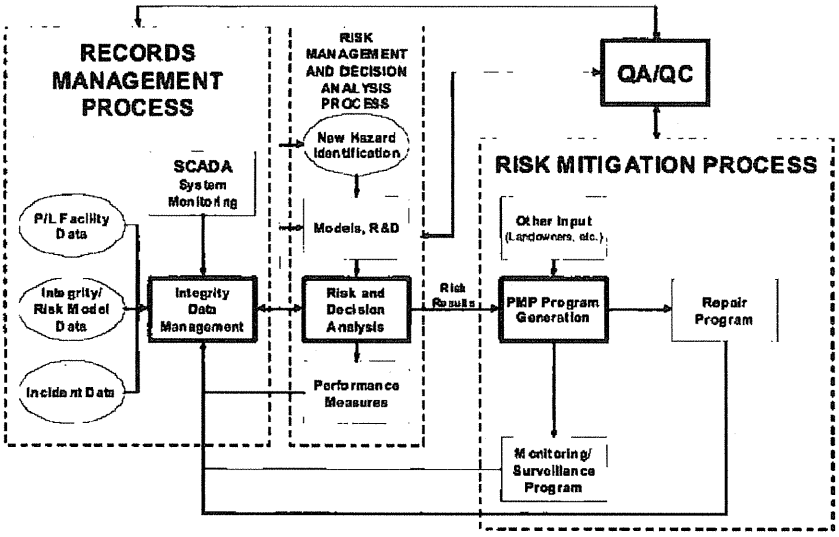
The Integrity Management Program for Pipelines is risk-based and "process focused." The IMPP document is the written process to provide consistent implementation, accountability, documentation, and program performance measurement.

A process flow diagram for management of integrity of the TransCanada's pipeline systems is presented below. The pipeline integrity management process essentially consists of four key elements:

1. Data and Records Management
2. Risk Management and Decision analysis
3. Risk Mitigation
4. Quality Assurance/Quality Control

Details of the processes are contained in subsequent chapters of the IMPP.

Integrity Management Process



TransCanada recognizes that optimal integrity management is best achieved from a pipeline life-cycle perspective. Optimisation of pipeline integrity management is achieved through consideration of the holistic interaction of the design, construction, operation and maintenance, and retirement stages of the pipeline life-cycle. The IMPP implicitly assumes that the pipeline system has been designed, constructed and operated according to all applicable codes (principally the appropriate edition of CSA Z184 or Z662, Oil and Gas Pipeline Systems (for Canadian based pipelines) or 49 CFR Parts 191, 192 and 195 (for US based pipelines)). While design and construction is grandfathered to the applicable code edition (dependent on year of construction), the pipeline system is operated, maintained and ultimately retired according to the most recent standards. The IMPP specifically addresses pipeline integrity related operation and maintenance activities, but through the continuous review, feedback and performance measure monitoring inherent in the process, it is also used to influence the design, construction and retirement of pipeline facilities.

In addition to satisfying regulatory requirements, the IMPP conforms to all pertinent TransCanada Operating Procedures (TOPs); Engineering Standards (TESs); Engineering Procedures (TEPs); and continuation of ongoing programs and inputs from other key stakeholders (i.e. Regions, etc).

Implicit in the execution of the IMPP are process controls (i.e. checks and balances) to ensure that processes and activities are implemented according to the IMPP and that key decision and process "milestones" are signed-off by the appropriate level of authority. The corporate engineering report TER-IMPP-Roles and Responsibilities summarizes the key integrity processes and activities correlated to the responsible individual (by position title). These roles, responsibilities and approvals are also summarized within the Roles, Responsibilities subsection of each section of the IMPP document. In addition, Chapter 11 of the IMPP (Quality Assurance Process) summarizes QA/QC processes utilized to ensure conformance to TransCanada's quality management system controls.

Documentation of specific PMP activities used to mitigate identified risks is through the Decision Summary Process (DECSUMM). Individual decision summaries for all work in the current year's program are also documented on this site as well as in a central hard copy file maintained by the Pipe Integrity group in E&AR.

The DECSUMM process provides a common framework for evaluating potential mitigation options for individual risk situations and provides a rigorous and consistent methodology for support and justification of integrity projects. The individual program decision summaries are the primary documentation used by E&AR Department management to support decision analysis and document activities contained in the annual PMP.

Following roll-up of the individual integrity projects proposed for the annual PMP, the annual pipeline integrity/maintenance budget is prepared and documented in the annual PMP presentation.

COMMUNICATION AND IMPLEMENTATION

Critical to achieving the goals and objectives of the IMPP is timely and content-appropriate communication to the various departments and individuals affected by the IMPP results. All departments or individuals directly affected by the IMPP, or those responsible for executing programs developed by the IMPP, are informed and where appropriate, directly involved in the IMPP development process.

All TransCanada employees have access to the IMPP on the E&AR Homepage and the Corporate Policy Webpage. The IMPP is further communicated through specific presentations to senior management and field personnel.

The following reports are generated and distributed through the execution of the IMPP:

- Pipeline Maintenance Plan (PMP)
- Monthly PMP update
- Year end PMP report
- Residual risk report
- Quarterly non-compliance report
- Performance measures report
- Bi-weekly integrity activity report

These reports are reviewed by the management of E&AR, and where appropriate, senior management. Whereas the reports all support the preparation of the budget to varying extents, they are technical reports in nature and as such address issues beyond purely budgetary considerations.

Communication of the PMP is provided in detail, as required for internal TransCanada process conformance and external regulatory compliance. Land owners receive appropriate communication of the PMP and participate in its programs through the various liaison and public awareness initiatives contained within TransCanada's Integrated Public Awareness Program (IPA).

Appendix 7: Inventory of Audit Findings from Field Visits

Region: Wildrose
Date of Audit: December 2nd and 3rd, 2009
Audit Team: s.19(1)

TransCanada Liaison: (Edson)
(Vegreville)

REGION	AREA	FACILITY	FINDINGS & CITATIONS
Wildrose	Vegreville	Ben's Lake Compressor Station	o We noted that no signage indicating storage of dangerous good (TDG Class 3) were posted at the entrance to barrel dock used for storage of oil and diesel [*OPR(99), S.4(2)]*. o No TransCanada signage on perimeters of the compressor stations [*OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2*]
Wildrose	Vegreville	Smoky Lake Compressor Station	o We noted that no signage indicating storage of dangerous good (*TDG Class 3)* were posted at the entrance to barrel dock used for storage of oil and diesel [*OPR(99), S.4(2)]*. o No TransCanada signage on perimeters of the compressor stations [*OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2*]
Wildrose	Vegreville	Hanmore Compressor Station	o We noted that no signs indicating storage of dangerous goods (*TDG Class 3*) were posted at the entrance to barrel dock used for storage of oil and diesel [*OPR(99), S.4(2)]*. o No TransCanada signage on perimeters of the compressor stations [*OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2]*
Wildrose	Edson	Knight Compressor Station	o Staff at the compressor station regularly test quality of well water (every 6 months) and sample analysis reports from an accredited laboratory, but the staff are unable to interpret the details of the sample results [*OPR(99), S.56*] o The Chemical Inventory form, kept on-site in the Compliance Cabinet, did not have any evidence of review in 2007 and 2008 (the 2006 inventory record was copied and placed in the cabinet for 2007 and 2008). The pipeline technician at the compressor station had recently reviewed the chemical inventory, but had not filed the inventory record sheet (in the cabinet or in electronic form). Staff were unsure what the inventory record should have been for 2007 and 2008 [*OPR(99), S.56*].
Wildrose	Edson	Swartz Creek Compressor Station	o Staff reported that they regularly (every 6 months) submit water samples to an accredited laboratory for testing of quality, yet do not receive the results of the sample analyses to keep on site [*OPR(99), S.56*] o A fire extinguisher located within the Compressor Building was noted to have had its last annual inspection performed in 2008, rather than in 2009 (at the same time as other fire extinguishers) [*OPR(99), S.39*] o We noted that the Compressor Station did not have any

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REGION	AREA	FACILITY	FINDINGS & CITATIONS
			hearing protection signage/ placards on one of the entrances *[OPR(99), S.30(a)]*. o We noted that chains surrounding a platform used for operational work to be conducted on blow-down valves, and acting as a fall-arrest system, were not engaged *[OPR(99), S.30(a)]*
Wildrose	Vegreville	Vegreville Sales Meter Station	o No issues observed
Wildrose	Vegreville	Royal Park Meter Station	o No issues observed
Wildrose	Vegreville	Hairy Hill Meter Station	o No issues observed
Wildrose	Vegreville	Willington Meter Station	o No issues observed
Wildrose	Vegreville	Andrew Meter Station	o No issues observed
Wildrose	Edson	Pioneer Meter Station	o No issues observed
Wildrose	Edson	Ansel Meter Station	o Fencing surrounding the meter station was noted to have been damaged in multiple areas. The damage was reportedly caused by fallen trees surrounding the station, which occurred during a storm event in the first week of August, 2009. *[OPR(99), S.11(b)]*
Wildrose	Edson	Edson Meter Station	o TransCanada staff advised us that hearing protection be worn upon entry to the Valve Control Hut, yet there was no signage/ placards on the entrances to the building indicating that hearing protection be necessary *[OPR(99), S.30(a)]*
Wildrose	Vegreville	North Saskatchewan River crossing at Flat Lake	o No issues observed
Wildrose	Edson	North Saskatchewan River crossing (south of Lodgepole)	o Signage at the north riverbank was observed to be somewhat obscured by vegetative growth *[OPR(99), S.4(2)]*

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Region: Central
Date of Audit: December 8th, 2009
Audit Team: s.19(1)

TransCanada Liaison:

REGION	AREA	FACILITY	FINDINGS & CITATIONS
Central	Palliser	Cavendish Compressor Station	o The Fire-proof cabinet storing chemicals was noted to be blocked by its abutment to an electrical panel [*OPR(99), S.30(a)*] o The "Meter Station Local Procedures Manual" has not been updated since June, 2006. There are no indications that the manual has since been updated, or reviewed to ensure that no changes to the manual are necessary. [*OPR(99), S.32(1)*] o The "Meter Station Local Procedures Manual" does not contain facility schematics, facility access map, side valve access outside, producer index files, or an isolation plan, all of which are noted in the Table of Contents of the manual [*OPR(99), S.32(1)*]
Central	Palliser	o Dunmore Meter Station o Medicine Hat East Meter Station o Empress East Sales & McNeil Meter Stations	o No TransCanada signage on perimeters of the meter station – [*OPR(99), S.36(f), CSA Z662-07 s.10.3.9.2*] o Emergency gates not marked with any signage or marker that would allow easier visibility of the gate location [*OPR(99), S.30(a)*] o "Meter Station Local Procedures Manuals" were all last updated in June, 2006. There are no indications that the manuals has since been updated, or reviewed to ensure that no changes to the manual are necessary [*OPR(99), S.32(1)*]
Central	Palliser	South Saskatchewan River crossing	o We noted a fixed ladder leading from ground at edge of riverbank to top of pipes on crossing (excess of 30 feet in height) did not have a surrounding safety-cage [*OPR(99), S.30(a)*]

Region: Rocky Mountain
Date of Audit: December 9th and 10th, 2009
Audit Team: s.19(1)

TransCanada Liaison: (East Loop)
(West Loop)

REGION	AREA	FACILITY	FINDINGS & CITATIONS
Rocky Mountain	East Loop	Beiseker Compressor Station	○ We noted no legible TDG Class 2.1 pictorial at Beiseker Compressor Station Main Entrance [*OPR(99), S.4(2)]*. ○ We noted that the warm storage area was used for storage of hazardous materials (three full oil barrels, ten full 25L containers of oil and hazardous chemicals within the storage cabinets) ○ There was no indication of such by the posting of signs identifying the stored products on the entrances to the warm storage building [*OPR(99), S.4(2)]* ○ Barrels of oil and 25L containers where not stored at least above 100 mm above the floor level [*OPR(99), S.13(c)*] ○ One Fire-proof cabinet vent in the Warm Storage Building was noted to be open and venting inside the building [*OPR(99), S.30(a)*]. ○ No TransCanada signage on perimeters of the compressor stations *[OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2]*
Rocky Mountain	East Loop	Hussar Compressor Station	○ Site inspection discovered a total of four Westinghouse transformers (range 45kVA and 300kVA) located in the basement of main building. Basement has no adequate protection against water seepage during summer months (observed water marks and stain on floor). This situation poses constant safety and equipment integrity hazard. *[OPR(99), S.13(a)]* ○ Site has two high pressure boilers that have to be inspected by ABSA accredited inspector at interval deems appropriate by inspector. There were no records available in hard or electronic form confirming that Vessel (B) inspection was completed [*OPR(99), S.56*] ○ We noted that obsolete version of *Segregation Chart for Dangerous Goods and Hazardous Material* was posted at Barrel dock (outside storage area). In addition the poisonous material (Roundup) was stored together with flammable material (oil) in contravention to internal TC and TDG regulatory requirement [*OPR(99), S.4(2)*] ○ We noted several fire extinguishers with no annual inspection tags present [*OPR(99), S.39]* ○ We noted that station Emergency Response Plan does not contain residence lists as per TC requirement [*OPR(99),*

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REGION	AREA	FACILITY	FINDINGS & CITATIONS
			S.32(1)] o We noted that no signage indicating storage of dangerous goods (*TDG Class 3*) were posted at the entrance to barrel dock used for storage of oil and diesel [*OPR(99), S.4(2)]*. o No TransCanada signage on perimeters of the compressor stations [*OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2]*
Rocky Mountain	West Loop	Schrader Creek Compressor Station	o Signage – There did not appear to be adequate High Pressure Warning signage on the perimeter fence [*OPR(99), S.4(2)*] o Signage – There did not appear to be adequate dangerous goods storage signage at the entrance to barrel dock used for storage of oil and diesel [*OPR(99), S.4(2)*].
Rocky Mountain	West Loop	Winchell Lake Compressor Station	o Signage – There did not appear to be adequate High Pressure Warning signage on the perimeter fence [*OPR(99), S.4(2)*] o Signage – There did not appear to be adequate dangerous goods storage signage at two of the three entrances to the warm storage area. [*OPR(99), S.4(2)*]. o ERP – contact names not listed in the ERP. Only a reference to another online document is provided [*OPR(99), S.32(1)*]
Rocky Mountain	East Loop	Severn Creek Meter Station	o We noted three high pressure helium cylinders stored in a position not protecting them against valve damage (not securely fastened) [*OPR(99), S.30(a)*]. o No TransCanada signage on perimeter fencing [*OPR(99), S.32(1), CSA Z662-07 s.10.3.9.2*]
Rocky Mountain	West Loop	South Elkton – Harmattan Delivery Meter Station	o We noted an H_2S warning sign on the entrance gate, however no H_2S gas present in the line. According to Darrel Sayer, Regional Asset Reliability Manager, Rocky Mountain Region, the sign was originally installed when the South Elkton station was a receipt point and not subsequently removed [*OPR(99), S.4(2)]*
Rocky Mountain	East Loop	Hussar North Meter Station	o No TransCanada signage on perimeter fencing [*OPR(99), S.32(1)]*
Rocky Mountain	West Loop	River Crossing – Cochrane Bow River	o Signage – There appeared to be inadequate high pressure pipeline warning signage at the Cochrane Bow River crossing. Only the pipeline markers were in place. Mitch Starke, HS&E Coordinator, advised us that the sign was removed due to the difficulty of maintaining the sign at the river crossing, but that the sign will be replaced [*OPR(99), S.4(2)]*.

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2010 Alberta System Audit

Opportunities for Improvement and Corrective Action Plan

2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

Element	Opportunities for Improvement ("OFI")	Classification	Corrective Action	Target Completion Date	Department Accountable	Person Responsible
Corporate Policy	▪ The company has not developed a policy relating to physical security.	Moderate	TransCanada Corporate Security acknowledges this OFI, however at the time of the audit, the following documents were in the internal document review process and have been subsequently approved and issued: o Updated Corporate Security Policy o Updated Physical Security & Incident Reporting TOP o New Security Threats TOP o New Physical Security for Construction Sites TOP	Completed		
			The draft Critical Facilities Identification TOP is currently working through final approvals and will be issued this quarter.	Q1, 2010	Corporate Security	[redacted]
	▪ The company has not developed a policy relating to cyber-security.		TransCanada's Information Management and Security Policy is intended to cover cyber security for all information technology and SCADA systems. TransCanada is undertaking a review of the policy and will make any necessary changes to ensure SCADA systems are adequately addressed.	Q3, 2010	Governance & Security	[redacted]
Risk Identification	▪ The company has not formally identified and assessed the cyber-security risks associated with its SCADA system as required in the NEB Pipeline Security Change Notification, 2006. – see Section 2.2.3	Moderate	TransCanada recognizes that NOPRC 2009-01 supersedes PRC 2006-01. NOPRC 2009-01 proposes to incorporate CSA Z246.1, by reference into OPR-99. TransCanada will undertake to assess its current cyber security risk assessment processes to identify any gaps with respect to section 5 (Security Risk Management) of CSA Z246.1-09, TransCanada will undertake to remediate any gaps that are identified as a result of this assessment.	Q4, 2010 to Q1, 2011	Facilities Reliability IS Governance & Security	[redacted] [redacted]

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2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

Element	Opportunities for Improvement ("OFI")	Classification	Corrective Action	Target Completion Date	Department Accountable	Person Responsible
Legal and Other Requirements	▪ Although electronic copies of correspondence with regulators is maintained for each project or operations file, the company does not maintain a centralized consolidated file of interpretations, exemptions, and waivers from regulations as agreed upon with regulators (voluntary management practice). – see Section 2.2.6	Low	TransCanada will create and maintain a centralized consolidated file that contains records relating to interpretations, exemptions and waivers from regulations as agreed upon with regulators. This will include a review of projects completed under NEB jurisdiction since April 2009. On a prospective basis, a new management process will be implemented whereby regulatory project managers will note any interpretations, exemptions and waivers from regulations and record these and any associated documents in a centralized file maintained by Regulatory Services. TransCanada will create and maintain a centralized consolidated file to contain the records relating to interpretations, exemptions and waivers from regulations occurring during operations.	Q1, 2010 Q1, 2010	Regulatory Services Canadian Pipeline Operations - Compliance	[redacted] s.19(1) [redacted]
Objectives, Targets and Programs	▪ In some cases, performance goals or targets may have been established without regard to the underlying specific risks and without a practical means of prioritizing. As a result, some managers may have difficulty assessing whether under-achievement against targets poses a particular operational or other risk.	Low	TransCanada is undertaking a review of the process for setting its performance goals and/or targets relating to regulatory and/or compliance requirements and will communicate more explicitly the rationale and consequences of not meeting the objectives.	Q2, 2010	All	[redacted] s.19(1)
Resources, Roles, Responsibilities and Authority	▪ Roles and responsibilities regarding SCADA security have not been documented. – see Section 2.2.3	Moderate	TransCanada is in the process of reviewing the RACI (Responsibility, Accountability, Consult and Inform) matrix for cyber security. We will validate existing documentation and incorporate roles and responsibilities for SCADA security into the overall RACI matrix.	Q2, 2010	Facilities Reliability IS Governance & Security	[redacted]
Competence, Training	▪ Security Awareness Poster campaign	Low	A Security Awareness poster regarding	Q2, 2010	Corporate	G. Reierson

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2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

Element	Opportunities for Improvement ("OFI")	Classification	Corrective Action	Target Completion Date	Department Accountable	Person Responsible
and Awareness			suspicious activities, persons and objects has been developed. Field implementation of the poster has begun. Security awareness considerations will be included as part of regular site orientations.		Security	
Communication	▪ None identified	Not applicable	Not applicable	n/a	Not applicable	Not applicable
Documentation	▪ The company's cyber-security management system is currently not well documented. Interviews with relevant personnel indicate that the company will document the SCADA and cyber-security management system and associated processes over the next few years, starting with TransCanada's Power division. – see Section 2.2.3	Moderate	TransCanada has completed a significant effort to document cyber security policies and procedures. These policies and procedures are specific to NERC CIP compliance within TransCanada's Power division. TransCanada will undertake to assess the cyber- security policies and procedures for applicability to all SCADA environments.	Q4, 2010 to Q1, 2011	Facilities Reliability IS Governance & Security	
Control of Documents	▪ We noted during our interviews that document control practices do not always cascade down to specific desk procedures and other departmental-specific guidance and protocols beyond the scope of the relevant "official" policy and procedure documents (version numbers, dates, owners, etc.)	Low	Engineering and Operations will undertake a review of its current document control practices to ensure corporate requirements are being met.	Q4, 2010	Engineering & Operations	
Operational Control	▪ Some interviewees indicated that occasionally there can be temporary gaps in the ownership and accountability for managing certain TOPs following organizational and staff changes. These gaps can persist for some time, depending on the schedule for review and update of the particular TOP. However, we did not see evidence suggesting that these gaps were causing undue risk to operations.	Low	TransCanada will incorporate a Management of Change process into the TOPs management system to address changes in functional responsibility through attrition, promotions, and re-organizations.	Q2, 2010	Asset Management Improvement	
Emergency Preparedness and Response	▪ There is an opportunity to enhance the annual review process (EMS Manual, Section 1.7) for site specific emergency response plans. We noted during the site visits that the emergency response plans at several Compressor stations were partially out of date or incomplete. See Appendix 7 for details.	Moderate	TransCanada will undertake to review and update the site specific response plans at compressor stations in 2010. This update will be added as a yearly task to the compressor station compliance calendars to ensure an annual review of the document is completed	Q4, 2010	Regions	

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2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

Element	Opportunities for Improvement ("OFI")	Classification	Corrective Action	Target Completion Date	Department Accountable	Person Responsible
	▪ The effectiveness of the IPA program is currently monitored through initiatives such as assessing feedback received from information mail-outs and surveys as well as quarterly tracking of the number of unauthorized crossings. Separate groups track the number of requests for crossing agreements and the number processed. The IPA program can be further enhanced by including these statistics as part of its review.	Low	each year. The statistics and trends related to unauthorized crossings will be included as part of the annual review of IPA program effectiveness commencing in 2010.	Q4, 2010	Integrity Services and Support	[redacted]
Monitoring and Measurement	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site inspection process is not effective. These are discussed in Section 2.2.1 and again in Appendix 7.	High	TransCanada will conduct a review of its Planned Inspection Program and the accompanying Pocket Guide in 2010 to ensure it provides sufficient guidance to Field Staff conducting the planned inspections. TransCanada will undertake a review of the site inspection process in 2010 to determine if the identified skill sets required to complete the inspections are adequate. TransCanada will reinforce the expectations of the site inspections with its Field personnel.	Q2, 2010 Q2, 2010 Q2, 2010	Canadian Pipeline Operations – Compliance Canadian Pipeline Operations – Compliance Regions	[redacted]
Evaluation of Compliance	▪ We identified numerous deficiencies at the sites during the site inspection component of our audit, suggesting that the company's site-level compliance evaluation processes are not effective. These are discussed in Section 2.2.1 and again in Appendix 7.	High	TransCanada will undertake a review of its Planned Inspection Program and the accompanying Pocket Guide in 2010 to ensure it provides sufficient guidance to Field Staff conducting the planned inspections. TransCanada will undertake a review of the site inspection process in 2010 to determine if the identified skill sets required to complete the inspections are adequate. TransCanada will reinforce the expectations of the site inspections with its Field personnel.	Q2, 2010 Q2, 2010 Q2, 2010	Canadian Pipeline Operations – Compliance Canadian Pipeline Operations - Compliance Regions	[redacted]

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2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

Element	Opportunities for Improvement ("OFI")	Classification	Corrective Action	Target Completion Date	Department Accountable	Person Responsible
						[redacted]
Nonconformity, Corrective Action and Preventive Action	▪ We noted during our site inspections that there were a relatively large backlog of issues and items in the IIT system. This is discussed further in Section 2.2.5.	Moderate	TransCanada will undertake a review of the IIT management process in 2010 to assess and if necessary, reduce the backlog of outstanding issues moving forward with a single prioritization model.	Q2, 2010	Wildrose Region	C. Pezoulas
Control of Records	▪ TransCanada should consider enhancing its record keeping process for hard copies of records required to be kept at compressor stations. We noted during the site visits that certain records required to be kept on sites were not available for inspection. See Appendix 7 for details.	Moderate	Hard copy inspection records related to boilers are held centrally as ABSA jurisdiction does not require the documents to be held at site. TransCanada will undertake to add hard copies of boiler inspection records to the site specific compliance files in 2010. Likewise, hard copies of water sample test results will be kept on site.	Q4, 2010	Regions	[redacted]
Internal Audit	▪ Although we have identified weaknesses in the company's site inspection program, we have not identified specific opportunities for improvement in the overall internal audit processes.	Not applicable	Not applicable	n/a	Not applicable	Not applicable
Management Review	▪ None identified.	Not applicable	Not applicable	n/a	Not applicable	Not applicable

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2010 Alberta System Audit – Opportunities for Improvement / Corrective Action Plan

A summary of the opportunities for improvement identified during the audit is presented in the following table. PwC has categorized the OFIs under three classifications:

Classification	Description
High	Significant deviation from regulatory requirements, company standards, or other practices of a substantial nature leading to significant requirements or concepts not addressed in implementation or TransCanada's documentation. This can include absence of required programs, management systems or processes; ineffective implementation or maintenance of a key requirement or procedure; potential liability issues; or repeat findings from previous audits.
Moderate	Moderate deviations from regulatory requirements, company standards or other practices leading to noticeable differences in structure and implementation or depth of coverage, but general alignment of main requirements and concepts. This can include gaps in formal programs, incomplete implementation of programs, lack of awareness of some requirements, or informality of management systems.
Low	Minor deviations from regulatory requirements, company standards or other practices in an otherwise good program leading to slight but noticeable differences in implementation. This includes opportunities to strengthen or fine-tune the management systems or processes, or can indicate potential for escalation in the future if not addressed.

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TES-NDT-UT1 Mechanized Ultrasonic Examination of Pipeline Girth Welds		Document Type: Specification
Effective Date: 2010/02/19	Revision: 02	Status: Issued
Classification Code: DE-16	Document Owner: Engineering and Asset Reliability	
Originator: [redacted], NDE Engineering		[redacted] 19 Feb 2010 Signature/Date (signed copy on file)
Discipline Checker: [redacted] Materials Engineering Governance and Quality Management		[redacted] 19 Feb 2010 Signature/Date (signed copy on file)
Discipline Checker: [redacted] Materials Engineering Governance and Quality Management		[redacted] Feb 19 2010 Signature/Date (signed copy on file)
Responsible Engineer: [redacted], NDE Engineering		[redacted] 19 Feb 2010 Signature/Date (signed copy on file)

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PURPOSE

This Specification details the requirements for the ultrasonic system (transducers, ultrasonic instrument, and recording system), calibration standards, system set-up and performance, field inspection and records for the examination of pipeline girth welds using a mechanized ultrasonic examination system.

The pipeline contractor should be aware of these inspection requirements and work with the NDE contractor to ensure that welds are inspected as required by the Company

SCOPE

This Specification establishes minimum requirements for ultrasonic examination of qualification welds, production welds and repair welds. Notwithstanding the requirements set forth herein, ultrasonic examination shall comply with the requirements of the latest approved edition CSA Z662.

This Specification applies to welds made in pipe having a nominal wall thickness 7.2 mm and greater.

BRIEF DESCRIPTION OF CHANGE

This Specification has been fully revised to capture new AUT technologies, update system requirements, and performance monitoring. Data interpretation and flaw marking protocols for weld removal have been added. Specifications TES-NDT-UTS, TES-NDT-UTG, and TES-NDT-UT2 have been revised and consolidated into this Specification.

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1 SCOPE

This Specification establishes minimum requirements for ultrasonic examination of qualification welds, production welds and repair welds. Notwithstanding the requirements set forth herein, ultrasonic examination shall comply with the requirements of the latest approved edition of CSA Z662, and any amendment, supplement, or errata issued by CSA; and the Company Environment, Occupational Health and Safety standards. This Specification applies to welds made in pipe having a wall thickness 7.2 mm and greater.

2 REFERENCES

a) CSA Standard Z662-07 Oil and Gas Pipeline Systems (referred to as CSA Z662)

b) British Standard BS EN 12668 Characterization and Verification of Ultrasonic Examination Equipment; Part 1 Instruments, part 2 Probes, Part 3 Combined Equipment

c) ASTM E164, Practice for Ultrasonic Contact Examination of Welds

d) ASTM E317, Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Systems Without the Use of Electronic Measurement Instruments

e) BS EN 583-6:2008, Non-destructive testing. Ultrasonic examination. Time-of-flight diffraction technique as a method for detection and sizing of discontinuities

f) Canadian General Standards Board, CAN/CGSB 48.9712 Qualification and Certification of Nondestructive Testing Personnel

g) Electrical Supply Industry Standard ESI 98-2 Issue 1 Dec 1979/R1998, Ultrasonic Probes: Medium Frequency Miniature Shear Wave, Angle Probes

h) ASTM E 1316 Standard Terminology for Nondestructive Examinations

i) ASME Section V, Nondestructive Examination

j) Applicable TransCanada specifications

3 DEFINITIONS

Definitions contained in ASME Section V, Article 5, Mandatory Appendix III apply to this Specification; in addition the following definitions shall be added:

Company	TransCanada Pipelines Limited (Company) including their engineering agencies, inspectors and other authorized representatives.
Contractor	The ultrasonic inspection contractor engaged to perform work covered by this Specification.
Operator(s)	Operators of ultrasonic equipment. Ultrasonic operators shall be qualified and certified in accordance with the requirements of Level II Canadian General Standards Board, CAN/CGSB 48.9712 Qualification and Certification of Nondestructive Testing Personnel.
Pipeline	A pipeline for the transmission of natural gas or hazardous liquids including laterals, branch connections, extensions, compressors, pumps, and related facilities as defined by CSA Z662.

4 GENERAL

All documents listed in the tender shall apply to and govern all phases of the Work hereinafter specified.

4.1 General Conditions

4.1.1 The Company will only use Contractors who have been pre-approved using the system performance qualification process detail in Clause 6.2 of this Specification.

4.1.2 The Company shall have the right to nondestructively examine any weld; the examination shall be used to assess compliance with CSA Z662. The Company shall also have the right to require the removal of any weld for the purpose of destructive tests. The Company is the final authority for the acceptance of welds.

4.1.3 The Contractor shall provide ultrasonic examination services for all welds designated by the Company during the construction of a pipeline or facility, as described in Clause 6.

4.1.4 The pipe coating shall be cutback for a minimum distance of 125 mm from the original bevel face; spiral or long weld seams shall be ground within 0.5/-0 mm of the pipe surface for a distance measured along the length of the pipe of 125 mm from the original bevel face to ensure that no transducers are lifted from the pipe surface during the scanning operation.

4.1.5 No transducers shall operate on the coating.

4.1.6 Pulse-echo and pitch-catch techniques, using either focused transducers or phased array transducers, in combination with a minimum of A-scan, stacked A-scan presentations, and a fully automatic recording system shall indicate accurately the circumferential location, circumferential length, and through-thickness location of indications as well as the continuity of acoustic coupling. The system analysis software shall be capable of determining the through-thickness height of indications with an accuracy $\leq$ 1.5 mm. System resolution shall be 1 mm of circumferential distance, and the system shall provide for encoder accuracy verification. Circumferential distance markers shall be provided at intervals not exceeding 1 cm of weld length.

4.1.7 Each system shall incorporate a Time of Flight Diffraction (TOFD) configuration, this shall augment, but not replace, the pulse echo system. A single TOFD configuration shall be used for wall thickness $\leq$ 25 mm, whereas a dual TOFD configuration shall be used for wall thickness greater than 25 mm.

4.1.8 In addition to an analog strip recording for all sequences/channels, a stacked A-scan mapping display shall be provided or each root and volumetric sequence/channel. For any selected analog strip sequence/channel, there shall be an A-scan presentation of the gated period available for viewing in the display during scanning when required.

4.1.9 The Contractor shall provide the Company with an electronic copy of the raw data and a hard copy recording of the inspection, together with the judgment of acceptability of each weld examined and the recordings of the calibration standard scans. The raw data shall capture the A-scan signal within the gated period of each sequence at a sampling rate allowing proper reconstruction of the signal. The Contractor shall supply a viewer program to enable the Company to view the raw data in the same manner used by the system operator at the time of inspection, and the program shall allow the Company to verify amplitude or TOFD indication height values from the raw data.

4.1.10 The inspection shall be carried out using an automatic ultrasonic system capable of maintaining production rates established by the pipeline construction contractor, which can be as many as 150 welds/day. The system shall be self-contained, have its own independent power supply, and be mounted on a suitable all-terrain vehicle. The Contractor shall have necessary spare equipment to ensure continuance of the work without interruption or delays.

4.1.11 The Contractor shall designate one person as the NDE Supervisor, and this person shall be responsible for the conduct and performance of all ultrasonic personnel and for maintaining all equipment and supplies in reliable condition. The NDE Supervisor shall work closely with the Company's Senior Welding Inspector in the documentation of inspections completed and shall be responsible for all reports, interpretations and evaluation. The Contractor Job Supervisor shall audit daily results to ensure that interpretations are consistent, informative, and concise, and this supervisor shall be capable of technical support for automated UT operations. The extent of data audit shall be approved by the Company. The NDE Supervisor shall be approved by the Company for duties to be performed.

4.1.12 The Contractor shall have sufficient equipment and personnel on site to maintain a production rate which ensures that any weld completed prior to 4:30 PM shall be inspected, interpreted and included in the Ultrasonic Inspection Report for that working day, unless otherwise directed by the Company.

5 VISUAL INSPECTION

At suitable intervals, the Contractor or designate should confirm by visual inspection and with a slip gauge that the pipe bevel dimensions and alignment prior to welding conform to the dimensional tolerances of the ultrasonic testing procedure. Any differences in dimensions or alignment observed during setup and scanning should be reported to the appropriate Company representative.

6 ULTRASONIC INSPECTION

6.1 Introduction

6.1.1 Mechanized mainline girth welds shall be fully examined by an automated ultrasonic inspection system for 100% of the circumference, in accordance with CSA Z662. The inspection system shall be capable of locating and accurately predicting the through wall height and circumferential length of defects, in a manner that permits the use of acceptance criteria defined by the Company in accordance with CSA Z662, Annex "K".

6.1.2 Girth welds made in a factory bevel or repairs made to welds produced using automatic welding shall be fully examined by an automated ultrasonic inspection system for 100% of the circumference in accordance with CSA Z662. The inspection system shall be capable of locating and accurately assessing circumferential length of defects, in a manner that permits the use of CSA Z662 "Workmanship Acceptance Standards".

6.1.3 Girth welds made in a factory bevel which cannot be inspected by automated ultrasonic inspection may where practicable, and with permission of the Company be inspected by manual ultrasonic inspection according to Appendix C of this Specification.

6.2 System Performance Qualification

The Contractor shall be pre-approved prior to bidding the work. During the pre-approval process the Contractor must successfully demonstrate system performance by examining a minimum of five welds supplied by the Company. The demonstration shall include integration of hardware, software, and personnel in a manner that permits reliable detection and accurate height sizing of weld imperfections to CSA Z662. The Company shall be the sole judge of the adequacy of system performance for the intended use. Systems failing the performance test requirements shall not be re-evaluated until it is proven that all previous non-performance issues have been addressed. The Company reserves the right to require the Contractor be re-approved if the Company is of the opinion that the Contractor's system has changed with respect to technology, or requires modification to correct non-performance issues.

6.3 Operator Qualification

6.3.1 Ultrasonic operators shall be qualified and certified as a Level II in the "Ultrasonic" method in accordance with CAN/CGSB 48.9712, and shall submit their current records of certification. In addition, operators shall have completed a minimum of 40 hours training in automatic testing, including practical and theoretical aspects pertinent to the equipment and general configurations to be examined. This training shall be documented and the records shall be provided to the Company. An operator's project experience shall include stand-alone automated ultrasonic testing of a minimum 1000 pipeline girth welds.

6.3.2 The Company reserves the right to assess the competency of system operators for pipeline inspection by demonstrating their ability to detect and characterize typical weld indications and determine their acceptance. The Company will provide qualification test welds containing known defects, for operator qualifications. The qualification test will be administered and witnessed by the Company prior to production welding. This process may be waived in lieu of an alternate approach, at the discretion of the Company. The Company shall be sole judge of operator performance.

6.3.3 The Company reserves the right to assess the competency of ultrasonic operators for manual inspection using qualification welds containing defects. Operators must demonstrate their ability to detect and characterize typical indications and determine their acceptance according to the CSA workmanship criteria, and shall be approved by the Company. This process may be waived in lieu of an alternate approach, at the discretion of the Company. The Company shall be sole judge of operator performance.

6.3.4 Only ultrasonic operators/systems qualified in accordance with this Specification shall be permitted to inspect welds using the ultrasonic method.

6.4 Procedure and Technique Qualification

6.4.1 Ultrasonic inspection shall be performed in accordance with a documented, detailed procedure, technique approved by the Company. Approved procedures shall contain as a minimum the applicable information stated in this Specification, information stated in ASME Section V, Article 4 paragraph T.421, and a description of the methodology used to investigate indications.

6.4.2 If not issued by the Company, project-specific inspection designs shall be developed by the Contractor following the requirements of Appendix A of this Specification for automated GMAW, and Appendix B for welds produced in a standard factory bevel. Using either the design information provided by the Company or derived from the relevant Appendix, the Contractor shall prepare a detailed technique for each wall thickness to be inspected by automated ultrasonic

inspection. The Contractor shall prepare a detailed technique(s) for manual ultrasonic inspection. only when required by the Company.

6.4.3 The Contractor shall demonstrate the effectiveness of all proposed procedures and techniques to the Company prior to mobilizing each system to the project. The specific technique for each wall thickness will be assessed according to the performance requirements contained in Section 7 of this Specification. All project procedures/techniques must be approved prior to mobilization to the project. The Contractor shall not use any procedure or technique in the performance of the work that has not been approved by the Company. The Company shall be sole judge of the adequacy of the technique for the intended use.

6.4.4 Further procedure/technique validation may be required by the Company during welder training and qualification testing.

6.4.5 The Contractor shall provide an automatic ultrasonic inspection procedure and specific techniques which permit full volumetric examination of the weld in a single pass from both sides of the weld. The procedure shall provide tolerance for pipe misalignment and weld shrinkage; it shall provide for characterization of imperfections, their location in the weld thickness direction, through-wall defect height, and circumferential imperfection length and location. Imperfection location and sizing must be adequate to permit use of Company defined acceptance criteria based on the Engineering Critical Assessment provisions of CSA Z662 Annex "K". It should include but not be limited to describing the following requirements:

a) an automatic variable speed scanner mounted on automatic welding bands or other tracking devices;
b) an encoder capable of accurately indicating any defect location within the girth weld;
c) independently loaded ultrasonic transducers mounted in a configuration that provides independent inspection of the weld from both sides;
d) provisions for adjustments and maintaining the alignment of the transducers;
e) provisions for recording the continuity of the coupling;
f) provisions for ensuring the mechanical reliability of the equipment;
g) a technique summary sheet stating beam angles, wave types, transducer frequencies, beam size profiles and sketches for each geometry to be examined, and other relevant information;
h) a record of analog and/or digital signals from the multiple channels to a common circumferential distance;
i) provisions for a permanent copy of the scans in an easily interpretable format to meet archival and audit needs;
j) construction and accuracy details of the calibration piece; calibration procedures to be used in the field;
k) calibration checks that shall be established and verified on a time or weld cycle defined by the Company, with system performance between calibration checks continually monitored for degradation;
l) area of inspection; and
m) marking defects for repair.

6.4.6 The Company will notify the Contractor of its approval of each procedure and/or technique. Upon approval from the Company, the procedure becomes a mandatory requirement and changes are only permitted with further approval from the Company.

6.5 Calibration Standards

6.5.1 The number of calibration reflectors shall be adequate to provide better than 1.5 mm height sizing accuracy, and clearly discriminate buried from surface breaking imperfection, as well enable classification of imperfection type, planar and volumetric.

6.5.2 Calibration standards shall be used to qualify the system for field inspection and to monitor ongoing system performance.

6.5.3 Calibration standards shall be manufactured from a section of project specific line pipe supplied by the Company and designed such that the target reflectors simulate the bevel geometry to be inspected.

6.5.4 The acoustic velocity of each pipe material shall be determined in the same plane as the pipe axis using SH shear waves polarized to simulate particle displacement during actual inspection conditions. Measurements shall be made using parallelograms machined to represent the lowest and highest inspection angles. Two complete sets of parallelograms shall be taken from each pipe section; sets shall be separated by 180°. This data shall be considered during transducer selection or design and be recorded in the procedure submitted to the Company.

6.5.5 Calibration standards shall be designed with sufficient surface area so that the complete transducer array will traverse the target areas in a single pass. The lateral position of calibration reflectors shall be such that there will be no interference from adjacent reflectors, or the edges of the block.

6.5.6 Calibration standards shall be identified with a unique serial number providing traceability back to the project for which they were manufactured. Records of the serial number, wall thickness, diameter, and acoustic velocity shall be kept. Calibration standards remain the property of the Company.

6.5.7 For stress based pipeline design in wall thickness of 25 mm or less, and for all wall thicknesses used in a strain based pipeline design the principal calibration reflectors for fusion defects shall be 2 mm diameter flat bottom holes (FBH) and 1 mm deep surface notches. The principal reflector for porosity detection shall be a 1.5 mm FBH. For stress based pipeline design in wall thickness greater than 25 mm the principal calibration reflectors for fusion defects shall be 3 mm diameter flat bottom holes (FBH) and 1 mm deep surface notches, and the principal reflector for porosity detection shall be a 2 mm FBH. The central axis of each FBH calibration reflector shall coincide with the central axis of the sound-beam interrogating it. For inspection of welds made with a standard bevel (e.g., the shielded metal arc [SMAW], gas metal arc [GMAW/PGMAW] or flux-cored arc [FCAW] welding process, two transverse notches are required, each measuring 10 mm long and 2 mm deep, with one on the ID and one on the OD surface. TOFD notches shall not be deeper than 2 mm for the inside surface and 3 mm for the outside surface.

6.5.8 Machining tolerances for all calibration reflectors shall be less than or equal to the following:

a) Hole diameter ± 0.1 mm
b) Flatness of FBH ± 0.2 mm
c) Angles ± 1 degree
d) Notch Depth ± 0. 2 mm
e) Notch Length ± 10%
f) Center location ± 0.2 mm

g) Hole depth ± 0.2 mm

6.5.9 Calibration standards shall be certified by the machine shop and a report shall be provided to the Company verifying the tolerance to design actual for each of the calibration reflectors. In addition, the Contractor shall ultrasonically verify the signal response from like kind reflectors on upstream versus downstream sides; a report shall be provided to the Company.

6.5.10 Holes and notches shall be protected from degradation by filling them with a suitable silicone sealant.

6.5.11 Project pipe will normally be available for procedure development and calibration block design 60 days before construction.

6.6 Ultrasonic Equipment General

6.6.1 The instrument shall provide a linear A-scan presentation for each channel selected. A selectable A-scan presentation shall be available during scanning. The inspection channels shall allow assessment of the full volume of the weld scanned, and all defects present detected, located and sized in the through-wall direction. Instrument linearity shall be determined according to ASTM E317, within 3 months of the intended end use date and not deviate by more than 5% from ideal. The Contractor shall retain a current copy of the calibration certificate at the worksite.

6.6.2 Each inspection channel shall provide:

a) Pulse echo or through transmission modes;
b) Two gates, each adjustable for start position and length;
c) Gain adjustment independent of the other inspection channels;
d) Recording threshold between 5 and 100% of full screen height for A-scan and transit time recording and 0% to 100% for stacked A-scan mapping;
e) For TOFD waveforms, a recording threshold of 100% to -100%;
f) Recording of the first or the largest signal in the gated region; and signal outputs representing signal amplitude and time of flight

6.6.3 All transducers shall be contoured to match the curvature of the pipe surface.

6.6.4 The acoustic focus shall occur at the target ±10 mm of steel path and the beam height shall be within ±25% of that required by the inspection design; the -6 dB horizontal dimension of the beam at the target shall not be greater than two times the -6 dB vertical dimension of the beam.

6.6.5 Transducers shall be certified as meeting the performance requirements of British Electrical Supply Industry Standard ESI 98-2.

6.6.6 Each transducer's performance shall be documented before use on a Contractor developed form approved by the Company.

6.7 Phased Array

6.7.1 When phased array technology is used as an alternative to a focused multi-transducer array, the Contractor shall apply the following additional requirements:

6.7.2 Phased array systems will simulate the focused multi transducer array system function for weld volume inspection. Azimuthal scans are permissible when required to provide enhanced defect height sizing.

6.7.3 Phased array equipment shall meet the requirements of Part 1, 2 &3 of BS EN 12668.

6.7.4 Phased array transducers shall have a minimum of 48 elements. Due to the large wedge footprint and therefore sensitivity to surface waviness, care must be taken to ensure the contact surface of the transducer is properly dressed to match the contour of the pipe surface. The permissible gap between pipe and wedge shall not exceed 0.25 mm.

6.7.5 Phased array transducers shall contain shaped elements in the passive none steered direction, radius of curvature 75 to 125 mm. Alternatively phased array transducers shall contain a suitable lens in the passive none steered direction.

6.7.6 Each array will be assessed at intervals not exceeding 500 welds or 1 week of production whichever comes first to confirm continued element integrity and performance within the manufacturers acceptable tolerance. The Contractor shall follow the manufacturer's performance tolerances with respect to sensitivity across the array, number of non-active elements.

6.7.7 Each focal law will provide for the maximum sound pressure at the target defined in the inspection design. The focus shall occur at the target ±10 mm of steel path and the beam height shall be within ±25% of that required by the inspection design.

6.7.8 Software locks shall be active for each focal law to limit changes by the system operator which will alter the system configuration once approved by the Company Representative. Changes will only be permitted by the Contractor Job Supervisor with approval of the Company Representative. The Contractor shall demonstrate the tolerance to ideal for each focal law. With permission from the Company a software feature which identifies in the display that a focal law is outside the tolerance set for that focal law may be substituted for software locks. This out of range condition shall appear in the display continuously until corrected and recorded in the raw data for welds examined with this out of range condition.

6.8 Time of Flight Diffraction

6.8.1 Time of flight diffraction TOFD shall be configured following BS EN 583-6:2008 guidelines.

6.8.2 The receiver bandwidth shall have a range 0.5 to 2 times the nominal transducer frequency at -6dB.

6.8.3 The system shall have an electronic gate with both start and lengths within the digitized, un-rectified A-scan.

6.8.4 The gate shall be set starting 1 microsecond prior to the arrival of the lateral wave and extend to ensure that the complete reflected back wall signal is recorded.

6.8.5 The digitization rate shall be at least 4 times the nominal transducer frequency.

6.8.6 The system shall be able to acquire and digitize and display at least one A-scan for each 1mm of scan length.

6.8.7 The system shall be capable of displaying D-Scan images in at least 128 grey scale levels.

6.8.8 If pre amplifiers are used then the bandwidth of the pre amplifier at -3dB shall be similar to that of the system. The preamplifier shall be low noise better than 20μV peak to peak.

7 SYSTEM SET-UP

7.1 Transducer Positioning and Primary Reference Sensitivity

7.1.1 Primary Reference Level

The system shall be optimized for field inspection using the calibration standard established in Clause 6.5 of this Specification. Each transducer shall be positioned at its operating distance away from the simulated weld centerline on the calibrated standard and adjusted to provide a peak signal from its target reference reflector in its inspection zone. The peak signal response shall be adjusted to approximately 80% of the full screen height for each channel. This gain level shall be the primary reference level for that transducer, and shall be recorded in the procedure (see Clause 6.3 of this Specification). Variation and corrective actions to maintain calibration shall be recorded on a Company pre-approved form. The noise shall be at least 20 dB weaker than the signal at the target path, and the electronic noise 40 dB weaker. The transducer operating distance relative to a marked index point shall also be recorded on the form. Signal discrimination between adjacent zones shall be a minimum 6 dB but not exceed 12 dB.

7.1.2 Gate Settings

Using the calibrated standard, each detection gate shall be set to cover a sound path which starts at least 3 mm before the weld preparation in the hot pass and fill /cap zones, and 5 mm before for the root and cross-penetration zones, and ends at least 1 mm past the weld centerline. The gate start position and gate length with respect to the weld preparation for each detection channel shall be recorded in the procedure. For mapping (stacked A-scan) the gate shall mimic the start positions above and extend past the weld geometry.

7.1.3 Gate Recording Threshold

The recording threshold of each planar detection channel shall be 40% of full screen height when on the peak signal response from the target FBH or surface notch is set at 80% of full screen height. The recording threshold of each porosity detection channel shall be 20% of full screen height when the 1.5 mm diameter FBH is set at 80% of full screen height and 6 dB is added. Alternatively, the recording threshold of each porosity detection channel shall be 10% of full screen height when the 1.5 mm diameter FBH is set at 80% of full screen height.

7.1.4 Data Display

Channel output signals shall be arranged in the data display and hard copy record in an order acceptable to the Company In addition, time delays shall be applied to the signals to compensate for different transducers circumferential positions relative to the circumferential zero point and subsequent distance markers. Details of the delays applied and the chart arrangement shall be recorded in the procedure. Variations and corrective actions to maintain calibration shall be recorded on a Company pre-approved form.

7.1.5 Circumferential Scanning Velocity

$Vc \leq Wc * PRF / 3$ - Where Vc is the scanning velocity and Wc, is the narrowest -6dB beam width at the appropriate operating distance(s) of all transducers in accordance with the design requirements and PRF is the pulse repetition frequency per transducer.

7.1.6 Circumferential Scanning Direction

The circumferential scanning direction shall be clockwise when the pipe axis is viewed in the direction of construction. Drag sections and other instances when the pipe is scanned in reverse shall be documented "REVERSE SCAN" on the weld chart and NDE Weld Form

7.1.7 Operating Log

A log shall be kept of adjustments; changes to measurements, dB changes or other changes from those stated the original technique. Replacements will be documented i.e.: major system components, transducer wedge change-outs, transducer change-outs. Transducer details shall include angle, frequency, serial number, diameter, and focal position (if focused).

8 CALIBRATION QUALIFICATION

8.1 Detection Channels

8.1.1 With the system optimized, the calibration standard shall be scanned in the multiplexed mode. The recording medium shall indicate 70-100% (within specified tolerance) of full screen height signals from each calibration reflector recorded in their correct position assigned on the recorder chart. The circumferential positional accuracy of the recorded reflectors relative to each other shall be within ± 2 mm. A calibration acceptable to the Company shall be used as the inspection quality standard to which subsequently produced calibration charts shall be judged for acceptability.

8.1.2 Calibrations shall be performed at the same scanning speed as the weld examination – no stop/starting or rocking will be allowed, as this intended to be a representative dynamic scan.

8.2 Coupling Monitor Channels

8.2.1 Amplifier gain shall be adjusted when the system is mounted on the calibration standard to produce a maximum echo height of 80% from the full "vee" path, when using separate coupling monitors, or 80% FSH and up to a maximum of +12dB transmitted signal for the through transmission mode. The recording gate threshold level shall be a minimum of 20% of full screen height to a maximum 80% of full screen height.

8.2.2 The re-inspection of the calibration standard with its surface wiped dry shall produce a record showing a lack of coupling (i.e., absence of recording signal). This shall be performed at least twice a day; once at the start of the day and once at midday..

8.3 Measurement to Assess Transducer Wear

8.3.1 The Contractor shall provide baseline height measurement for the transducer case prior to the start of field weld examinations. An accurate (± 0.1 mm) measurement shall be made of the case height at each of the corners of each transducer. These measurements shall be recorded on a Company approved form for a comparison of periodic measurements taken throughout the project to assess transducer wear. The frequency of checks shall be defined in the procedure. An ongoing transducer performance monitoring process may be used as a substitute for physical measurements, if approved by the Company.

9 INSPECTION OF PRODUCTION WELDS

9.1 Weld Marking

9.1.1 The Contractor shall permanently identify each weld with a unique weld number following the weld number system provided by the Company.

9.1.2 The weld number shall be positioned on the pipe surface on the work side of the pipe in a manner agreed by the Company.

9.1.3 Weld numbers shall be large enough to be clearly and visually identified from a distance of 3 metres.

9.2 Surface Condition

The scanning surfaces shall be free of weld spatter and other irregularities, which may interfere with the movement of the transducers, the coupling or the transmission of acoustic energy into the material.

9.3 Reference Line

9.3.1 Prior to welding, the Contractor shall scribe a reference line on the pipe surface at 40 mm from the weld centerline with an accuracy of ± 0.5 mm from the centerline of the weld preparation and on the inspection band side.

9.3.2 The reference line shall be used to ensure that the band is adjusted to the same distance from the centerline as to replicate the calibration standard. The tolerance to ideal positioning shall not exceed ± 0.5 mm. The 12 o'clock position shall also be clearly marked on the pipe to indicate the start position (0 cm) position of the scan.

9.3.3 The Contractor shall take into account the circumferential shrinkage of the girth weld during the design and calibration sequences. Shrinkage is determined by scribing a reference line on both pipe ends for the first 10 welds, then measuring the distance in between them after welding.

10 SYSTEM PERFORMANCE MONITORING

10.1 Sensitivity

10.1.1 The calibration standard shall be used daily before beginning pipe weld inspections, after repairs to the system, and thereafter at intervals not exceeding 1 hour or 10 welds, whichever comes first, and again at the conclusion of the shift.

10.1.2 When changes are made to the setup, for example a change of wall thickness, transducer or wedge, then six acceptable consistency calibration scans are required.

10.1.3 The hard copy record of the calibration standard scan shall be included sequentially with the weld inspection charts. The last weld number inspected and time at which it was performed shall appear on each calibration chart. These charts shall be made available to the Company when requested.

10.2 Circumferential Position Accuracy

The position accuracy of the chart distance markers shall be validated twice during each working shift. The scanner shall travel from the zero position with the scanning frame coincident with the pipe. At all o'clock positions, the index marks on the scanning frame and the pipe must be aligned. The chart shall then be compared to circumferential distance measured with a diameter tape; chart accuracy shall be within ±1 cm or better. The results shall be recorded on a Company approved form.

10.3 Transducer Surface Position Accuracy

Shifts in the refracted angle resulting from the change in velocity within the wedge line materials or pipe due to temperature, for example when scanning cold welds, shall be corrected for by adjustment of the transducer surface position. Care shall be taken to ensure that the gate start, and length positions are still set as required by paragraph 7.1.2 following any such adjustment. .

10.4 Temperature Control

10.4.1 It shall be the Contractor's responsibility to maintain a stable transducer wedge temperature between the calibration scan and scanning the weld. This shall be monitored using a thermocouple embedded in a dummy transducer within the transducer array, or in one of the active transducer wedges used in conjunction with a digital temperature gauge. The difference between the temperature of the transducers on the production weld and the temperature of the transducers when scanning the calibration block shall be monitored, and must be within 10 Celsius degrees. The temperature shall be recorded on all the hard copy printouts and be present in the electronic data.

10.4.2 For testing at temperature extremes, in very hot or very cold conditions, the calibration block may need to be heated or cooled so that the array is maintained within a 10 Celsius degrees variance when completing calibration in, weld scan, and calibration out cycles. The need for heating or cooling of the calibration standard shall be documented on all the hard copy calibration and weld printouts.

11 SCANNING SENSITIVITY

An additional 2 dB of gain shall be added globally to the system for weld examination to compensate for differences in coupling efficiencies between the calibration standard and the production pipe. This additional gain shall be removed during calibration. During production weld inspection, with the Company's approval, the system may be operated at a higher gain to ensure detection of defects, or to account for excessive pipe surface roughness.

12 RE-INSPECTION

12.1 Sensitivity

Welds examined at a sensitivity varying more than 2 dB from the scanning sensitivity shall require re-calibration of the system and re-examination, with no additional compensation to the Contractor.

12.2 Coupling Losses

Welds examined exhibiting coupling losses with a length exceeding the acceptable defect length for that channel shall be re-inspected.

12.3 Scanner Slippage

Scans shall not be acceptable where any slippage occurs. Where slippage is noted, the scanner shall be adjusted to correct the problem and the scan shall be repeated, with no additional compensation to the Contractor.

12.4 Weld Repairs

Welds examined by automatic ultrasonic inspection requiring repair shall be re-tested by automated ultrasonic inspection, or if not practicable, by using manual ultrasonic testing per Appendix C (of this document) after the repair has been completed.

12.5 Temperature Variance

Welds examined with wedge temperature difference greater than 10 Celsius degrees from the temperature used for calibration shall be re-tested with no additional compensation to the Contractor.

12.6 Other Conditions

When conditions exist where data collection is impaired or data is lost, the weld shall be retested with, no additional compensation to the Contractor. The operator shall write down the reason for impaired data and relay that to the Company on the daily report.

13 TRANSDUCER PERFORMANCE

Transducers shall be examined for wear as per Clause 8.3 of this Specification, whenever wear is apparent, but not greater than an interval of 500 welds. The signal to noise value for each transducer shall also be compared to the value obtained in accordance with Clause 7.1.1 at the start of the project. Case heights and the signal to noise value for each transducer shall be recorded on Company approved forms. The transducer contact face shall be re-surfaced, or the transducers replaced to correct any of the following.

13.1.1 Beam angle changes of ±1.5 degrees for angles less than 45 degrees or ±2 degrees for angles greater than 45 degrees.

13.1.2 Squint angles exceeding 1.5 degrees for single crystal transducers and 2 degrees for twin crystal transducers.

13.1.3 A signal-to-noise value 6 dB less than the value obtained at the start of the project

13.1.4 Scores in the transducer wear faces which exceed 0.2 mm in depth.

14 EVALUATION OF INDICATIONS

14.1 Imperfections

14.1.1 Weld imperfections shall be evaluated according to the defect acceptance criteria defined by the Company; evaluations shall be completed immediately after inspection of the weld.

14.1.2 When evaluating imperfections following the CSA Z662 Annex "K" length interaction criteria, the ends of the indications are to be determined from the points where the signal reduces in amplitude to two times the background noise level. Imperfections are considered to interact when the space between adjacent imperfections is smaller than the length of the shortest imperfection.

14.2 SMAW Root Zone Buried versus Open to the Surface Classification

Indications in the 70 degree root sequence must have a corresponding signal > 40% FSH in 60 degree root sequence to be interpreted as surface breaking, in addition to meeting the following requirement. Indications occurring simultaneously in root 60 and root 70 degree sequences must have the transit times compared to the calibration notch transit times to aid correct classification as buried or surface breaking. Indications occurring >0.5 mm prior to the respective notch transit time must be reviewed in the A-scan map display. The indication must to be classed as buried if there is a simultaneous signal evident from the face of the root bead.

15 WELD INSPECTION RECORD & REPORTS

15.1 Weld Inspection Record

A hard copy record of each weld and calibration scan shall be provided to the Company. In addition the Contractor shall supply the Company the raw data for both calibration and weld scans every 300 welds or 3 days, whichever comes first, for ongoing audit purposes. Before the start of the project, the Contractor shall supply the Company with a viewer program with full functionality to view the raw data files.

15.2 Interpretation of Weld Inspection Record

Areas in the AUT data with a corresponding pulse echo response will be evaluated and given a disposition by the operator as to whether it is a relevant or non-relevant indication. This area will be highlighted on the strip chart and have associated comment in the comments section of the AUT data.

15.3 Weld Acceptance from the Inspection Record

15.3.1 A weld shall be considered acceptable when the weld inspection shows imperfections that do not exceed the acceptable values, as given by the Company.

15.3.2 The Contractor shall submit ultrasonic weld interpretation reports to the Company daily, as directed by the Company, using forms approved by the Company. Contractor shall ensure that all electronic data files and hard copy graphs are further identified with the following:

a) Project Name
b) Work Order Number
c) Date
d) Inspector's Name
e) Inspection Unit Number
f) Weld Number

15.3.3 All hard copy charts shall be catalogued by consecutive weld number in binders.

15.3.4 Clear and legible interpretation records shall be included inside the binders.

15.4 Data Management

Back-ups of all digital data shall be made for audit purposes on a daily basis with a minimum of two back-ups of each file on separate mass storage media. The working computer system disk shall not be considered as a back-up.

15.5 Archives

No later than 3 months after completion of the project, a copy of all of the raw weld and calibration data shall packaged together with a weld interpretation log and a raw data viewer program to provide an archive record. The viewer software shall allow reconstruction of the weld data files in an identical manner to that viewed by the system operator at the time of inspection.

16 ADDITIONAL REQUIREMENTS

16.1 Weld Repair List

16.1.1 Weld repair lists shall be provided to the Company in electronic and hard copy format each working day by 6:00 PM.

16.1.2 Repair lists shall report the weld quality, including outstanding weld repairs and/or weld cutouts, of all welds completed by the prime Contractors mainline welding crew, by 4:30 PM each day.

16.1.3 The Contractor shall have sufficient equipment and personnel on site to maintain a production rate that ensures any weld completed prior to 4:30 PM on any working day shall be inspected, interpreted and included in the Ultrasonic Report for that working day.

16.2 Weld Cut –outs

16.2.1 Prior to removal of the suspect weld it must be rescanned using the system which identified the rejected defect.

16.2.2 The system operator must maximize the signal from the longest/ highest amplitude signal in the rejected area.

16.2.3 With the transducer positioned for maximum signal response mark with a metal punch at the weld cap edge the centreline of the phased array transducer, one centre punch mark on the upstream side and two on the downstream.

16.2.4 Mark with a metal marker the overall defect length.

16.2.5 The section of weld removed for analysis must be under direct control of the Company at all times.

16.2.6 When the weld is metallographically examined the bottom of the centre punch marks must be evident on the macro section.

16.2.7 Samples removed for analysis will be tracked and verified by the Company.

16.3 Training

If required by the Company, the Contractor shall provide training (one day minimum) for Company Inspectors on the techniques of ultrasonic inspection. This training shall be at a date and location determined by the Company and shall occur prior to the start of production welding.

17 RECORDS

The following records shall be kept:

Scanning Calibration	*material and manufacture
Standard Records	*date of manufacture of the standard *actual dimensions and angles of reference *reflectors *actual surface roughness and outer profile
Transducer records	*make, date of manufacturing & serial number *nominal dimensions *nominal frequency *height & wear
Ultrasonic System Records	*system description *make & model number of units *operating procedure *technique detail *operator log

17.1 Report Format

17.1.1 Equipment performance logbooks, daily reports (Weld Log) and Repair Lists will be presented to the Company in both hard copy and electronic format. The format shall be comma delimited ASCII, and be capable of displaying and printing the Electronic Report, Daily Repair Summary and Repair List.

17.1.2 Evaluation of the acceptability of every weld inspection shall be reported on the "NDE Daily Report". The NDE Daily Report form will be the only form used for NDE (UT, VT, RT, MT, and PT) for weld accepted/reject status. The Contractor will ensure that GPS coordinates are recorded applicable weld information on NDE Daily Report for all Tie-ins, repair welds and every 650 feet (200m) intervals for main and poor boy, if applicable.

17.1.3 The NDE Supervisor will collect all reports from the system operators and document weld status in a database. The reports shall include weld identification, description, position, and length of indications recorded from weld imperfections; identification of indications recorded from sources other than weld imperfections; date; time, signature of qualified ultrasonic inspectors, spread identification, project name, inspection unit number, chainage and upstream and downstream pipe unique number, pipe material and thickness, pipe diameter and manufacturer, and AUT technique/procedure.

17.1.4 All completed weld inspection and calibration charts shall be catalogued and packaged on a daily basis. The Repair List shall consist of the following fields, date, weld identification, imperfection type, and length in mm, and position in mm from zero, upstream or down stream, depth in mm to the bottom of the imperfection and GPS. The Repair List shall retain all non-status welds, weld repairs until the repair is cleared or status is determined.

APPENDIX A – INSPECTION DESIGN REQUIREMENTS GAS METAL ARC WELDS

A1 PURPOSE

This appendix details the inspection design requirements for automated ultrasonic inspection of gas metal arc welds produced in the specified weld bevel.

A2 SCOPE

This appendix applies to mechanized ultrasonic inspection of gas metal arc welds made with an internal root bead or with all passes deposited externally, in pipe having a nominal wall thickness 7.2 mm and greater.

A3 APPLICABLE STANDARDS

Ultrasonic examination to this procedure shall also meet the requirements of CSA Z662 and any amendment, supplement, or errata issued by CSA.

A4 APPLICABLE WELD BEVEL

This design is applicable to mechanized gas metal arc weld bevel designs shown in Figure A1.

A5 ULTRASONIC PARAMETERS

Ultrasonic parameters (transducer number, angle, frequency, beam size and position) shall be selected for each zone of the specified weld bevel, beginning in the weld root and finishing at the weld cap.

A5.1 Root Zone

A5.1.1 Welds with an Internal Root Bevel (37.5° Internal Bevel) and a weld pass deposited internally, see Figure A1 (a) One transducer shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 8	52.5 ± 2.5	min. 4 max. 8	min. 2.0 max. 2.5	1.5 skip
> 8	52.5 ± 2.5	min. 4 max. 8	min. 2.0 max. 2.5	0.5 skip

A5.1.2 Weld with all Passes Deposited Externally (0° Land) All weld passes deposited externally, see Figure A1 (b). One transducer shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	1.5 skip
> 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	0.5 skip

A5.2 Cross Penetration Zone

(0° Bevel - Welds with an Internal Root Bevel only) refer to Figure A1 (a) for bevel sketch. One transducer shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	1.5 skip
> 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	0.5 skip

A5.3 Hot Pass Zone

A5.3.1 Welds with an Internal Root Bevel (45° or 52° Hot Pass Bevel)
For a hot pass with a bevel offset less than 2.5 mm one transducer is required with a -6dB beam size of 3.5 mm.
For a hot pass with bevel offset of 2.5 mm and greater this zone shall be divided in 2 sub-zones (refer to Figure A1 (a)) two transducers shall be required with the following parameters.

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 10	min. 50 max. 55	min. 4 max. 5	min. 2.5 max. 3.0	1.5 skip
> 10	min. 50 max. 55	min. 4 max. 5	min. 2.5 max. 3.0	0.5 skip

A5.3.2 Weld with all Passes Deposited Externally (Radius Hot Pass)
Refer to Figure 1 (b) for bevel sketch. One transducer shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 10	min. 50 max. 55	min. 4 max. 5	min. 2.0 max. 2.5	1.5 skip
> 10	min. 50 max. 55	min. 4 max. 5	min. 2.0 max. 2.5	0.5 skip

A5.4 Fill(s) and Cap Zones

The number of transducers for the fill(s) and cap zones, and their parameters, are linked directly to the pipe wall thickness. Typical bevel sketches are shown in Figure A1.

A5.4.1 For wall thickness smaller than 8 mm one focused 70 ±2° transducer shall be used.

A5.4.2 Wall thickness larger than 8 mm, but smaller than 11.7 mm,

Two focused 70 ±2.5° transducers, or a combination of one focused 70 ±2.5° transducer for the cap zone, and a single tandem arrangement for the fill zone shall be used.

The -6 dB beam height selected for the cap zone shall have a dimension equal to or greater than the fill zone intimately below it.

The preferred tandem configuration is shown in Figure A2 and acceptable tandem combinations are specified in Table A1.

A5.4.3 Wall thickness 11.7 mm and larger

The cap zone shall be considered as having a 3 mm vertical extent and be inspected using a 65° to 70 ° pulse echo, or creeping wave transducer, typically with a -6 dB beam height of approximately 3.0 mm.
The remaining bevel dimension extending from the top of the hot pass to the bottom of the cap zone (outside pipe surface minus 3 mm) shall be divided equally into fill sub-zones, with the following conditions:
The fill sub-zone intimately below the cap zone shall have a -6 dB beam height equal to or less than the cap zone dimension; and
No individual -6 dB beam size shall exceed 3.5 mm.
Each sub-zone shall be inspected using one of the suitable tandem combinations specified in Table A1.

Table A1 – Tandem Configurations

Fill Bevel Angle °	Transmitter Angle °	Receiver Angle °
4	38 - 50	Transmitter Angle + 8 (46 - 58)
5	38 - 48	Transmitter Angle + 10 (48 - 58)
6	38 - 46	Transmitter Angle + 12 (50 - 58)
7	38 - 44	Transmitter Angle + 14 (52 - 58)
8	38 - 42	Transmitter Angle + 16 (54 - 58)
9	38 - 40	Transmitter Angle + 18 (56 - 58)
10	38	58

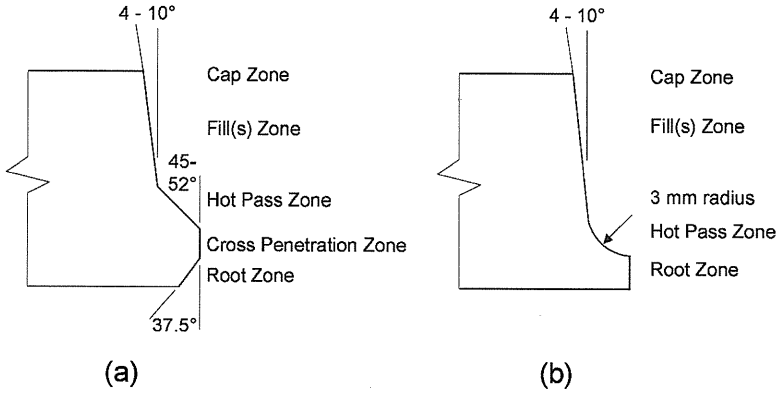
A6 POROSITY TRANSDUCERS

For the detection of porosity, the weld shall be divided into equal zones each not exceeding 3.5 mm, and examined using transducers with the following angles and frequency.

Root zone: One 72° transducer having a center frequency between 5 and 6 MHz.
All other zones: 45 to 50° transducer/s having a center frequency of 4 MHz.*

* Phased array transducers of higher centre frequency are permitted provided the -6 dB bandwidth includes a frequency of 4 MHz.

FIGURES



Figures A1: Bevel Designs
(a) Weld with Internal Root (b) Weld with all Passes Deposited Externally

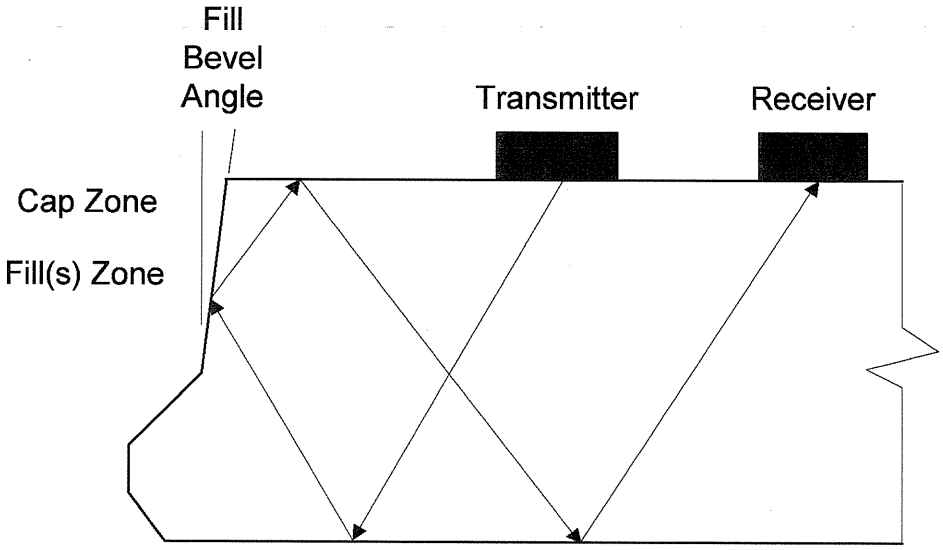


Figure A2: Typical Tandem Sound Path for W.T. < 20 mm
(Shown for a weld with an internal root pass,
same sound path for a weld with all passes deposited externally)
When mechanically achievable the sound path should as short as practical; in the example above the receiver could be in front of the transmitter.

APPENDIX B – INSPECTION DESIGN REQUIREMENTS WELDS IN FACTORY BEVEL

B1 PURPOSE

This appendix details the inspection design requirements for automated ultrasonic inspection of welds produced in the standard bevel.

B2 SCOPE

This appendix applies to mechanized ultrasonic inspection of arc welds made in pipe having a nominal wall thickness 7.2 mm and greater.

B3 APPLICABLE STANDARDS

Ultrasonic examination to this procedure shall also meet the requirements CSA Z662 and any amendment, supplement, or errata issued by CSA.

B4 APPLICABLE WELD BEVEL

This design is applicable to the standard end preparation of pipe as shown in Figure B1 of this document.

B5 ULTRASONIC PARAMETERS

Ultrasonic parameters (transducer number, angle, frequency, beam size and position) shall be selected for each zone of the specified weld bevel, beginning in the weld root and finishing at the weld cap.

B6 ROOT ZONE (0° BEVEL)

Two transducers shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	1.5 skip
	60.0 ± 2.5			
> 8	70.0 ± 2.5	min. 5 max. 6	min. 1.5 max. 2.0	0.5 skip
	60.0 ± 2.5			

B7 HOT PASS ZONE (30° BEVEL)

One transducer shall be required with the following parameters:

Wall thickness mm	Angle °	Frequency MHz	Beam Size mm	Surface position
≤ 8	60.0 ± 2.5	min. 4 max. 6	min. 3.0 max. 4.0	1.5 skip
> 8	60.0 ± 2.5	min. 4 max. 6	min. 3.0 max. 4.0	0.5 skip

B8 FILL(S) AND CAP ZONES

The number of transducers for the fill(s) and cap zones, and their parameters, are linked directly to the pipe wall thickness.

B8.1 Wall thickness smaller than 9 mm

Three focused 60±2.5° transducers shall be used. The –6 dB beam height selected for the cap zone shall have a dimension equal to or greater than the fill zone intimately below it.

B8.2 Wall thickness larger than 9 mm

The number (n) of sub-zones and focused 60±2.5° shear wave transducers and their -6 dB beam height shall be determined by the formula;
$n = (WT - RH) / (\cos(A)*h) = (WT - 3) / (0.866*h)$

Where, A is the bevel angle (30° for a standard bevel),
WT is the wall thickness in mm,
RH is the vertical displacement to account or the root and hot pass (assumed as 3 mm), and
h is -6 dB beam height such that:

No individual -6 dB beam size shall exceed 3 mm, and the –6 dB beam height selected for the cap zone shall have a dimension equal to or greater than the fill zone intimately below it.

B9 POROSITY TRANSDUCERS

For the detection of porosity, the weld shall be divided into equal zones each not exceeding 3.5 mm, and examined using transducers with the following angles and frequency.

Root zone: One 60 or 70° transducer having a center frequency between 5 and 6 MHz.
All other zones: 45 to 55° transducer/s having a center frequency of 4 MHz.*

* Phased array transducers of higher centre frequency are permitted provided the -6 dB bandwidth includes the frequency 4 MHz.

B10 TIME OF FLIGHT DIFFRACTION (TOFD)

For a given pipe wall thickness, the transducer angle, frequency and damping characteristics shall be selected to optimize detection and to limit the depth of the lateral wave below the surface to a maximum of 4 mm, giving consideration to the index-to-index spacing and the maximum width of the weld reinforcement.

B11 TRANSVERSE CRACK DETECTION (SEE FIGURE B2)

Two pair of 50° to 70° transducers positioned at 20° from the weld axis in a cross configuration shall be used to detect transverse cracks. The signal shall be sent from the transducer on the upstream side of the weld and received by the downstream transducer. One pair of transducers shall interrogate the upper half of the weld while the other pair interrogates the lower half. Coupling shall be monitored by sensing through-transmission diagonally across the weld.

FIGURES

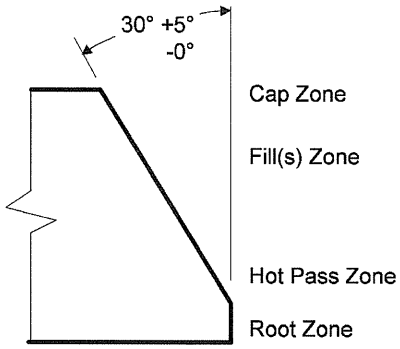


Figure B1: Standard Bevel Design

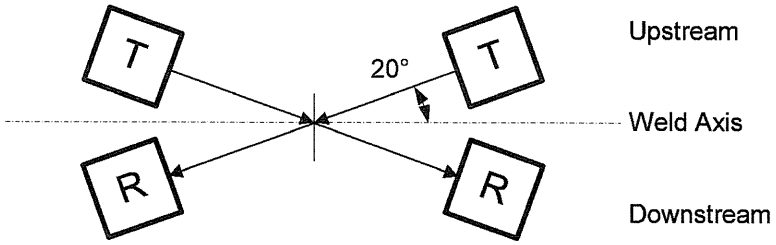


Figure B2: Sound Paths for Transverse Crack Detection

APPENDIX C – SPECIFICATION FOR MANUAL ULTRASONIC INSPECTION OF PIPELINE WELDS

C1 SCOPE

This Specification establishes the requirements for manual ultrasonic examination of pipeline GMAW weld repair verifications, mainline SMAW repair girth welds and welds in test heads. The referenced clauses in this appendix are from the main body of the Ultrasonic Specification.

C2 PERSONNEL

Personnel performing manual ultrasonic inspection shall be certified to Level II in the "Ultrasonic" method in accordance with Canadian General Standards Board, CAN/CGSB 48.9712 "Qualification and Certification of Nondestructive Testing Personnel", and shall submit their records of certification. Personnel must have an additional 16 hours of in-house training on manual inspection of pipeline girth welds. Personnel must demonstrate proficiency in calibrating the portable A-scan instrument on the sensitivity calibration blocks with the selection of transducers to be used to inspect the different zones. Personnel must demonstrate proficiency in setting and interpreting both the amplitude scale and the time gates to determine the location within the weld of received indications. Personnel must demonstrate proficiency to recognize linear versus volumetric echo dynamic pattern recognition and differentiate between geometry and actual weld anomalies. This training shall be documented and accompanied by an in-house certifying exam.

The Company reserves the right to approve operators as described by Clause 6.3.3. Manual ultrasonic operators shall be required to take the manual qualification test only.

C3 PROCEDURES

A procedure, specific techniques and instructions for each thickness and variation shall be prepared (see Clauses 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.6 of this Specification). The procedure shall meet the requirements of CSA Z662.

C4 EQUIPMENT

C4.1 Ultrasonic equipment shall meet the requirements of ASME Section V, Article 4.

C4.2 Instrument A-scan presentation shall meet the requirements of ASME Section V, Article 4.

C4.3 Instrument linearity shall meet requirements of Clause 6.6.1 of this Specification.

C4.4 Ultrasonic transducers shall meet the requirements of Clause 6.6.5 of this Specification.

C4.5 Sensitivity calibration blocks shall meet the requirements of CSA Z662

C4.6 Reference blocks for angle beam distance calibration shall meet the requirements of ASTM E164 Appendix 1.

C4.7 Coupling shall be a water-based product. Water or gel (provide MSDS sheet) may be used but shall be completely removed upon completion of the test.

C5 CALIBRATION

C5.1 Calibration shall meet the requirements of Clause 7 of this Specification, except that individual transducers shall be set up according to the parameters used by the automatic ultrasonic unit. The "standoff distances" shall be noted if different from the technique detail. Transfer value shall be checked and documented for each weld.

C5.2 GMAW setup shall mimic automated ultrasonic system sensitivities when verifying all GMAW indications and ensuring all GMAW defects have been removed in designated repair areas. The SMAW manual ultrasonic setup sensitivities shall be set using the 2.4 mm side drilled hole.

C6 SCANNING

C6.1 The repaired area shall be scanned ± 50 mm either side of the repaired area. Tested areas shall be marked to indicate acceptance or rejection status.

C6.2 The repairs scans and verifications shall be raster or fixed scans (i.e., the standoff distance for the transducer and zone shall be determined and the transducer shall then be set at this distance). For fixed position scans a magnetic strip shall be used to keep the transducer at the set distance for the length of repair. The transducer shall be moved continuously along the area of interest. The transducer may be adjusted back and forth slightly to maximize the signal. The adjacent zones shall be examined in the same way.

C6.3 The transducers used shall be the same transducer specification as the original mechanized test (i.e., transducer beam angle shall be ±1.5 degrees for angles less than 45 degrees or ± 2.0 degrees for angles greater than 45 degrees, transducer frequency, focus, crystal size and configuration).

C6.4 Where volumetric scanning of a repair weld is required, focused transducers shall not be used. The test shall be conducted with a minimum of two (2) different angles to a procedure based on ASME Section V, Article 4 and acceptable to the Company.

C6.5 Ensure that the scan raster provides for a minimum 30 percent overlap of the beam width.

C7 RECORDING

C7.1 All indications above 40% of DAC or zonal designated threshold shall be recorded.

C7.2 All interpreted indications shall be recorded on the report sheet.

C7.3 The acceptance criteria for GMAW/ SMAW repair areas performed by manual ultrasonic shall be defined by CSA Z662 workmanship criteria.

C7.4 Recordable indications and defects shall be noted numerically and diagrammatically on the report. Reports shall be pre-approved prior to fieldwork.

C8 REPORTING

C8.1 The report shall include as a minimum:

a) Operator Name and Date of Test
b) Technique number or unique ID
c) Zone(s) examined
d) Thickness
e) Gate start and length
f) Repair or verification or other detail
g) Position(s) & length(s)
h) Coupling used (and removed)
i) Transducer(s) used (type, size, frequency) and standoff & gain setting
j) Unique number of calibration (sensitivity) block used
k) Defect/Discontinuity description, depth, location, size length, zone, and amplitude
l) UT instrument serial number

C8.2 All welds tested shall be reported on a separate report sheet(s) approved by the Company. The reports shall be handed to the Contractor NDE Supervisor on a daily basis to meet the requirements of Clause 15.1. The Contractor NDE Supervisor shall verify the areas scanned against the interpretations made by both automatic ultrasonic inspection and manual ultrasonic inspection. The Contractor NDE Supervisor shall then endorse the report. The Contractor NDE Supervisor shall record and store them for review and transmittal to the Company. Reports shall be kept current and up to date with the weld repair production.

Title: TES-NDT-RT Radiographic Examination of Welds		Document Type: Specification
Effective Date: 2004/02/28	Revision: 2	
Document Owner: Pipe Engineering, T[redacted]		
Originator: [redacted] Technologist, Pipe Engineering, Technical Support	: [redacted] Signature/Date - Signed copy on file 2004/02/27	
Reviewer: [redacted] Pipeline Integrity Specialist, Rocky Mountain Region	: [redacted] Signature/Date - Signed copy on file 2004/03/11	
Reviewer: [redacted] President, CogniSpecs Consulting Ltd.		
Approver: [redacted] Manager, Pipe Engineering, Technical Support	: [redacted] Signature/Date - Signed copy on file 2004/03/17	

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PURPOSE

This specification details the equipment, operator and procedure qualification, quality and reporting requirements for examination of welds by radiography.

SCOPE

This specification applies to TransCanada (the Company).

This specification applies to welds made for the purpose of welder or welding procedure qualification and to production welds in the pipeline system, between pipes and components of any size and wall thickness.

BRIEF DESCRIPTION OF CHANGE (IF A REVISION)

This specification was revised to ensure it is compliant with CSA Standard Z662-03. Paragraphs were completely renumbered. There are no technical changes from the previous revision.

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1 PURPOSE

This specification details the equipment, operator and procedure qualification, quality and reporting requirements for examination of welds by radiography.

2 SCOPE

This specification applies to TransCanada (the Company).

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3 APPLICABLE STANDARDS

Radiographic examination to this procedure shall also meet the requirements of
(a) CSA Z662-03, and any amendment, supplement or errata issued by CSA; and
(b) The Company Environment, Occupational Health and Safety standards.

4 REFERENCE DOCUMENTS

(a) CSA Standard Z662-03 *Oil and Gas Pipeline Systems* (referred to as CSA Z662)
(b) Canadian General Standards Board, CAN/CGSB 48.9712 *Qualification and Certification of Nondestructive Testing Personnel*
(c) Company Specification *TES-WELD-AS Welding of Assemblies and Station Piping*
(d) Company Specification *TES-WELD-PL Welding of Pipelines and Tie-ins*

5 DEFINITIONS

The following definitions shall be added:

Assembly Weld - Weld joining pipe to components or components to components; weld joining pipe to pipe made in stations or at a manufacturing plant or fabrication shop remote from the final location of the weld
DWDI - Double-wall, double-image
DWSI - Double-wall, single-image
IQI - Image quality indicator
Mainline Weld - Pipe-to-pipe weld made on a pipeline site
RT Contractor - The contractor performing radiographic inspection.
SWSI - Single-wall, single-image
Test Head Weld - Temporary weld made to join the test head assembly to the pipeline facility, is to be cutout after pressure testing.

6 RADIOGRAPHERS

6.1 General

(a) Personnel performing these examinations shall be qualified as Level I or Level II Radiographers in accordance with the requirements of CAN/CGSB 48.9712 (Industrial Radiography Category) as specified below.
(b) Film interpretation and reporting shall be performed by a Level II radiographer.
(c) RT Contractor shall assign at least one Level II radiographer per radiographic crew to be responsible for the conduct of the radiographic personnel, the performance of

equipment, the on-site inventory of spare part, and the inspection work, including reports and records.

6.2 Approval of Radiographers

(a) RT Contractor shall provide the Company with details of each radiographer prior to the start of the project (i.e., certificates and copy of CGSB tickets).
(b) Radiographers shall be approved when they produce an acceptable procedure qualification radiograph as specified in Paragraph 9.
(c) RT Contractor shall not use a radiographer who is not approved, nor substitute radiographers without prior approval of the Company.

6.3 Radiation Safety

(a) Radiographers shall be responsible for the protection and monitoring of every person working with or near radiation in accordance with the regulations of the Department of Health and Welfare Canada, Health Protection Branch.
(b) Personnel involved in Gamma radiography shall be "Qualified Operators" as defined by the Atomic Energy Control Regulations.
(c) A minimum of two Qualified Operators shall be required to perform Gamma radiography.

7 EQUIPMENT AND TECHNIQUES

7.1 Radiation Sources and Techniques

(a) Radiation sources and techniques shall be as given in the following table:

Piping Size	Mainline Weld	Tie-in and Repair Weld	Assembly Weld & Test-Head Weld
< 60.3 mm OD (NPS 2)	N/A	N/A	DWDI X-ray or Gamma-ray
60.3 to 219.1 m OD (NPS 2 to 8)	DWSI Gamma-ray	DWSI Gamma-ray	DWSI-Gamma-ray
> 219.1 mm and smaller than 406.4 mm OD (> NPS 8 and smaller than NPS 16)	DWSI X-ray or Gamma-ray SWSI Gamma-ray	DWSI X-ray or Gamma-ray	DWSI X-ray or Gamma-ray SWSI Gamma-ray
406.4 mm OD or larger (NPS 16 or larger)	SWSI X-ray	DWSI X-ray	DWSI or SWSI X-ay or Gamma-ray*

* Radiation source selected with consideration for material thickness, and latitude required to radiograph welds between materials of different thickness.

(b) Gamma-ray radiography shall be performed using radioisotope Iridium 192 in conjunction with class I film specified in paragraph 7.2.

7.2 Radiographic Film

Film shall be as specified in the table below for each application:

Film Brand Name	APPLICATION			
	Mainline		Repairs, Tie-ins & Assemblies	
	X-Ray	Gamma-Ray	X-Ray	Gamma-Ray
AGFA-Gevaert D2	Yes	Yes	Yes	Yes
AGFA-Gevaert D4	Yes	Yes	Yes	Yes
AGFA-Gevaert D5	Yes	No	Yes	No
AGFA-Gevaert D7	No	No	Yes	No
Fuji #50	Yes	Yes	Yes	Yes
Fuji #80	Yes	Yes	Yes	Yes
Fuji #100	No	No	Yes	No
Kodak AA	No	No	Yes	No
Kodak AX	No	No	Yes	No
Kodak Industrex M	Yes	Yes	Yes	Yes
Kodak Industrex R	Yes	Yes	Yes	Yes
Kodak Industrex T	Yes	Yes	Yes	Yes

7.3 Viewers

A high intensity viewer shall be provided for each radiographic unit to allow adequate viewing of film having a density up to 4.0.

7.4 Densitometers

A calibrated densitometer shall be provided for each radiographic unit to ensure that film densities are within specified limits.

7.5 Image Quality Indicators

Wire type Image Quality Indicators (IQI) conforming to ASTM E 747 or ISO 1027 shall be used to measure sensitivity.

7.6 Placement of Image Quality Indicators

(a) When multiple film holders are used, the image of one IQI shall appear on each film.
(b) If long film holders or redipak film are used to expose an area greater than 457 mm in length the image of two IQIs shall be visible, one at each end.
(c) For double-wall, single-image radiographs, the IQI shall be placed on the source side.

7.7 Transportation

RT Contractor shall have in his possession documentation required by the "Transportation of Dangerous Goods Act".

8 FILM QUALITY

8.1 Density

(a) Radiographic film density shall be measured through the weld, between the edge of the cap and the image of the root bead.

(b) The density through the image of the weld shall be

(i) in excess of 2.0;

(ii) between 2.0 and 3.5 on a pipe-to-pipe or component-to-component weld;

(iii) between 2.0 and 4.0 on a pipe-to-component weld.

(c) The unexposed base density of the film shall not exceed 0.30.

8.2 Sensitivity (Definition of IQI Image)

(a) Except for pipe diameters smaller than 114.3 mm OD and components smaller than NPS 4, the following wire shall be visible on each radiograph:

Pipe Wall Thickness Range	Essential Wire Diameter
Smaller than 6.4 mm	0.16 mm (0.006 in)
6.4 mm to 12.7 mm	0.20 mm (0.008 in)
Greater than 12.7 mm	0.25 mm (0.010 in)

For welds between materials of different wall thickness, the thinner wall shall be used to determine the required number of visible wires.

(b) For pipe diameters smaller than 114.3 mm OD and components smaller than NPS 4, a 0.25 mm (0.010 in) essential wire diameter shall be used.

9 RADIOGRAPHIC PROCEDURES

9.1 General

(a) A procedure for the production of radiographs shall be established and qualified by each radiographic unit prior to the start of inspection of production welds.

(b) The procedure qualification test shall be witnessed by the Company.

(c) RT Contractor shall have a copy of the radiographic procedure readily available during production radiography.

(d) Changes exceeding the tolerances in any of the variables of the procedure listed in Paragraph 9.2 shall require a requalification of the procedure.

9.2 Radiographic Procedure Variables

The recorded radiographic procedure shall include the following variables and their tolerances:

(a) Type of material to be radiographed;

(b) Material thickness range for which the procedure is suitable;

(c) Type of radiation to be used with details of effective source size or X-ray machine voltage;

(d) Position of radiation source (external or internal);

(e) Type, thickness and position of intensifying screens and filters;

(f) Sketch showing the geometric arrangement for the production of the radiographs, including minimum source to film distance and radiation angle with respect to the weld;

(g) Film type and brand, length and width;

(h) Exposure conditions in milliampere•minutes or curie•minutes; and

(i) Processing time and temperature for development, stop bath or rinse, fixing, washing and drying.

9.3 Qualification Radiographs

(a) Radiographs of welds that are similar to those that will be inspected during production welding shall be made in accordance with the requirements of the procedure using IQIs positioned both on the source side and film side.
(b) IQIs shall be identified as to their location.
(c) An unexposed base film shall be processed in accordance with the requirements of the procedure.
(d) Radiographs shall meet the quality requirements of Paragraph 8.
(e) Radiographs shall be interpreted in accordance with the requirements of the acceptance criteria provided by the Company (Paragraph 10.3), and the results shall be recorded on the form specified in Paragraph 11.1.
(f) Radiographs shall be identified with the RT Contractor's name, radiographer's name, date of test, and procedure number.

10 PRODUCTION RADIOGRAPHY

10.1 General

(a) Radiographic procedures qualified in accordance with the requirements of Paragraph 9 shall be used.
(b) A single wall radiographic technique shall be used whenever practical.
(c) Except for elliptical radiographs, double wall radiographic method shall require a minimum of three exposures for each weld.
(d) Contact method of radiography shall not be used for welds in piping smaller than 60.3 mm OD or NPS 2.
(e) The elliptical or super-imposed techniques shall be limited to welds of 60.3 mm OD or smaller pipe, or NPS 2 or smaller component.
(f) Film overlap shall not be within 50 mm of the 12 o'clock and 6 o'clock positions.
(g) Welds shall not be radiographed until the surface temperature is below 50°C.

10.2 Film Identification

(a) Films shall be clearly identified by lead numbers, letters or flash cards, or any other method approved by the Company to ensure that the location of the weld and any discontinuity in the weld can be quickly and accurately located.
(b) When more than one film is used to inspect a complete circumferential weld, the identification markers shall appear on each film and the weld marker location shall be common to two successive films to ensure that the entire weld has been examined.
(c) Where applicable, the location markers shall be placed in a clockwise direction on the down-stream side of the weld and the zero marker (clearly marked by an arrow) shall correspond to the 12 o'clock position (top dead center).
(d) A number shall be assigned to each weld to be radiographed as follows:
  (i) For pipeline welds, using the sequence specified by the Company, or
  (ii) For assemblies and station welds, using the number specified on the piping drawings.
(e) Replacement welds (cutouts) shall be identified by adding the suffix "CO" to the original weld number.

(f) Repaired welds shall be identified by adding the suffix "R" for the first repair, or "R2" for a second repair, to the original weld number.

10.3 Film Interpretation

(a) Radiographs shall be properly dried prior to interpretation.
(b) Final interpretation shall be completed on a high intensity viewer.
(c) The standards of acceptability shall be the applicable requirements given in Company welding specifications TES-WELD-PL and TES-WELD-AS.

11 RECORDS AND REPORTS

11.1 General

(a) Inspection results shall be recorded on the Company standard radiographic report form, or alternate forms provided by RT Contractor and subject to approval by the Company.
(b) Such reports shall be made available to the Company on a daily basis, at the time designated by the Company.
(c) Radiographic reports and records shall become the property of the Company upon completion of the project.

11.2 Inspection Records for Production Welds

RT Contractor shall provide to the Company
(a) the radiographic procedure, qualification radiographs and unexposed base film;
(b) the radiographic films of welds inspected; and
(c) an assessment of the weld quality in accordance with the requirements of the acceptance criteria provided by the Company (Paragraph 10.3).

11.3 Packaging of Radiographs

(a) Films shall be packaged as follows:
  (i) For pipeline and tie-in welds, one weld per slot in divided boxes approved by the Company.
  (ii) For assemblies and station welds, in envelops placed in boxes.
(b) Film boxes shall be identified with Project name and number, Range of weld numbers, Dates exposed, Box number, RT Contractor and Radiographer names. Each box shall contain a copy of the interpretation sheet for every film.
(c) Radiographs of replacement welds shall be placed in the same slot or envelop as the original (cutout) weld.
(d) All repair films and/or re-shot films shall be packaged with the original films.

- END OF DOCUMENT -

ACUREN

Technical Procedure: **RT-0016**

GENERAL PROCEDURE FOR RADIOGRAPHIC EXAMINATION

Division	ALL
Revision Date	April 18, 2009
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	NAME	SIGNATURE	POSITION
Level III Approved:	[redacted]		CGSB / SNT RTIII
QA Approved:		[redacted]	Quality Manager

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1.0 SCOPE

1.1 This procedure outlines the procedure for radiographic examinations of ferrous materials and non-ferrous materials. This is a non-destructive examination used for detecting discontinuities that are on or below the surface such as cracks, seams, laps, cold shuts, laminations, inclusions, lack of fusion, or welding discontinuities.

1.2 This examination procedure is applicable to in-process, final and maintenance (in-service) examinations.

1.3 Examinations may be carried out on forgings, castings, welds on vessels, piping, fittings and valves and related components.

1.4 Examination shall be performed in accordance with ASME Section V, Article 2. Examination method will be for Gamma or X-ray sources. This procedure is used in conjunction with a specific technique for the method utilized.

2.0 STANDARDS AND SPECIFICATIONS

2.1 This procedure is prepared according to ASME Sect V – Article 2
2.2 ASTM E-94 Standard Guide for Radiographic Testing.
2.3 Acuren Health Safety & Environmental Manual.
2.4 Acuren RT-0002 Calibration of Densitometers.
2.5 Acuren RT-0007 Density Strip Calibration.
2.6 Acuren MISC-0001 SNT NDT Procedures. (SNT-TC-1A)
2.7 Acuren Radiation Safety Management System (RSMS).
2.8 Acuren Safe Operations and Emergency Procedures Manual for X-Ray devices.

3.0 PERSONNEL QUALIFICATIONS

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3.1 All personnel operating gamma equipment shall be certified as a minimum to a qualified Certified Exposure Device Operator (CEDO), or if they are classified as a Trainee, they shall be 100 % visually supervised by a Certified Exposure Device Operator (CEDO).

3.2 Examination personnel shall be qualified and certified in accordance with Acuren Group Inc. written practise MISC-0001.

3.3 Techniques and procedures are to be carried out by personnel with a minimum certification of CGSB and SNT Level I and trained in the use of the applicable procedure and technique.

3.4 Only personnel having a minimum certification to CGSB and SNT Level II shall carry out final interpretation.

4.0 SAFETY

4.1 Acuren shall comply with the safety requirements of the Canadian Nuclear Safety Commission and any other federal, provincial, territorial or municipal regulatory authority. Details of these safety requirements are contained in the Acuren Radiation Safety Management System (RSMS)

4.2 Applicable sections of the RSMS Manual shall be available in all vehicles used to transport radioactive isotopes and all locations where radiographic examinations are carried out.

4.3 All x-ray or gamma ray equipment shall be operated in accordance with the manufacturer's instruction guidelines and/or recommendations.

4.4 Chemicals used for development of radiographic film may be corrosive and shall be handled and stored according to the manufacturer's recommendations and WHMIS requirements. Disposal of chemicals and chemical containers shall be in accordance with Provincial and Municipal regulations.

4.5 The client is to take reasonable steps to help Acuren with safety concerns relating to positioning and the location of work.

5.0 DEFINITIONS AND TERMINOLOGY

a) ASNT- American Society of Nondestructive Testing
b) ASTM – ASTM International
c) ASME – American Society of Mechanical Engineers
d) NDT – Nondestructive Testing
e) CGSB – Canadian General Standards Board
f) SFD – Source to film distance
g) SOD – Source to object distance
h) IQI – Image Quality Indicator

6.0 EQUIPMENT AND APPARATUS

6.1 Selection of Radiographic Source

a) Unless specified by contract, the source of radiation may be an x-ray emitting machine or gamma rays emitted by a radioactive isotope.

b) X-rays shall be produced by an x-ray machine operating at any kilo-voltage and milli-amperage that achieves the required radiographic sensitivity.

c) Where gamma radiation is selected as the source of radiation, Iridium 192 may be used for all total thicknesses 3" (76 mm) or less.

d) Cobalt 60 may be used for all thickness from 1" (25.4 mm) to 8" (200 mm).

6.2 Selection Of Radiographic Film

a) Film brand, size and designation will be selected on the basis of the ability to meet sensitivity requirements and coverage specified by the governing standard, code or specification.

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b) Unless specified by contract, the film brand and designation must be capable of providing full coverage for the area of interest, and have the ability to meet specified sensitivity requirements.

6.3 Radiographic Screens

a) Fluorescent screens are not permitted by this procedure.

b) Radiographs may be produced with or without lead screens

c) Only lead intensifying screens shall be used. Intensifying screens shall be free of any defects that would produce artifacts on the final radiograph.

d) Screens shall be in direct contact with the film.

6.4 Image Quality Indicators

a) Penetrameter design and selection shall be in accordance with the referencing code section.

b) Hole type penetrameters or wire type image quality indicators (IQI) shall be used to evaluate film sensitivity.

c) IQIs shall be selected from either the same alloy material group or grade as identified in SE-1025, or SE-747, as applicable, or from an alloy material group or grade with less radiation adsorption than the material being radiographed.

d) The thickness on which the penetrameter is calculated is based on the nominal single wall thickness plus the estimated weld reinforcement not to exceed the maximum permitted by the referencing code section.

e) Where densities may vary by more than allowable by the referencing code sections, an additional IQI will be used for each exceptional area of density to show sensitivity in that area.

f) The number and placement of penetrameters shall be as specified by governing standard, code or specification.

- Where accessibility permits, source side penetrameters shall be used.

- Film side penetrameters shall be designated by the placement of a lead letter "F" adjacent to or on the penetrameter and shall not be in the area of interest.
- Hole type penetrameters shall be placed adjacent to the weld where possible.
- When radiographing welds, the wire penetrameters are to be placed with the wires across the weld area. Any identifying lead numbers must not be in the area of interest.

g) When hole type penetrameters are selected, shims may be used to compensate for material thickness greater than the parent metal or to compensate for the total material thickness when the penetrameter cannot be placed on the material being radiographed. Shims will be made from radiographically similar material.

6.5 Facilities for Viewing radiographs

a) The viewing facilities and equipment for viewing shall be as specified by governing standard, code or specification.

b) Viewing facilities shall provide subdued background lighting of an intensity that will not cause troublesome reflections, shadows, or glare on the radiograph that interfere with the interpretation process.

c) Masks should be used to control extraneous light coming through lower density areas or the outer edges of the radiograph to prevent interference with the interpretation.

d) Equipment used to view radiographs for interpretation shall provide a variable light source sufficient for the essential IQI hole or designated wire to be visible for the specified density range.

6.6 Densitometers and Step Wedge comparators

a) Densitometers or comparison density strips shall be used to assure film density compliance. Densitometers must be checked against a traceable step tablet at the beginning of each shift, after 8 hours of continuous use, or change of apertures, whichever comes first. Readings must be within ± 0.05 on the step tablet.

b) Densitometers shall be calibrated every 90 days or when accuracy is questionable. Calibration must be with a step tablet traceable to national standards, having 5 steps and neutral densities from 0.3 to 4.0. The step tablet used for calibration must have been verified within the last year. Densitometers are calibrated as per Acuren Technical procedure RT-0002.

c) Step Wedge comparison films used will be calibrated as per Acuren Technical procedure RT-0007.

7.0 GENERAL PROCEDURE

7.1 Surface Preparation

a) All surfaces shall satisfy the requirements of the applicable materials specification or referencing Code Section, with additional conditioning if necessary. Conditioning can be by any suitable process and shall be to a degree that the resulting radiograph will not show surface irregularities that could mask or be confused with the image of a discontinuity.

b) Weld surface irregularities shall be removed by a suitable process to the degree that the resulting radiograph will not show surface irregularities that could mask or be confused with the image of a discontinuity. The finished surface of a butt-welded joint may be flush with the base material or may have reasonably uniform crowns, with reinforcement not to exceed that specified in the referencing code section.

7.2 Identification of Examination Areas

a) All weld areas to be identified with a sequential numbering system that relates to the type of weld being radiographed. The following is the standard in industry. Clients may dictate specific numbering that relates to their needs.

TYPICAL WELD TYPE	NUMBER SEQUENCE	FOR REPAIRS
Piping welds	X1, X2, X3, ...	X1R1, X1R2, ...
Circumferential welds on vessels	C1, C2, C3, ...	C1R1, C1R2, ...
Longitudinal welds (long seams)	LS1, LS2, LS3	LS1R1, LS1R2, ...
Manway Welds on vessels	MW1, MW2, MW3, ...	MW1R1, MW1R2 ...
All Spot Welds	SP1, SP2, SP3, ...	SP1R1, SP1R2, ...
Tracers from Spot welds	SP1T1, SP1T2, SP1T3	SP1T1R1, SP1T1R2....
Welds that have been "cut out" should be marked with suffix of "CO" after the number		

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b) A weld map must be generated to record the area that spots have been selected on tanks. Maps must show a roll out from the "zero point" starting on the left side of the tank.

c) Film shall be identified using any method that permanently identifies the film. As a minimum identification must include Acuren name or symbol, client name, date, job number and unique trace numbers, which will identify the weld or component examined.

7.3 Examination coverage

a) Location markers shall be placed as specified by governing standard, code or specification.

b) At least two (2) location markers will appear radiographically on each film. The location markers must be placed on the part not on the film cassette.

c) Location markers incorporated into fibre tapes should be checked periodically for accuracy to imperial or metric increments.

d) Where multiple films are used for an exposure, radiographic images of location markers shall be visible on each film to indicate complete coverage in the area of interest.

e) Permanent stamping or marking shall be the responsibility of the client.

f) As a minimum the reference point and direction shall be marked on the component using a paint stick so that the location of any defects noted in the radiographs can be measured from the marked reference point. References are to show an arrow of direction from a zero point. Clients should reference this location marker to a map for traceablitiy.

7.4 Examination Process

a) Select applicable technique for the configuration and accessibility of the part.

b) Maximum physical source size for Iridium 192 shall be 5.0 mm, and for Cobalt 60 a maximum of 7.0 mm.

c) All details shall be recorded on an Acuren radiographic report. All relevant areas identified on the radiographic report must be completed. A copy of the report is attached to this procedure.

d) Film Processing

- Film processing may be carried out using the automatic or manual processing method. Processing details as per Acuren procedure RT-0018.
- For automatic processing, the recommendations of the film, processor and chemical manufacturers shall be followed.
- Changes in chemistry temperatures can affect development time, therefore, manufacturer's recommended development time versus temperature charts should be consulted.
- Processing shall be according to manufacturer recommendations and standards guide SE-999 or paragraphs 23-26 of SE-94.
- Processed film may be packaged by rolling and placing in boxes, flat in envelopes with interleaves, or any other manner suitable to the client.

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e) Direction of Radiation

- Any source to film distance that achieves the required sensitivity and does not exceed the geometric unsharpness (Ug) requirements of the governing code, standard or specification is permitted.
- Geometric unsharpness of the radiographs shall be determined in accordance with:

$$\mathbf{Ug = Fd/D}$$

where:

Ug = geometric unsharpness

F = source size: the maximum projected dimension of the radiating source (or effective focal spot) in the plane perpendicular to the distance D from the weld or object being radiographed, in.

D = distance from source of radiation to weld or object being radiographed, in.

d = distance from source side of weld or object being radiographed to the film.

7.5 Interpretation and Evaluation

a) Film Density

- Exposure times for radiographs shall be calculated using exposure calculators, exposure charts, or other established methods capable of determining the amount of exposure in order to have a necessary density in the area of interest specified by the governing standard, code or specification.
- Film density shall be measured between the root pass and the edge of the weld cap using a calibrated densitometer or calibrated comparator density strip.
- Where measured density does not meet the specification or code requirements, the area shall be re-radiographed.
- If any film should become pre-exposed or fogged more than allowable by the referencing code section it shall not be used.

b) Film Quality

- All radiographs shall be free from mechanical, chemical, false indications or other blemishes to the extent that they will not mask or be confused with the image of any discontinuity in the area of interest

of the object being radiographed.

- Where required by referencing codes, a lead symbol "B", 0.500" in height and 0.062" thickness shall be attached to the back of each film holder as a check on backscatter radiation. If a light image of the "B" is visible on the radiograph, protection against backscatter is insufficient and the radiograph will be considered unacceptable. A dark letter B is not cause for rejection.
- Demonstration of the density and IQI image sensitivity on production or technique radiographs will be considered satisfactory evidence of compliance with the procedure.

c) IQI Sensitivity

- The sensitivity shall be sufficient to display the required hole or essential wire of the IQI used.
- The radiograph shall display the IQI identifying numbers and letters.
- If a thinner or thicker hole type penetrameter is used, an equivalent IQI sensitivity chart may be used.

d) Interpretation

- Sizing of defects shall be measured directly from the radiograph.
- Completed radiographs to be evaluated, interpreted to the referenced code section, and results documented on an Acuren radiographic report.

7.6 Marking

a) During examination, parts, components, and/or assemblies shall be marked in accordance with the applicable code or as directed in the contract or purchase order.

b) Increments corresponding to the location markers and direction of travel shall be marked on the part with a permanent ink marker. These marks provide orientation and location relative to any discontinuities observed during the interpretation.

8.0 ACCEPTANCE CRITERIA

8.1 The client shall designate the acceptance criteria in accordance with the referencing code or a written specification.

8.2 In absence of a designated code or specification, all indications are to be reported with no acceptance or rejection.

9.0 POST CLEANING

9.1 There is no post cleaning required.

10.0 REPORTS AND RECORDS

10.1 Radiographic reports shall be prepared for all exposures taken and shall include all the following information, and any additional client requested information.

a) Identification, Acuren job number, client job number or contract number, and heat number if applicable.
b) Dimensional map (if used) of location marker placement.
c) Number of exposures.
d) X-Ray voltage or Isotope used.
e) X-Ray machine focal spot size or physical isotope source size.
f) Base material type and thickness, weld thickness, weld reinforcement thickness, as applicable.
g) Minimum source to object distance.
h) Distance from source side of object to the film at the minimum source-to-object distance.
i) Film manufacturer and type.
j) Number of films in each cassette.
k) Single or double wall exposure.
l) Single or double wall viewing.
m) All relevant indications shall be noted on the radiographic report.

10.2 One (1) copy of the report shall be included in the packaging, one (1) copy will be presented to the client representative, and two (2) copies will be submitted to the regional Acuren office for processing.

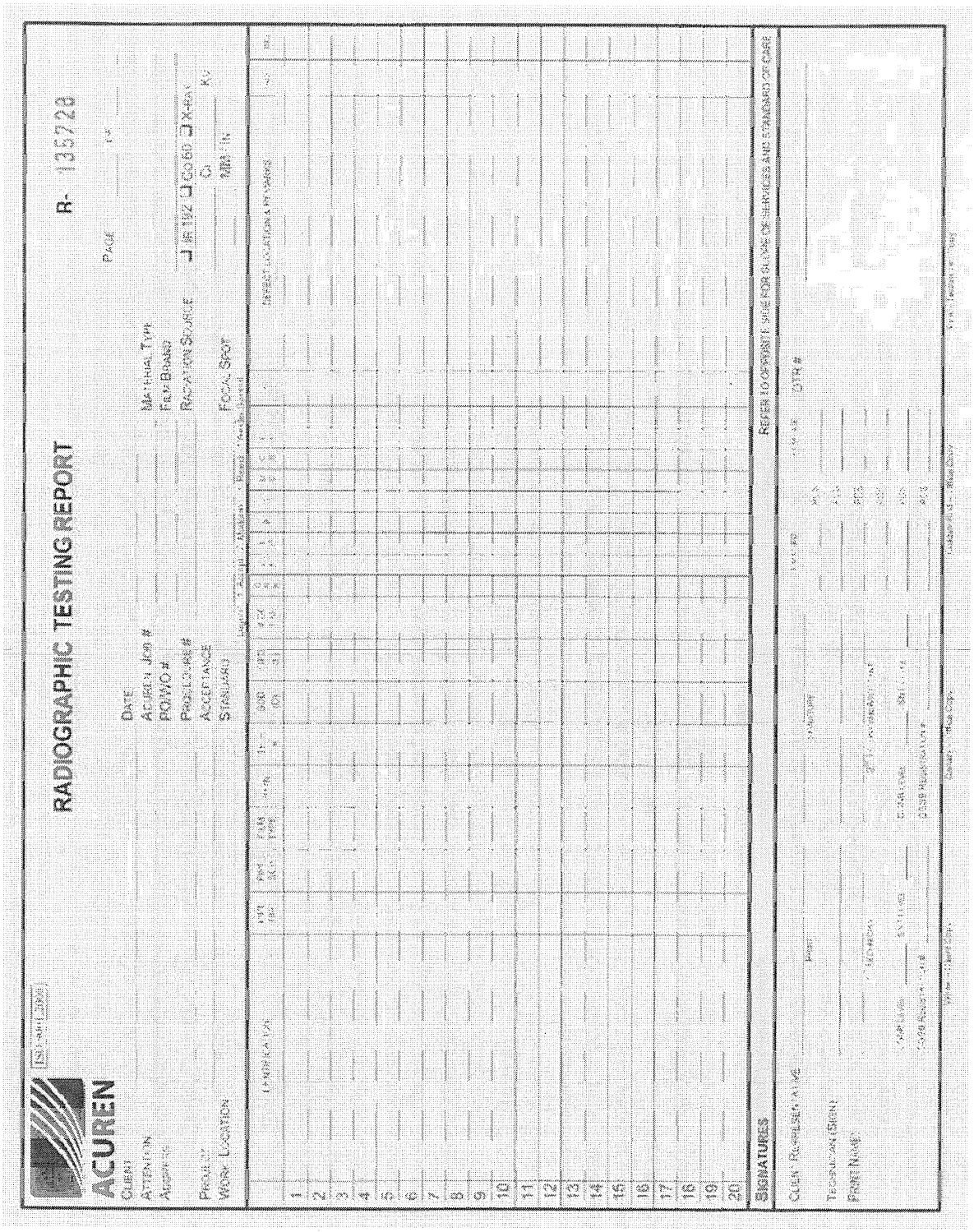
11.0 NONCOMPLIANCE

11.1 All items of non-compliance will be dealt with according to the Acuren quality management system, and a report shall be generated on non-conformance items to correct any problems that may occur.

Technique "1"
SWE-SWV
Technique "2"
SWE-SWV
Technique "3"
DWE-SWV
Technique "4"
DWE-DWV
Technique "5"
DWE-DWV
INDICATIONS LEGEND
IDK Crack
LF Lack of Fusion
IP Incomplete Penetration
P Porosity
S Slag
UC Undercut
CR Concave Root
EP Excessive Penetration
BT Burn Through
HB Hollow Bead
PI Pinhole
OTHER LEGENDS
SWT Single Wall Exposure
DWT Double Wall Exposure
SWV Single Wall View (S)
DWV Double Wall Viewing
EXP Exposure
RETN Retention (mm)
DIA Diameter
SOD Source Object Distance
OFD Object Film Distance
SCOPE OF SERVICES:
STANDARD OF CARE:
U_g = Geometric Unsharpness
D = Source to Object Distance
I = Object to film distance
F = Focal Spot Size
$U_g = Fi/O$

12.0 APPENDIX – RADIOGRAPHIC REPORT

Front



Back

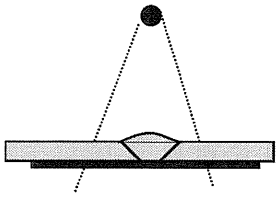
ACUREN

Single Wall Exposure Method

Procedure RT-0016
Technique 1

Procedure Used	RT0016	**Technique Description**	General Single Wall exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	2.0 mm – 160 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE



Source of Radiation
Film
Material wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 70mm
Source Type	Co 60	**Source size**	< 7.0 mm	**Thickness range**		25mm –160mm
Strength	Min 15 Ci	**Exposure**	As required	**SFD**		Calculate Ug
Technique	Single Wall	**Viewing**	Single Wall	**# of Exposures**		n/a
Calculated Ug Factor		< 0.020"	**Max Allowable Ug Factor**			< 0.020"
Intensifying Screens		Lead	**Tk. Front**	0.005"	**Tk Back**	0.010"
Film Designation		Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**	1 (one)
Penetrameter Type		ASTM wire or ASME Hole		**Designation #**	As per referenced code.	
Essential Sensitivity		As per code		**Placement**	Sourceside unless inaccessible	
Penetrameters per Film		CSA codes - 2 (middle/end) ASME codes - 1		**Per Weld**	2 per exposure 1 per exposure	
Comparator Shims per Film		1 (CSA Z662 only)		**Per Weld**	1 per exposure	
Shim Used		Only ASME hole penetrameters		**Thickness**	0.062" each	
Location Marker Type		Lead #		Metric ☐	Imperial ☐	
Location Marker Placement		On part		Source side when accessible Filmside is only allowed when source to material distance equals the radius of component.		
Density		2 to 4.0 H&D		**Area Taken**	Through Weld	
Additional Information		• Must meet the UG factor with SFD				
Identification on film		• As per specification - Lead Numbers or Flash				

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150° F
Storage of Finished Radiographs	Placed in interleaves and film envelope				

All processing and storage in accordance with ASME SE999.

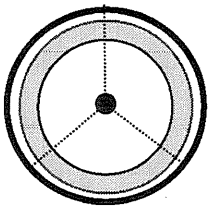
s.19(1) s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval	[redacted]	[redacted]	Quality Manager

ACUREN	Single Wall Panoramic Exposure Method	Procedure RT-0016 Technique 2

Procedure Used	RT0016	**Technique Description**	Single Wall Panoramic Exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	2.0 mm – 160 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE



Source of Radiation
Film
Pipe wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 70mm	
Source Type	Co 60	**Source size**	< 7.0 mm	**Thickness range**		25mm –160mm	
Strength	Min 15 Ci	**Exposure**	As required	**SFD**		0.5 dia must meet Ug	
Technique	Single Wall	**Viewing**	Single Wall	**# of Exposures**		3 to 4	
Calculated Ug Factor		< 0.020"	**Max Allowable Ug Factor**			0.020"	
Intensifying Screens		Lead	**Tk. Front**	0.005"	**Tk Back**	0.010"	
Film Designation		Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**	1 (one)	
Penetrameter Type		ASTM wire or ASME Hole		**Designation #**	As per referenced code.		
Essential Sensitivity		As per code		**Placement**	Source side only when accessible		
Penetrameters per Film		N/A		**Per Weld**	3 @ 120° apart		
Comparator Shims per Film		1 (CSA only)		**Per Weld**	3 @ 120° apart		
Shim Used		Only ASME hole penetrameters		**Thickness**	0.062" each		
Location Marker Type		Lead #		Metric ☐	Imperial ☐		
Location Marker Placement		On part		Source side ☐	Film side ☑		
Density		2 to 4.0 H&D		**Area Taken**	Through Weld		
Additional Information		• Must meet the UG factor with SFD					
Identification on film		• As per specification - Lead Numbers or Flash					

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150° F
Storage of Finished Radiographs	Placed in interleaves and film envelope				

All processing and storage in accordance with ASME SE-999.

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s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval			Quality Manager

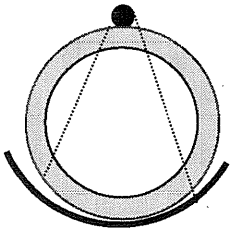
ACUREN

Double Wall Exposure Method

Procedure RT-0016
Technique 3

Procedure Used	RT0016	**Technique Description**	Double Wall Exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	2.0 mm – 70 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE



Source of Radiation
Film
Pipe wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 70mm	
Source Type	Co 60	**Source size**	< 7.0 mm	**Thickness range**		25mm –70 mm	
Strength	Min 15 Ci	**Exposure**	As required	**SFD**		Pipe Diameter	
Technique	Double Wall	**Viewing**	Single Wall	**# of Exposures**		3 to 4	
Calculated Ug Factor		< 0.020"	**Max Allowable Ug Factor**			0.020"	
Intensifying Screens		Lead	**Tk. Front**	0.005"	**Tk Back**	0.010"	
Film Designation		Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**	1 (one)	
Penetrameter Type		ASTM wire or ASME Hole		**Designation #**	As per referenced code.		
Essential Sensitivity		As per code		**Placement**	As per referenced code		
Penetrameters per Film		1		**Per Weld**	1 / exposure		
Comparator Shims per Film		1 (CSA only)		**Per Weld**	1 / exposure		
Shim Used		Only ASME hole penetrameters		**Thickness**	0.062" each		
Location Marker Type		Lead #		Metric ☐	Imperial ☐		
Location Marker Placement		On part		Source side ☐	Film side ☑		
Density		2 to 4.0 H&D		**Area Taken**	Through Weld		
Additional Information		• Must meet the UG factor with SFD					
Identification on film		• As per specification - Lead Numbers or Flash					

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150° F
Storage of Finished Radiographs		Placed in interleaves and film envelope			

All processing and storage in accordance with ASME SE-999.

s.19(1)

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	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval	[redacted]	[redacted]	Quality Manager

ACUREN

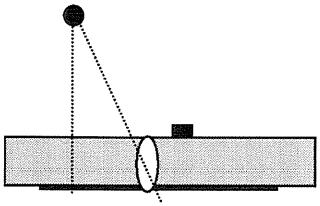
Elliptical Exposure Method

Procedure RT-0016
Technique 4

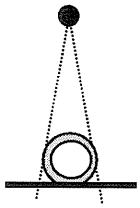
Procedure Used	RT0016	**Technique Description**	Elliptical Exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	5.0 mm – 25 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE

A&B - 30° offset



A & B - 90°



Source of Radiation
Film
Pipe wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 25 mm	
Strength	Min 15 Ci	**Exposure** ci/sec	As required	**SFD**		10X dia. minimum	
Technique	Double Wall	**Viewing**	Double Wall	**# of Exposures**		2	
Calculated Ug Factor		< 0.020"	**Max Allowable Ug Factor**			0.020"	
Intensifying Screens		Lead	**Tk. Front**	0.005"	**Tk Back**	0.010"	
Film Designation		Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**	1 (one)	
Penetrameter Type		ASTM wire or ASME Hole		**Designation #**	As per referenced code.		
Essential Sensitivity		As per code		**Placement**	Source Side		
Penetrameters per Film		1		**Per Weld**	2 @ 90° apart		
Comparator Shims per Film		1 (CSA only)		**Per Weld**	2 @ 90° apart		
Shim Used		Only ASME hole penetrameters		**Thickness**	0.062" each		
Location Marker Type		Lead #		Metric ☐	Imperial ☐		
Location Marker Placement		On part		Source side ☐	Film side ☑		
Density		2 to 4.0 H&D		**Area Taken**	Through Weld		
Additional Information		• Must meet the UG factor with SFD					
Identification on film		• As per specification - Lead Numbers or Flash					

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150°F
Storage of Finished Radiographs	Placed in interleaves and film envelope				

All processing and storage in accordance with ASME SE-999.

s.19(1)

s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval			Quality Manager

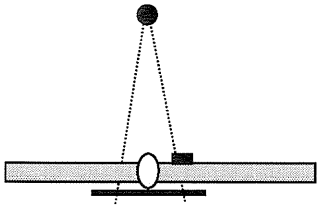
ACUREN

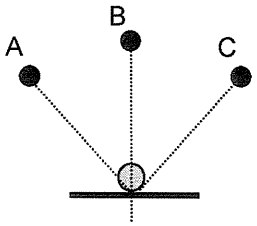
Superimposed Exposure Method

Procedure RT-0016
Technique 5

Procedure Used	RT0016	**Technique Description**	Superimposed Exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	5.0 mm – 25 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE





Source of Radiation
Film
Pipe wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 25 mm	
Strength	Min 15 Ci	**Exposure ci/sec**	As required	**SFD**		10X dia. minimum	
Technique	Double Wall	**Viewing**	Double Wall	**# of Exposures**		3	
Calculated Ug Factor	< 0.020"	**Max Allowable Ug Factor**				0.020"	
Intensifying Screens	Lead	**Tk. Front**	0.005"	**Tk Back**		0.010"	
Film Designation	Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**		1 (one)	
Penetrameter Type	ASTM wire or ASME Hole			**Designation #**	As per referenced code.		
Essential Sensitivity	As per code			**Placement**	Source Side		
Penetrameters per Film	1			**Per Weld**	1		
Comparator Shims per Film	1 (CSA only)			**Per Weld**	3 @ 45° angle between		
Shim Used	Only ASME hole penetrameters			**Thickness**	0.062" each		
Location Marker Type	Lead # A, B, C			Metric ☑	Imperial ☐		
Location Marker Placement	On part			Source side ☑	Film side ☐		
Density	2 to 4.0 H&D			**Area Taken**	Through Weld		
Additional Information	• Must meet the UG factor with SFD						
Identification on film	• As per specification - Lead Numbers or Flash						

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150° F
Storage of Finished Radiographs	Placed in interleaves and film envelope				

All processing and storage in accordance with ASME SE-999.

s.19(1) s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval	[redacted]	[redacted]	Quality Manager

ACUREN

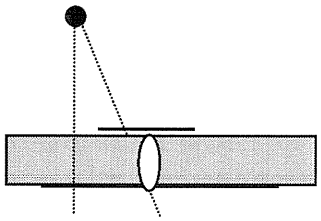
Elliptical / Contact Exposure Method

Procedure RT-0016
Technique 6

Procedure Used	RT0016	**Technique Description**	Elliptical/ Contact Exposure
Applicable specifications	ASME Sect V, CSA Z662, and CSA W59		
Material	P1 – P5	**Thickness Range**	2.0 mm – 25 mm
Joint Type	Butt Weld		

DRAWING OF TECHNIQUE

A - 30° offset



2 Contact exposures

One each side B & C

Source of Radiation
Film
Pipe wall
Beam direction

Beam Angle: 90° Perpendicular to weld

PARAMETERS

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**		2mm – 25 mm	
Strength	Min 15 Ci	**Exposure ci/sec**	As required	**SFD**		10X dia. For A Pipe dia. For B&C	
Technique	Double Wall	**Viewing**	Double Wall	**# of Exposures**		3	
Calculated Ug Factor		< 0.020"	**Max Allowable Ug Factor**			0.020"	
Intensifying Screens		Lead	**Tk. Front**	0.005"	**Tk Back**	0.010"	
Film Designation		Class I or II	**Brand**	Agfa or Kodak	**No./ Cassette**	1 (one)	
Penetrameter Type		ASTM wire or ASME Hole		**Designation #**	As per ASME V Art 2 table T-276		
Essential Sensitivity		2T		**Placement**	Source side when accessible		
Penetrameters per Film		1		**Per Weld**	1		
Comparator Shims per Film		N/A		**Per Weld**	N/A		
Shim Used		N/A		**Thickness**	N/A		
Location Marker Type		Lead # A, B, C		Metric ☑	Imperial ☐		
Location Marker Placement		On part		Source side ☑	Film side ☑ for B & C		
Density		2 to 4.0 H&D		**Area Taken**	Through Weld		
Additional Information		• Minimum offset at 30° for Exposure A (must ellipse). • Contact shots for B & C are opposite sides of tangents. • SFD at diameter of weld.					
Identification on film		• As per specification - Lead Numbers or Flash.					

PROCESSING AND STORAGE OF FILM

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°F
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150° F
Storage of Finished Radiographs	Placed in interleaves and film envelope				

All processing and storage in accordance with ASME SE-999.

s.19(1) s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed	[redacted]	[redacted]	SNT / CGSB RT III
QA Approval	[redacted]	[redacted]	Quality Manager

Procedure Used	**RT-0016**		
Technique Description	**Calculation of wall thickness with shadow shot radiography**		
Applicable Specification	Providing information for client evaluation		
Material	Ferrous and Non ferrous	**Weld Types**	N/A
Method	Projection of wall thickness to large format film.		
Equipment:	• Flat 14" x 17" or larger film holder with proper straps to secure film to part. • Cobalt 60, Iridium 192, or X-Ray may be used to produce acceptable results. Choice is dependent upon the thickness range, and/or location or the component. • Jig for positioning source and holding in stable position during exposure. • Film cassettes of appropriate size to provide coverage • Film • Penetrameters • Tungsten collimator • High intensity viewer. • Single edge razor blade for removing emulsion. • Standard block of known thickness or diameter.		
Planning	1. Discuss the orientation with the client to ensure the desired positioning of the test is relative to the evaluation for traceability. This is normally in the horizontal or vertical position to determine corrosion or pitting in a selected area. (See figure 1) 2. In most situations the exposure will only be in one direction at 90 degrees to the part, and utilize only one exposure per location. Verify with client. 3. Select the film speed based on what the client's expectations are. Best industry practice is to select a fast film with lower contrast and higher grain to meet the productivity needs. The sensitivity provided is high due to the greater source to film distance (SFD). 4. When requested by the client a standard may be used as a comparison tool to provided accuracy of the calculations. 5. The set-up and technical information in the datasheet (Table 1) attached will provide best quality results.		

General set up procedure	1. Set-up the jig and collimator in exposure position. 2. Perform a test pocket dosimeter shot on opposite side of the part to determine exposure time. 3. Position an attenuative material approximately 1 inch x 3 inches to block out radiation in the top left hand corner of the film. This is for the Flash ID. 4. Position the film on the part 90 degrees perpendicular to the source position. • Ensure that the film remains flat and is not curved. Measure from both sides of the edge of the film to ensure distance is equal. • Take care to prevent pressure marks due to handling and positioning the film. • If a physical standard is used for comparison, position at the same distance where measurements will be compared. See technique drawing. • It is critical to record and report orientation of the radiograph. (See figure 1.) 5. Take precautions to prevent movement of all equipment and film. 6. Project source and expose film for pre-determined time 7. Process film.
Methods of determining the wall thickness	1. Projected comparison • Formulas **Actual wall thickness** = Known outside diameter X Projected wall thickness / Projected outside diameter Or Projected OD/Actual OD = Ratio, (then with this ratio): **Actual wall** = ratio x projected wall

Evaluation	Client is normally responsible for evaluation of the results. Acuren will provide calculations in accordance with this technique when requested by the client. Recommendations to assist in the evaluation • If range of the radiographic density is high in the area of interest, a good practice is to remove the emulsion from one side of the film with a single edge razor blade. This allows a reduction in the density and permits easier measurement from the edges of the projected wall thickness. • Swab the area of measurement with a damp cloth to soften the emulsion. • Once the emulsion is softened, position flat against the viewer and scrape the emulsion only from the outer wall with a smooth angular motion.
Reporting	Identification on the radiograph. • Flash or lead numbers providing the Acuren name or logo, client name, ID number, date, part or line number. Best practice is with the flash in the top left hand corner utilizing a lead block or other similar material positioned during exposure to white out the area for the flash. This provides a small detailed identification of the identification. Data to be Recorded on Acuren Report Form (s) • As per RT-0016

Lead #	Designation
T	Top
N	North
E	East
W	West
S	South

Film & Lead # positions

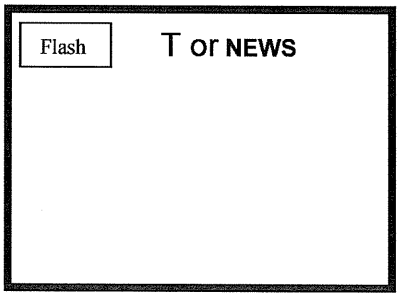


Figure 1

s.19(1)

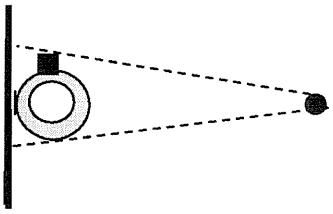
s.19(1)

	NAME	SIGNATURE	POSITION
Level III Reviewed			SNT / CGSB RT III
QA Approval			Quality Manager

Table 1

Procedure Used	RT0016		
Technique Description	Wall thickness evaluation with radiography		
Applicable specifications	ASME Sect V, Article 2		
Material	N/A	**Thickness Range**	2.0 mm – 160 mm
Joint Type	N/A		

Drawing:



Source of Radiation
Film on rigid board
Pipe wall
Beam direction
Physical Comparator Standard
Beam Angle: 90 degrees Perpendicular to weld
Penetrameter in contact film side

Parameters

Source Type	IR 192	**Source size**	< 5.0 mm	**Thickness range**	2.0 mm – 70 mm		
Source Type	Co 60	**Source size**	< 7.0 mm	**Thickness range**	25 mm – 160 mm		
Strength	**Min 30 Ci preferred.**	**Exposure**	**As required**	**SFD**	**7 x diameter**		
Technique	Single Wall	**Viewing**	Single Wall	**# of Exposures**	1		
Calculated Ug Factor		N/A	**Max Allowable Ug Factor**		N/A		
Intensifying Screens		Lead	**Thk Front**	.005"	**Thk Back**	.010"	
Film Designation		Class II preference	**Brand**	Agfa D7 or Kodak AA	**# Per Cassette**	1 (one)	
Penetrameter Type		ASTM wire or ASME Hole	**Designation #**		Use ASME Specification based on single wall thickness.		
Essential Sensitivity		N/A	**Placement**		Film side		
Penetrameters per Film		1					
Comparator Standard		1	**Location**		As per figure 1		
Shim Used		None	**Thickness**		N/a		
Location Marker Type		Lead #					
Location Marker Placement		On part	Source side ☐		Film side ☑		
Density		1.2 to 2.0 H&D	**Area Taken**		Through double wall area		
Additional Information		• Density specified above is not critical.					
Identification on film		• Lead Numbers or Flash – Top left corner or Top center of wall area.					

Processing and Storage of Film

Method	Manual	**Developing Time**	5 minutes	**Temperature**	68°
Fixing time	3 minutes	**Washing Time**	20 minutes	**Drying Temp**	150°F
Storage of Finished Radiographs		Placed in interleaves and film envelope			

Title: **TEP-NDT-ADT Procedure for Non-Destructive Examination (NDE) Audits**	Document Type: Procedure
Effective Date: 2004/11/30 Revision: 0	
Document Owner: Pipe Engineering, Technical Support & Technology Management	
s.19(1) Originator: [redacted]Engineer, Consultant	
Reviewer: [redacted] Technologist, Regional Integrity, Airdrie	Signature/Date (signed record on file)
Reviewer: [redacted]echnologist, Pipe Engineering, Technical Support & Technology Management	Signature/Date (signed record on file)
Reviewer: [redacted]Project Manager, Program Implementation, Pipe Engineering	Signature/Date (signed record on file)
Reviewer: [redacted]Project Manager, Plant Engineering	Signature/Date (signed record on file)
Reviewer: [redacted]Project Manager, Major Projects	Signature/Date (signed record on file)
Approver: [redacted]Manager, Major Projects	Signature/Date (signed record on file)

PURPOSE

This document describes TransCanada's (The Company) procedure for auditing Non Destructive Examination (NDE) results of welds within the Company's pipeline system to ensure that these inspections are carried out complying with the Company specifications, and applicable codes and regulations.

SCOPE

This procedure applies to the auditing of NDE results based on the various methods the Company employs for inspecting welds for Pipeline, Compression, Meter Station, Maintenance and Integrity projects.

The implementation of this procedure will be the responsibility of the project manager.

BRIEF DESCRIPTION OF CHANGE (IF A REVISION)

This is a new procedure.

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1. PURPOSE

This document describes TransCanada's (The Company) procedure for auditing Non Destructive Examination (NDE) results of welds within the Company's pipeline system to ensure that these inspections are carried out complying with the Company specifications, and applicable codes and regulations.

2. SCOPE

This procedure applies to the auditing of NDE results based on the various methods the Company employs for inspecting welds for Pipeline, Compression, Meter Station, Maintenance and Integrity projects.

3. DEFINITIONS

ASME -	American Society of Mechanical Engineers.
ASTM -	American Society for Testing and Materials.
CGSB -	Canadian Government Standards Board.
CSA -	Canadian Standards Association.
ECA -	Engineering Critical Assessment.
EUB -	Alberta Energy and Utilities Board.
GMAW -	Gas Metal Arc Welding.
LPI -	Liquid Penetrant Inspection.
MPI -	Magnetic Particle Inspection.
NEB -	National Energy Board (Board).
RT -	Radiographic Testing.
TOFD -	Time of Flight Diffraction.
TOP -	TransCanada Operating Procedure.
UT -	Ultrasonic Testing.

4. REFERENCES

1. ASME – Section V.
2. ASTM E-709 specification.
3. CSA Z662 – Latest Edition, Oil and Gas Pipeline Systems.
4. Pipeline Act and Pipeline Regulations of Alberta.
5. NEB - Onshore Pipeline Regulations, 1999, Part 9, Audits and Inspections.

6. TransCanada documents:
   - Magnetic Particle Test Forms (TOPS# 003672904).
   - TES-NDT-UT1 Mechanized Ultrasonic Examination of Pipeline Girth Welds.
   - TES-NDT-UT2 Manual Ultrasonic Examination of Welds.
   - TEP-NDT-REC Nondestructive Testing Records Management.
   - TES-NDT-RT Radiographic Examination of Welds.
   - TES-NDT-UTG Ultrasonic Inspection Design of Gas Metal Arc Pipeline Girth Welds.
   - TES-NDT-UTS Ultrasonic Inspection Design of Pipeline Girth Welds with a Standard Bevel.
   - TEP-NDT-IMP Implementation of Ultrasonic Inspection of Pipeline Girth Welds.
   - TED-NDT-GPU Guiding Principle for Mechanized Ultrasonic Inspection of Pipeline Girth Welds.
   - TOP - Magnetic Particle Inspection Procedure.

5. GENERAL

The Company uses four non-destructive testing methods to assess pipeline welds:

1) Ultrasonic Testing (UT), which uses short wavelength, high frequency sound waves to detect weld defects.
2) Radiographic Testing (RT), which uses X-ray and Gamma rays to detect weld defects.
3) Magnetic Particle Inspection (MPI), which creates magnetic field on the inspected weld.
4) Liquid Penetration Inspection (LPI), which is done by spraying or swabbing penetrants on the weld to detect defects.

This procedure is divided into these four areas.

5.1 REGULATIONS

NEB, in its Onshore Pipeline Regulations, Part 9, Audits and Inspections - General Compliance, Clause 53, states that:

1) A Company shall conduct an audit and an inspection on a regular basis to ensure its pipeline is designed, constructed, operated and abandoned in compliance with:
   (a) Part III of the Act;
   (b) Part V of the Act , as its relates to the protection of property and the environment and the safety of the public and of the company's employees;

(c) The Regulations; and

(d) The terms and conditions of any certificate or order issued by the Board, as they relate to the protection of property and the environment and the safety of the public and of the company's employees;

2) The audit shall document:

(a) All non-compliance noted; and

(b) Any corrective action taken or planned to be taken.

5.2 ROLES AND RESPONSIBILITIES

The Company will assign the following personnel and their responsibilities for the NDE audit on a given project:

a) Project Manager - The individual responsible for the overall execution of a project and for deciding whether the project will undergo an NDE audit.

b) Auditor - The individual responsible for auditing the NDE results of the pipeline welds.

An auditor could be:

- A third party individual holding a Level II or III CGSB's certificate in the appropriate inspection method, or,
- Company representative with experience in the NDE methods and interpretation of results.

c) Contractor - The party responsible to conduct the NDE inspection of the welds.

d) Construction Manager - The individual responsible for the workmanship of the Contractor and implementation of the specifications, codes and regulations.

6. ULTRASONIC TESTING (UT) - AUDIT PROCEDURE

The UT audit procedure is divided into two phases:

6.1 OFFICE AUDIT

The auditor will, preferably before the start of construction, review the following documents as part of this audit process:

- Prime contract documents for project scope.
- NDE contract documents.
- Weld joint configurations.
- UT contractor's inspection design when mechanized inspection equipment is used; this will include the calibration block and probe configuration.
- NDE Contractor's quality control manual

6.2 FIELD AUDIT

The auditor performing the office audit, in consultation with the Construction Manager, will advise the Project Manager to arrange for a field audit of the NDE results, if warranted.

The Project Manager will arrange to send either the same auditor or a Third Party auditor, for the field audit.

This auditor, once in the field, will:

a) Deal with the Construction Manager for any issues with the Contractors.

b) Be present on site at the start of the NDE to witness the initial set up of the Mechanized NDE systems and calibration of instruments.

c) Review the ultrasonic charts and corresponding calibration data produced by the UT Contractor during NDE to validate the Contractor's assessment of the mainline, compression and metering facilities, assemblies, crossings, tie-in and repair welds, to ensure they meet the acceptance criteria.

d) Review the manual ultrasonic reports and where possible witness a calibration and evaluation on an existing weld.

6.2.1 Audit Timing

The auditor will:

a) Audit the weld NDE results at least twice during the construction phase. At the construction kick-off, which is mandatory, and sometime during construction but before completion of the project.

b) Time the second visit in such a way that he/she can audit both mainline mechanized and manual UT examination results.

c) Forward the audit results to the Construction Manager before the completion of that particular phase of construction in order to resolve any deficiencies.

6.2.2 Mandatory Audit Items

The auditor will review the following items before construction kickoff:

a) Probe configuration (Mechanized).

b) System Evaluation (Mechanized).

c) Axial alignment of data (Mechanized).

d) Completeness of coverage of weld through thickness and length (Mechanized).

e) Complete, accurate reports and interpretations for project records (Mechanized/Manual).

f) Proper calibration reflector signal response for each channel/probe.

g) Signal discrimination between adjacent channels (Mechanized only).

The auditor will review the following items before construction completion:

a) Frequency of calibration (ensure specification requirement is met).

b) Correctness of interpretation sequential data files to ensure that files have not been overwritten.

c) Continuity between calibrations.

d) Complete, accurate reports and interpretations for project records.

e) Proper calibration reflector signal response for each channel/probe.

f) Coupling loss identified and resolved (Mechanized).

6.2.3 Audit Frequency

The auditor will audit the NDE records as follows:

- Mainline Welds - 15% of the Mainline Welds (random selection).
- Major Crossings - 15% of all welds within crossing boundary.
- Tie-in Welds - 15% of tie-in welds (random selection).
- Final Tie-in Welds - 100% of final tie-in welds.
- Repaired Welds - 10% of the repaired weld (random selection).
- Station welds - 15% of the station welds (random selection).
- Assembly welds - 15% of welds on pipeline assemblies.

Note:

1. Repair welds are examined manually with UT method and only paper-audit is required for manual UT.

2. Station welds are welds completed in Compression and metering facilities.

The auditor will review the calibration records (one before and one after) of the welds being audited.

6.2.4 Non-Compliance

The auditor will evaluate the two following types of non-compliances as outlined below;

1) System Performance (Mechanized)

There are two types of system performance non-compliances:

a) Loss of Coupling

Where a weld is exhibiting a lack of coupling in one channel and as well exceeding the maximum allowable defect length, the Contractor will re-inspect it, if the suspect area cannot be evaluated using the other data available for analysis.

b) Sensitivity

Sensitivity below the lower tolerance to ideal, in accordance with the Company specification TES-NDT-UT1 Mechanized Ultrasonic Examination of Pipeline Girth Welds, may be acceptable if the data can be reviewed after compensating for the reduced sensitivity using the raw mapped data channels.

If there is a non-compliance identified, the auditor will:

a) Complete the Progressive Audit, as noted below.

b) Convey the finding to an NDE Specialist for further evaluation.

c) Communicate the assessment of the Specialist to the Construction Manager for appropriate mitigative actions.

2) Interpretation

If there is an interpretation issue with a non-compliant weld, the auditor will:

a) Evaluate the defect for its height (Mechanized UT reports and scan data).

b) Complete the Progressive Audit, as noted below.

c) Convey the finding to a Fracture Mechanics Specialist for further evaluation.

d) Communicate the assessment of the specialist to the Construction Manager for appropriate mitigative actions.

6.2.5 Progressive Audit

In case of a non-compliance, the auditor will conduct progressive audits, which consist of auditing data from 10 welds prior and 10 welds following the non-compliant weld.

If non-compliance is still noted in those 20 welds, the auditor will audit an additional 20 welds, 10 prior and 10 following.

If further indications of non-compliance are noted, the auditor will audit all (100%) the welds in the pipeline for that day's production for that NDE technician.

6.3 DOCUMENTATION AND REPORTING

The auditor will, within two weeks of construction completion, provide a final report of UT audit to the Project Manager.

This report will summarize the inspection and provide an "exception report" detailing specific welds containing any non-compliances and resolutions.

7. RADIOGRAPHIC TESTING (RT) - AUDIT PROCEDURE

The RT audit procedure is divided into two phases:

7.1 OFFICE AUDIT

The auditor will, preferably before the start of construction, review, the following documents as part of this audit process:

a) Prime contract documents for the project scope.

b) NDE contract documents.

c) NDE Contractor's quality control manual

d) Weld joint configurations.

e) A procedure for the production of radiographs, which will include the following variables and their tolerances:

i. Type of material to be radiographed.

ii. Material thickness range for which the procedure is suitable.

iii. Type of radiation to be used with details of effective source size or X-ray machine voltage.

iv. Position of radiation source (external or internal).

v. Type, thickness and position of intensifying screens and filters.

vi. Sketch showing the geometric arrangement for the production of the radiographs, including minimum source to film distance and radiation angle with respect to the weld.

vii. Film type and brand, length and width.

viii. Exposure conditions in milliampere•minutes or curie•minutes; and,

ix. Processing time and temperature for development, stop bath or rinse, fixing, washing and drying.

7.2 FIELD AUDIT

The auditor performing the office audit, in consultation with the Construction Manager, will advise the Project Manager to arrange for a field audit of the NDE results, if warranted.

The Project Manager will arrange to send either the same auditor or a third party auditor, for the field audit.

The auditor, once in the field, will:

a) Deal with the Construction Manager for any issues with the Contractors.

b) Review the radiographs produced by the Contractor to validate the contractor's assessment of the mainline, compression and metering facilities, assemblies, crossings, tie-in and repair welds, to ensure they meet the acceptance criteria.

7.2.1 Audit Timing

The auditor will:

a) Audit the weld NDE results at least twice during the construction phase. Once, at the construction kick-off, which is mandatory, and the other during construction but before completion.

b) Forward the audit results to the Construction Manager before the completion of that particular phase of construction in order to repair any defects in time.

7.2.2 Mandatory Audit Items

The auditor will review the following items before construction kickoff:

a) Radiographic procedures on site.

b) Test Radiographs.

c) Radiographic test films and a piece of unexposed base.

d) Densitometers.

The auditor will review the following items before construction completion:

a) Consistent radiographic quality (density and sensitivity).

b) Correctness of interpretation.

c) Identification on film and reports (Proj.#, Company name, weld #, date, etc.).

7.2.3 Audit Frequency

The auditor will audit the NDE records as follows:

a)	Mainline Welds -	15% of the Mainline Welds (random selection).
b)	Major Crossings -	15% of all welds within crossing boundary.
c)	Tie-in Welds -	15% of tie-in welds (random selection).
d)	Final Tie-in Welds -	100% of final tie-in welds.
e)	Repaired Welds -	10% of the repaired weld (random selection).
f)	Station Welds -	15% of each piping system (random selection).
g)	Assembly Welds -	15% of the pipeline assembly welds.

Note:

1. Station welds are welds completed in Compression and metering facilities.

7.2.4 Non-Compliance

1) General

The auditor will evaluate two types of non-compliances, Procedural and Interpretation. If there is a non-compliance, the auditor will:

a) Complete the Progressive Audit, as noted below.

b) Communicate the assessment to the Construction Manager and Project Manager for appropriate mitigative actions.

2) Progressive Audit

In case of a non-compliance, the auditor will conduct progressive audits, which consist of auditing data from 3 welds prior and 3 welds following the non-compliant weld (Care shall be taken to include data from the same RT crew & equipment).

If a non-compliance is still noted in those 6 welds, the auditor will audit additional 6 welds, 3 prior and 3 following.

If a non-compliance is still noted in these new 6 welds, the auditor will audit additional 6 welds, 3 prior and 3 following.

If further indications of significant non-compliance are noted, the auditor will audit all (100%) the welds in the pipeline for that day's production for that NDE technician.

7.3 DOCUMENTATION AND REPORTING

The auditor will, within two weeks on construction completion, provide a final report of RT audit to the Project Manager.

This report will summarize the inspection and provide "exception report" detailing specific welds containing any non-compliances and resolutions.

8. MAGNETIC PARTICLE INSPECTION (MPI) - AUDIT PROCEDURE

The NDE results will be audited during the construction phase. The auditor will review 100% of the inspection reports. The audit will be a paper-audit of the MPI results for the following items:

1. Company Name.
2. Project Number.
3. Equipment List.
4. Identification of the inspected welds.
5. Weld Sketches.
6. Adherence to codes and specifications.
7. Application of proper techniques (include lifting power of yoke).
8. Signatures.
9. MPI report, containing the following items (Refer to ASME Section V, Article 7):
    a. Procedure identification and revision.
    b. Magnetic particle equipment and type of current.
    c. Magnetic particles (visible or fluorescent, wet or dry).

d. Examination personnel identity and qualification level.

e. Map or record of rejectable indications.

f. Material and thickness.

g. Lighting equipment.

h. Date and time examinations were performed.

9 LIQUID PENETRANT INSPCTION (LPI) - AUDIT PROCEDURE

The NDE results will be audited during the construction phase. The auditor will review 100% of the inspection reports. The audit will be a paper-audit of the LPI results for the following items:

1. Company Name.
2. Project Number.
3. Equipment List.
4. Identification of the inspected welds.
5. Weld Sketches.
6. Adherence to codes and specifications.
7. Application of proper techniques.
8. Signatures.
9. LPI report, containing the following items (Refer to ASME Section V, Article 6):
    a. Procedure identification and revision.
    b. Liquid penetrant type (visible or fluorescent).
    c. Type (number or letter designation of each penetrant remover, emulsifier, and developer used).
    d. Examination personnel identity and qualification level.
    e. Map or record of rejectable indications.
    f. Material and thickness.
    g. Lighting equipment.
    h. Date and time examinations were performed.
    i. Dwell times used.

END OF DOCUMENT

From: James Ferguson
Sent: Tuesday, June 23, 2009 5:54 PM
To: Amy Webster; Evan Vokes; Tom Slimmon; Kevin Widenmaier; Niteesha Edwards; John Riley; Christian Cyrenne; Trent Bertholet
Subject: DL Flange Meeting Agenda

Ahead of the meeting tomorrow, which some of you are not able to attend I wanted to update everyone as to where we are with these flanges. This will also serve as an Agenda for the meeting. Please review and feel free to discuss at the meeting.

1. DEFECTS IN FLANGE

There has been some discussion over the cracks in the flange that we repaired. There has been some discussion that they are forging defects and some discussion that they are related to heat treating/material issues. While we may not determine the actual root cause (because we were not able to send the flange for destructive testing) this point is mostly moot. Whether this was caused during forging, or whether it was caused by a material or heat treating issue, we have to seriously question the base materials and forgings that DL is using to manufacture their flanges. This applies to every DL Flange, even those that are final machined in Houston as per the Technical Agreement with TransCanada. For DL, all of their forgings come from the plant in Romania so we have to question all of the flanges supplied by DL.

To date we have suspended any future orders with DL Flange until we are confident that the issues have been resolved and we will not see these defects again. This is easier said than done, but restoring confidence in DL as a minimum will require:

i. A Report from DL as to the Root Cause of This Issue
ii. An Acceptable Plan to go forward (by DL) to ensure that these to not happen in the future
iii. Analysis from Final Investigation from Meikle River, Woodenhouse, and Keystone Flanges (See Agenda Item 5)

2. CODE COMPLIANCE FOR FLANGES / HISTORY

An analysis has been done as to the Code Compliance/Drawings of these flanges. It was actually much more complicated than it should have been. I will go into more detail in the meeting, but the history in short is:

i. These Flanges were Ordered to Our Specification (TES-FLGE-LD Rev. 3) which is based on CSA Z245.12-05;
ii. Drawings for the Flanges Were Questioned and it was Determined that the Flanges Were Manufactured, Machined, and Certified in Romania which is not as per the Technical Agreement under which DL is approved to supply Flanges to TransCanada;
iii. The Flanges Arrived On Site;
iv. The Flanges (from Drawings and Markings) Were to B16.47 Series A, and not to CSA Z245.12-05;
v. The Flanges Were Accepted on a Project Specific Basis;

Here is where the Code Compliance comes into play which will provide some good lessons learned for future projects:

i. CSA Z662 allows flanges to be B16.47 Series A, but they are limited to A350 LF2 (Class 1 or 2) or A105 material
ii. Under CSA Z662 you have to base the flange design on the minimum yield strength for these material standards, **which prevents us from taking advantage of higher grade (i.e. Q+T) material!**
iii. The Drawings and MTR's show the material to be CSA Z245.12 Grade 483. **For this to be allowed the flange must be in total accordance with CSA Z245.12!**

016254

iv. The dimensions of the flanges (from the drawings) meet both CSA Z245.12 and B16.47 Series A **with the exception of the hub angle which does NOT meet CSA!**
v. Under CSA Z245.12 you can use non-standard dimensions for flanges **if the flanges meet the requirements of ASME Section VIII Div I Appendix 2 with CSA's acceptance limits**
vi. The flanges meet ASME Section VIII Division I Appendix 2 for Operating Conditions under MAOP
vii. **The Flanges do NOT meet ASME Section VIII Division I Appendix 2 for Gasket Seating (Bolt Up) Conditions**

This would then appear that the flanges meet B16.47-Series A and not CSA Z245.12. Unfortunately we cannot use B16.47 Series A with the higher strength and the flanges would not be acceptable under CSA Z662. However, ASME Section VIII Div I has a Non Mandatory Appendix that says for large diameter flanges under high pressure that the bolt up conditions may not be met under Appendix 2 because the bolting stress calculation under these conditions is not necessarily accurate of the actual bolting stresses. Engineering Analysis shows that under Appendix 2 we could meet bolt up conditions if we moved to lower strength bolts or used smaller bolts, both of which contravene common sense. However, under Z662 we can use operating experience and engineering assessment to accept a non-standard material if it will meet or exceed the material requirements specified in Z662. We know from operating experience that the flanges are not being yielded or seeing excessive bolt up force, and we have a procedure to minimize the stresses during gasket seating (i.e. bolting up opposite sides). **Therefore we can accept this flange under Z662, but I am not sure if it is because we can say it meets CSA Z245.12-05 or because it meets B16.47-Series A and we can accept the non-standard material replacement under Z662 based on operating experience.**

I realize this point could be confusing, and hopefully Tom can correct my mistakes.

3. FOLLOW UP WITH DL FLANGE

Besides the points mentioned in (1) above, which DL has not yet responded too we have several other things we need to follow up on:

i. What do they suggest for inspection (I believe they have responded to this question)?
ii. Do we need DL/Can DL certify the flange to CSA Z245.12-05? If so, do we need to stamp/mark these flanges appropriately
iii. We need to issue NCR's to DL
iv. Clearly these flanges do not meet our specification – another NCR
v. We need to clarify the hub angle dimension requirements for CSA flanges to DL.
vi. More to come…

4. INSPECTION PLAN FOR REMAINING FLANGES

This becomes our next challenge. I have spoken with some of our integrity and crack assessment experts, and I have invited our NDE expert (Evan Vokes) to this meeting. We have also contacted some contacts at RTD to get their thoughts. Our current plan is that we would recommend inspection of 100% of all the above ground flanges, which would mean 100% of all the flanges because I believe they are all above ground. The inspection would be done with UT and visually. We would then take a percentage of the flanges, remove the coating, and perform MPI to confirm. However, this could change depending upon our discussion. We are mainly choosing UT because we are hoping we do not have to remove the coating. However, if we do we will have to reconsider our inspection. Because this is either a base material problem we have nothing to go on to say the other flanges cannot be affected, and we cannot pick which ones are more likely to have issues than others.

We need to firm up our decision on this ASAP.

5. KEYSTONE FLANGES

On an interesting note, Keystone has ordered a lot of flanges from DL, which were supplied out of Romania. Many of these are lower grade, but I am working with them so that we can coordinate our findings and inspections.

6. LESSONS LEARNED

016255

i. We should NOT be accepting flanges outside of CSA Z245.12 where the design is for high grade, and especially large diameter, flanges;
ii. We need to clarify the hub angle dimensions to each manufacturer
iii. More to come…

I'm sure we will go into more detail on some issues, but the main one to nail down is NUMBER 4!

Thanks,

TransCanada
In business to deliver

vancouver 2010
OFFICIAL SUPPLIER

James Ferguson, P.Eng.
TransCanada
450 - 1st Street S.W.
Calgary, AB T2P 5H1
Phone: 403.920.6009
Cell: 403.462.3313

016256

From: Russell Wong
Sent: Wednesday, September 02, 2009 8:20 AM
To: Christian Cyrenne
Cc: Marc Charland; Evan Vokes
Subject: RE: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000

I requested Bechtel issue a CAR, however, I specified to Bechtel that the basis of the CAR was the fact they did not ship the raw flange to Houston for final machining and inspection. Romania plant is not approved, however final product came from that plant. Only the Houston plant is approved. I will have to call Bechtel to revise the CAR.

From: Christian Cyrenne
Sent: Wednesday, September 02, 2009 7:58 AM
To: Russell Wong
Cc: Marc Charland; Evan Vokes
Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Hi Russell,

I'm getting some confused and concerned calls regarding the NCR Bechtel issued to CE and DL Flange. Looks like Bechtel is using info not associated with CE Franklin's order - not same material or specification.

Do you know who would of provided this info to Bechtel - the report has misleading info.

Christian Cyrenne
TransCanada - Supply Chain Management - Contract Analyst
403.920.2531 (Office) - 403.920.5444 (Fax) - christian_cyrenne@transcanada.com

---

From: Steve Bobzien [mailto:Steve.Bobzien@dlflange.com]
Sent: Wednesday, September 02, 2009 7:45 AM
To: Christian Cyrenne
Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Steve Bobzien
DL FLANGE

From: Jim Urness [mailto:jurness@CEFranklin.com]
Sent: Tuesday, September 01, 2009 11:54 AM
To: Steve Bobzien
Cc: Daryl Campbell
Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

016257

Was there any defects on flanges tested or are they referring to non compliance as in DL Flange was not an approved manufacturer out of Romania?

Jim

From: Glasgow, Daniel [mailto:dsglasgo@bechtel.com]
Sent: Tuesday, September 01, 2009 11:32 AM
To: Daryl Campbell; Jim Urness
Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Have you responded to this CAR yet?

Danny Glasgow
Bechtel OG & C
Expediting Specialist
voice **(713) 235-3231**
fax **(713) 235-1502**
e-mail dsglasgo@bechtel.com

From: Jones, Gary R (Houston)
Sent: Wednesday, August 19, 2009 12:35 PM
To: Garza, Fernando; Glasgow, Daniel
Cc: Nwokolo, Emmanuel; Patel, Mitul; Baksh, Tash R.
Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Fernando/Danny,

Did either of you handle this with CE Franklin?

Regards,

Gary R. Jones
Procurement
Bechtel Oil, Gas & Chemicals, Inc.
Keystone Pipeline Project
Ph.: 713-235-2147
e-mail: gjones@bechtel.com

The contents of this message, together with any attachments, are intended only for the use of the individual or entity to which they are addressed and contain information that are confidential, proprietary and not intended to be read or reviewed by someone other than the intended recipient. If you are not the intended recipient, we respectfully request that you do not disseminate, distribute or copy this message, or any attachment, and notify the original sender immediately of your receipt of this message by telephone at (713)235-2147 (collect calls accepted) or by return E-mail. Please delete this message, along with any attachments, from your computer. Thank you.

From: Tinn, Beverly
Sent: Wednesday, July 22, 2009 11:52 AM
To: Long, Janet
Cc: Jones, Gary R (Houston); Etzkin, Michael

Subject: FW: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Please have your expediter handle and keep me in the loop. Thanks,

---

From: Baksh, Tash R.
Sent: Wednesday, July 22, 2009 11:20 AM
To: Jones, Gary R (Houston); Tinn, Beverly
Cc: Crotts, Harold; Henschel, Jim; Kent, John; Chadha, Sham; Tinn, Beverly; Basham, William (Randy); Banfield, Craig; Olson, Donald; Laub, Dorothy; Thompson, Michael; Cetiner, Matt (KEY); Brito, Xavier; Dumont, Hugh D; Russell Wong; Ganase, Ryan
Subject: CE Franklin Surveillance Report (DL Flange) 25350-200-GQS-GAQR-V0023-000
Importance: High

Hi Beverly/Gary,

The attached Surveillance report summarizes the results of a QA Surveillance performed on 16th July 2009 based on a Limited scope review of the CE Franklin Purchase Orders to manufacturer DL Flange and a review of inspection documentation.

This surveillance identified one area of noncompliance that questions the integrity of the flanges manufactured by DL Flange for the purchase orders noted above, resulting in the issuance of one (1) Corrective Action Report (CAR). CE Franklin is required to submit a written response to the Corrective Action Report. (CAR-086) 25350-200-GCA-GAQR-00086-000 **by 4th August, 2009**

It is concluded that the DL Flange manufactured material on the Purchase Orders awarded to CE Franklin are suspect (questionable) and lack objective (documentation) to indicate they meet Project quality requirements for the lower tier quality flow downs and inspection documentation. Due to the nature of this defect type found, CE Franklin and the manufacturer DL Flange are requested to provide objective evidence that the flanges supplied to the locations noted above are fit for use.

If you have any questions relative to the surveillance , please contact Harold N. Crotts at 713-235-3892 or Tash R. Baksh at 713-235-5310.

kindest regards,
Tash R. Baksh
Sr. QA Engineer
Keystone Pipeline Project
Tel 713-235-5310
Cell 281-703-6476
trbaksh@bechtel.com

016259

From: Evan Vokes
Sent: Sunday, June 07, 2009 11:14 PM
To: David Taylor; Trent Bertholet; Christian Cyrenne; James Ferguson
Cc: Mark Oliphant; John Riley; Doug Harvey
Subject: RE: Flange on 30" Drop out spool C3

I am in Hardisty but I can phone in to a conference call # after 9:00
The best case scenario is if they are forging laps as the heat treatment is would not be a problem. We may need to confirm the nature of the cracks ASAP as forging laps are easier to live with and repair. The best proof is destructive testing which is technically speaking is the best solution but we may need to go in with shear wave UT and see if we can tell if they can characterise the indications. Cracks and Laps are distinctly different in UT.

If it is a heat treatment problem, we have no way of knowing what the material properties are, whereas if it is forging laps we can repair them. I do not think they are forging laps if the three pictures are individual cracks, then every one is adjacent to a bolt hole so three out of three suggests that we have cracks from heat treatment.

if the indication are heat treatment cracks, the quickest easiest solution to deal with the other thirty flanges, will be to immediately check all in-service flanges we can with shearwave UT to ensure we have no further cracked flanges in service. UT is the only NDE method that will give us an acceptable picture of the subsurface without stripping the coating. This will allow us enough time to make a fitness for service assessment if nothing traumatic is found and if all goes well we only have one suspect flange.

Thank you
Evan

From: David Taylor
Sent: Saturday, June 06, 2009 11:05 AM
To: Trent Bertholet; Christian Cyrenne; James Ferguson; Evan Vokes
Cc: Mark Oliphant; John Riley; Doug Harvey
Subject: RE: Flange on 30" Drop out spool C3

I chatted with both Mark and Vern this morning. They will map out the cracks (location and depths) as best they can and produce a rubbing of the stamping. I have asked them to send this to James. This is a critical spool piece that we need to consider all of our options (repair or cut-out) before the final decision is made. In addition we will need to consider what our plan should be for the remaining 30 + flanges which are at both Meikie River and Woodenhouse C/S (100% inspection or audit??).

Christian,
I know you have been in touch with DL Flange already, but we need to push them as well on a resolution. For example if we can repair the cracks what procedure would they accept, what type of heat treatment, inspection, etc.. We also will need the repair history of the forgings (all 30 + of them). We need this by Monday afternoon.

John,
James, Trent and Evan will work together to come up with a resolution for the project. Please keep in mind though the answer may be a replacement flange is necessary. We will meet on Monday morning to start review and laid down and plan of attack.

I will be in on Monday morning, but I have to travel to Kansas City in the afternoon.

If there are any questions please call.

Thank you

016260

Dave

From: Trent Bertholet
Sent: Friday, June 05, 2009 7:16 PM
To: David Taylor
Cc: Mark Oliphant; John Riley
Subject: FW: Flange on 30" Drop out spool C3

Dave,
The issue of this 30" flange is a little more complicated than just replacing it with a new one. The flange is part of the suction side spool that it bolted to the new unit. The new unit was aligned off of this spool; sending the spool to be re-built has the potential to throw the entire unit out of alignment if not built exactly as the original when it is bolted back in place. If this were to happen re-aligning the unit could delay the the Meikle River project 2-3 weeks. I believe the project team is very aware that there may be an integrity issue with the flange but all efforts must be exhausted in proving the flange is not usable before proceeding to scrap it.

Please let me know what may be a good time to give you a call in the morning to discuss further and what options we may have to assist the project group with this.

From: Mark Oliphant
Sent: Fri 05/06/2009 5:28 PM
To: John Riley; Amy Webster
Cc: Trent Bertholet
Subject: RE: Flange on 30" Drop out spool C3

Trent/Amy

Can you give me a call tomorrow please?

Mark Oliphant
Construction Manager
Construction Management Services
TransCanada Pipeline Meikle River Compressor Station
cell (403) 461-2960
Construction Office(780)836-4362

-----Original Message-----
From: John Riley
Sent: Friday, June 05, 2009 5:23 PM
To: Amy Webster; Mark Oliphant
Cc: Trent Bertholet
Subject: Re: Flange on 30" Drop out spool C3

I would like for you two to arrange a conference call or similar with Trent to discuss this issue with the 30" flange(s).

I am not convinced yet that this flange is still not reusable.

Please talk to Trent.

Cheers,

JR

----- Original Message -----
From: Amy Webster
To: John Riley
Sent: Fri Jun 05 17:09:00 2009
Subject: Re: Flange on 30" Drop out spool C3

I am going to talk to Tom Slimmon...he may have some ideas...good weekend JR...

----- Original Message -----
From: John Riley
To: Amy Webster; Vern Hosak; Mark Oliphant
Cc: Christian Cyrenne
Sent: Fri Jun 05 17:04:49 2009
Subject: Re: Flange on 30" Drop out spool C3

Let's not get to excited yet...we still may be able to use this flange.jr

----- Original Message -----
From: Amy Webster
To: John Riley; Vern Hosak; Mark Oliphant
Cc: Christian Cyrenne
Sent: Fri Jun 05 16:55:34 2009
Subject: RE: Flange on 30" Drop out spool C3

I just had a meeting with Procurement.

These flanges were shipped from an approved forging facility in Romania...DL Flange purchased them.

We received 32 flanges (all of which will need to be re inspected and perhaps quarantined) in total.
The major issue is that these flanges passed a third party inspection.
Moody completed the inspection, and OBVIOUSLY missed this crack. We are now stuck with flawed flanges. Procurement is raising the NCR and will follow up as required with DL Flange.

Christian Cyrenne is working getting us a new flange...with some cash upfront we can get the forgings machined in less than two weeks. We will work our hardest to get the flange ASAP.

We will need to send the flange in question to the lab to determine root cause failure.

Call me for more information...
Amy

-----Original Message-----
From: John Riley
Sent: Friday, June 05, 2009 4:12 PM
To: Amy Webster; Vern Hosak; Mark Oliphant
Subject: Re: Flange on 30" Drop out spool C3

Perfect....Not!

How will this now affect the project schedule and where does the re-work take place?

JR

----- Original Message -----
From: Amy Webster
To: John Riley; Vern Hosak
Sent: Fri Jun 05 16:05:52 2009
Subject: FW: Flange on 30" Drop out spool C3

Note remarks from Material Group,

I have also talked with the material group. The problem is we do not know how the cracks were formed, so we do not know the characteristics of the remaining flange material. I am proposing we find a new flange. Recommendation from material engineering is not to use this flange. The vibration from the compressor along with the torque of the bolts may cause failure.

I am investigating the third party inspection and will work with Jason to get a new flange.

Amy

From: Evan Vokes
Sent: Friday, June 05, 2009 3:56 PM
To: Amy Webster
Cc: Trent Bertholet; Michael Martens; Kevin Widenmaier; James Ferguson; Niteesha Edwards
Subject: RE: Flange on 30" Drop out spool C3

Hello Amy

I had talked to Trent about this earlier and recommended that these are most likely quench cracks but we can not be sure. I doubt if they are forging laps. What is really important is that Michael cannot model the effect of the cracks without a large capital/ time expenditure so we do not know what will happen when you tighten the flange. If there is a heat treat problem, the flange might create a problem but we do not know for sure. I would not trust this unless I could confirm that the applied stress would not create a problem.

We know the cracks have propagated through the outer wall and it would be pointless to check the inside of the holes with NDT as no new cracks would open till the pressure comes on.

It is possible that there is someone at TransCanada that has had a positive experience with using the flanges with the cracking through the bolt circle but in the absence of empirical evidence to support putting this into service, I would default to replacement.

Since #900 NPS 30 raised flanges are not unusual or uncommon it would be good to change it if you could. Have it pupped in the fabshop before you ship to site to speed up the welding process.

Have a good day

Evan

From: Michael Martens
Sent: Friday, June 05, 2009 3:32 PM
To: Evan Vokes
Subject: FW: Flange on 30" Drop out spool C3

016263

Sincerely

Michael Martens M.Sc. P.Eng

Mechanical Engineer, Engineering Governance

TransCanada PipeLines Limited

450-1st Street S.W.

Calgary, Alberta, T2P 5H1, CANADA

Tel: 403-920-7238 Cell: 403-835-1541

e-mail: michael_martens@transcanada.com <blocked::BLOCKED::mailto:michael_martens@transcanada.com>

From: Amy Webster
Sent: Friday, June 05, 2009 3:19 PM
To: Michael Martens
Cc: Vern Hosak
Subject: FW: Flange on 30" Drop out spool C3

FYI…

Vern has requested NDT…

From: Vern Hosak
Sent: Friday, June 05, 2009 2:01 PM
To: Trent Bertholet
Cc: Amy Webster; Mark Oliphant; John Riley
Subject: Flange on 30" Drop out spool C3

Hi Trent :

Could you please have a look at these pictures? There seem to be three separate and distinct marks in one of the 30" flanges on a dropout spool for the C3 compressor suction side spool # S-10 on the north end of line C3-30-E1- HG -004-N ,What do you think they could be.

Best regards

Vern Hosack

Mechanical & Welding Inspection

Morning Star Welding Ltd.

Cell 780-940-6038

Fax 780-963-5345

Vern_hosak@transcanada.com

From: John Riley
Sent: Wednesday, July 15, 2009 3:22 PM
To: Evan Vokes
Cc: Christian Cyrenne; Richard Coglon; Trent Bertholet; James Ferguson
Subject: RE: TransCanada NCR Identifed for DL Flange: TCPL-2009-060

Go get'm cowboy!

JR

From: Evan Vokes
Sent: Wednesday, July 15, 2009 3:20 PM
To: John Riley
Cc: Christian Cyrenne; Richard Coglon; Trent Bertholet; James Ferguson
Subject: RE: TransCanada NCR Identifed for DL Flange: TCPL-2009-060

Thank you John
I am on a fact finding mission. The correct thing I was looking for with this incident was the Moody involvement.
Christian just sent me the NCR for Moody accepting flanges with obvious rejectable indications.
I am writing a decision summary for third party inspection so I need to have hard facts to work with. This NCR works, but I thought it would be in IIT. Part of the fault for this incident lies with 3PI and part internally with TransCanada for not clearly specifying what the requirements are.
Have a good day
Evan

From: John Riley
Sent: Wednesday, July 15, 2009 2:23 PM
To: Evan Vokes
Cc: Christian Cyrenne; Richard Coglon; Trent Bertholet; James Ferguson
Subject: TransCanada NCR Identifed for DL Flange: TCPL-2009-060
Importance: High

Hi Evan,

This is what was sent out to DL Flange by Jason Machovec. It basically has all the information, except for the Change Order to cover all of the repair costs by our contractor which is currently being managed by the construction team and Christian.

Hope this helps....gotta go!

JR

016265

From: Evan Vokes
Sent: Wednesday, February 28, 2007 10:15 PM
To: David Taylor; Bob Hudson; Fred Kubke
Cc: Curtis Parker; Michael Moschopedis; Da-Ming Duan
Subject: RE: Production welding on Ft. McKay NPS 30 - Thickwood section

As requested, a survey of all welds was performed on Saturday February 24, 2007 with assistance of the Midwest pipelines technology assistant; Sean

The issue arose out of a visual inspection of a weld that was just after the second welding shack. The weld bead looked wrong and was only fused to one side of the groove. Barry went to look at the welding machine records and assuming that the welder was running HP was very concerned that the welder had run F1 instead of the HP. I had estimated that this would have been MLT 835 as UT had not assigned a MLT number yet but the location was the last weld of the particular section.

This is when we felt we had a problem as we were near 100% repairs and the morning of February 24, 2007, Barry was sure that at least one weld was affected based on his analysis of the data. A copy of a page from my personal logbook was emailed to Dave by Dianne on my behalf.

The morning of, February 24, 2007, I drove down the pipe and recorded all of the weld numbers, the Midwest Weld number, the MLT number and the approximate area of the defects and completed my list of welders assigned to each joint. A spread sheet of all of the weld sequences was built for MLT numbers 800 through 845. The suspected weld was actually numbered as MLT 836.

The analysis was complicated by the fact that the welders must advance the incremental count for the MW data logs and write the corresponding number on the pipe. Often this was not done on these two sections of pipe fabricated on February , 2007. The time logs had to be deciphered based on the welder pass record written on the pipe and the timestamp on the individual weld files.

It was determined that the weld pass sequence was in fact maintained for the entire day of February 23, 2007 for all welds including the suspected weld MLT #836. The net result of this analysis was trending that proved that the high rejection rate of the pipe was not due to a pass sequence errors. The incident investigation has not cost any production delays to Midwest. As discussed in David Taylor's notice of rejection email entitled "Production welding on Ft. McKay NPS 30 - Thickwood section" dated Friday Feb 23. 2007; we will accept the Fridays production based on the original AUT scans, which evaluated to the original ECA criteria for the project.

If you require any further information, please contact me
Thank you
Evan Vokes

From: David Taylor
Sent: Friday, February 23, 2007 5:13 PM
To: Bob Hudson; Fred Kubke
Cc: Evan Vokes; Curtis Parker; Michael Moschopedis; Da-Ming Duan
Subject: Production welding on Ft. McKay NPS 30 - Thickwood section

Bob,

016266

It has been brought to my attention through Evan and Ron that the welders have used the incorrect pass sequence on at least one weld. I believe it was weld # 835 – this should be confirmed as this weld was not numbered when the non-compliance was noted.

This is a major issue that Midwest needs to address immediately. The Engineering Critical Acceptance criteria, is based on the welding procedure qualified being maintained within the Annex K, essential variables, the use of an incorrect pass sequence places the weld outside of the procedure. The use of the wrong pass sequence voids the acceptance criteria.

Therefore TransCanada will not accept any of the production welding for Friday, Feb. 23, 2007.

Midwest shall provide to TransCanada an assessment of the welding data to determine the extent of the problem and identify the welds involved. TransCanada will review the Midwest submission and determine if the welds can be assessed to the project ECA, CSA workmanship (Clause 7) or have the welds cut-out.

If there are any questions please call.

Thank you!

016267

From: Evan Vokes
Sent: Monday, March 05, 2007 11:17 AM
To: Curtis Parker
Subject: other results from McKay

Hello Curtis
I forgot the most important thing I did up there.
While I tried to solve the contractor's problem, I collected some very damning information on welder trending by comparing Welder # to the UT scans.
This will be invaluable at the post mortem.

I also learned that there system of logging welds from each welder is not very good and it will be very difficult for them to prove to us which welder welded each weld pass without them logging the numbers on the outside of the pipe. This is a bit harder once the pipe is buried

Hope you find this tidbit useful
Evan

016268

Title: **TES-WELD-BC Specification for Welding on In-Service Pipelines**	Document Type: Specification
Effective Date: 2005/12/30	Revision: 0
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PURPOSE

This specification describes the technical requirements for qualification of welding procedures and welders, production welding, visual and non-destructive inspection for in-service welding on sweet natural gas/liquid pipeline systems. This specification shall be read in conjunction with and covers additional requirements to CSA Standard Z662 Oil and Gas Pipeline Systems.

SCOPE

This specification applies to TransCanada (the Company).

This specification applies to carbon steel, branch pipe to carrier pipe or carbon steel component to carrier pipe welds (branch connections, sleeves and stopple fittings) completed on flowing or non-flowing in-service pipelines.

This specification does not apply to welds covered by TransCanada specifications TES-WELD-PL or TES-WELD-AS.

This specification does not include welding procedure datasheets.

BRIEF DESCRIPTION OF CHANGE (IF A REVISION)

This is a new specification combined from procedures issued through out the company for different sizes of branch connections. It supersedes the following documents: "TCPL Manual for the Installation of Hot Tap Branches and Hot Tap Valves", "TransCanada/NGTL Installation welding procedure datasheets".

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1. REFERENCE DOCUMENTS

CSA Z662	Oil and Gas Pipeline Systems, Latest Edition
ASTM E23	Standard Test Methods for Notch Bar Impact Testing of Metallic Materials
ASME BPV Sect. VIII	ASME Boiler and Pressure Vessel code, Section VIII: *Pressure Vessels – Division 1*
ASME BPV Sect. V	ASME Boiler and Pressure Vessel code, Section V: *Nondestructive Examination*

2. DEFINITIONS

Components: Components include integrally reinforced fittings (threadolets, sockolets, weldolets), reinforcing or repair sleeves, split tees (full size or reducing), and stopple fittings.

Buttering: The buttering technique (shown typically in Figures 1 and 2 for branch connections and sleeves / split tees / stopples respectively) consists of the deposition of one layer of weld metal on the surface of the carrier pipe, followed by the deposition of a tempering layer on top of the first layer and coming as close as possible to the edge of the first layer. The buttering technique is used in order to reinforce the pipe wall, minimize the depth of penetration of the HAZ hardness, reduce the HAZ hardness and the risk of underbead cracking.

Temper bead: The vertical up temper bead welding technique is the placing of the last cap pass so that it will temper the previous weld metal pass and the HAZ of the carrier pipe. The vertical up temper bead welding technique is used on branch connections to reduce the carrier pipe HAZ hardness at the toe of the branch fillet weld.

3. GENERAL

(a) Welding shall be performed in accordance with:

(i) the applicable requirements of CSA Z662 and any amendment, supplement, or errata issued by CSA;

(ii) the additional requirements of this specification; and

(iii) the Company requirements for Environment, Occupational Health and Safety.

(b) Welding shall be performed by welders employed by the Company, or by contract welders supervised by a Company representative responsible for the adherence to this specification.

(c) Welding Procedure Datasheets selected from the Company procedure TEP-WELD-BC shall be on site during installation.

(d) Welding procedures supplied by the contractor shall be reviewed and accepted by the Company prior to starting the work and shall be on site during installation.

4. DESIGN TEMPERATURE

Welding procedures shall specify, and be qualified at or below, the minimum design temperature. Unless specified otherwise, the minimum design temperatures are - 5°C for welds on buried pipelines (60 cm or more of cover), and - 45°C for any other welds.

5. HARDNESS CONTROL

(a) Welding procedures (including those for repair, recap, etc.) shall specify, and be qualified with, techniques to control hardness of the weldment that are appropriate for the expected materials and line flowing conditions (less than or equal to 350 Hv).

(b) Except as permitted in (c) below the buttering technique (Figures 1, 2 and 3) shall be used for all permanent welds installed on the carrier pipe when the pipeline is under pressure and is flowing gas/liquid.

(c) The temper bead technique (Figure 4) may be used with prior approval, on carrier pipes with a Carbon Equivalent (CE_{CSA}) less than 0.35 (See also 7.1 (c) and (d)).

(d) The temper bead technique (Figure 4) may be used on welds that are to be removed during the tapping operation (pilot guide, stiffening ring).

(e) The weld faces of components with a Carbon Equivalent (CE_{CSA}) exceeding 0.35 shall be buttered prior to installation (Figure 3a) using a minimum preheat temperature of 150°C and the capping consumable listed on the intended production welding procedure.

6. WELDING PROCESS

(a) On flowing gas/liquid lines, buttering pads shall be made using low hydrogen welding consumables.

(b) On flowing gas/liquid lines, the combination groove/fillet weld shall be made using low hydrogen welding consumables.

(c) For branch connections installed with non-flowing gas and reduced pressure (less than 60 % MAOP), or no pressure, the root pass may be deposited using cellulosic consumables while the remainder of the weld shall be made using low hydrogen consumables.

(d) Welds completed on full encirclement reinforcement saddles, sleeves, split tees and stopple fittings shall be made using low hydrogen consumables.

7. JOINT DESIGN

7.1 Branch Connection Welds

(a) Branch connection welds between the branch pipe/fitting and the carrier pipe shall be designed as a combination full penetration groove weld on the branch with a reinforcing fillet weld.

(b) Except as permitted in (c) and (d), branch connection welds shall be made using the buttering technique.

(c) The temper bead technique (see also 5 (c)) may be used for carrier pipes with a wall thickness exceeding 9 mm.

(d) The temper bead technique (see also 5 (c)) may be used for carrier pipes with a wall thickness smaller than 9 mm and larger than 6 mm provided the wall thickness ratio between the branch pipe and the carrier pipe does not exceed 1.5.

(e) The minimum included angle for the weld joint between the carrier pipe and the bevel on the branch pipe shall be 45° as specified in CSA Z662, Figure 7.5.

7.2 Fillet Welds

Fillet welds are used for the reinforcement saddle, sleeves, split tees and stopple fitting installations and shall be as specified on the drawing accompanying the specific welding procedure datasheet. Except as specified on the installation drawing, the ends of full-encirclement reinforcement saddles shall not be welded to the carrier pipe.

7.3 Tack Welds

Tack welds shall be completed using the root consumable listed on the welding procedure datasheets and shall be full penetration tacks.

8. MATERIALS

8.1 Pipe and Components

(a) Materials shall be welded according to the diameter, wall thickness and carbon equivalent (CE) requirements of CSA Z662.

(b) Branch stubs shall be fabricated from pre-tested pipe.

(c) The end preparation on branch piping may be machined or flame cut for sizes ranging from 60.3 mm to 508 mm OD (NPS 2 to NPS 20).

(d) The end preparation of branch piping 610 mm OD (NPS 24) and larger shall be machine cut.

(e) The end preparation for reinforcement saddles, sleeves and stopple fittings shall be machined. When long seam full penetration groove welds are required to join the two halves of sleeves or stopple fittings, and unless specified otherwise on the

drawings, the bevels shall be machined and a recess shall be machined to accommodate a backing strip used to prevent penetration of the weld into the carrier pipe.

8.2 Filler Material

(a) Welding consumables shall have mechanical properties that are appropriate for the materials to be welded. Such mechanical properties shall be proven by a butt weld using such materials and consumables that meets the procedure qualification requirements for tensile strength for butt welds in CSA Z662 or ASME BPV, Section IX, and the additional requirements given in Paragraphs 9.5 and 9.6 of this specification.

(b) Filler metals shall be handled and stored in accordance with CSA Z662 requirements and the manufacturer's recommendations.

9. QUALIFICATION OF WELDING PROCEDURES

9.1 General

(a) Welding procedure specifications shall be qualified in accordance with the requirements of CSA Z662 Clause 7.2.5 and this section, and the applicable requirements of CSA Z662 Clause 10.9.2.

(b) Welding procedure specifications intended for use on flowing gas or liquid filled pipelines shall be qualified using flowing water or water spray technique. Weld cooling rates shall be measured in accordance with the procedure given in Appendix A and recorded on the WPS and PQR.

(c) Qualification of welding procedure specifications shall be conducted in the presence of a representative of the Company.

(d) Welding procedure specifications and procedure qualification records shall be submitted to the company for review and acceptance prior to being used for production welding.

9.2 Additional Limitation of Qualification

(a) The following conditions shall require re-qualification of the welding procedure specifications for in-service applications, or establishment and qualification of a new welding procedure specification:

(i) Weld cooling rates during production that are faster than those recorded during qualification.

(ii) Branch-to-carrier pipe diameter ratio exceeding the largest of 67% and the ratio used for qualification.

(iii) Carrier pipe thickness less than 4.8 mm when the wall thickness used for qualification is 4.8 mm or larger.

(iv) Carrier pipe thickness less than the value used for qualification when the wall thickness used for qualification is smaller than 4.8 mm.

(v) Carrier pipe thickness larger than 1.5 times the value used for qualification, when the wall thickness used for qualification is larger than 6.3 mm.

(b) An increase of more than two nominal diameters from the diameter used in qualification for branch pipe or sleeves larger than 323.9 mm OD (NPS 12) shall necessitate production of a test weld that meets the inspection requirements for production welds given in Paragraph 12.

9.3 Change in Minimum Design Temperature

A change to a minimum design temperature colder than that used for impact toughness testing during procedure qualification shall necessitate re-testing for impact toughness as specified in Paragraph 9.5.

9.4 Test Weld Acceptability for Destructive Testing

(a) Test welds shall meet the visual inspection requirements for production welds given in Paragraph 12.1 before they can be submitted to non-destructive inspection.

(b) Test welds shall meet the non-destructive inspection requirements for production welds given in Paragraph 12.2 before they can be submitted to destructive testing.

9.5 Impact Toughness Testing

Welding consumables used for in-service welding shall have proven notch toughness for the design temperature specified, testing of welding consumables shall be completed on a single vee circumferencial groove weld:

(a) Three (3) Charpy V-notch specimens from each of the weld metal and heat affected zone(s) shall be tested at a temperature not warmer than the minimum design temperature in accordance with the requirements of ASTM E 23.

(b) The average value of the Charpy V-notch energy for the three (3) specimens shall be a minimum of 27 J; the minimum energy value for any one specimen shall be 20 J.

(c) All test values shall be recorded on the Procedure Qualification Record.

9.6 Hardness Testing

(a) For single groove butt-welds, Vickers hardness measurements shall be taken, at a load not exceeding 10 kg, on a polished cross section of the weld along two (2) lines (root level and cap level).

(b) For fillet welds, branch connection welds, and welds including the buttering pad, Vickers hardness measurements shall be taken at a load not exceeding 10 kg on a polished cross section of the weld along the coarse grain heat affected zone next to the fusion line. A minimum of five indentations shall be taken from each weld toe

area (fillet weld, temper bead and edge of buttered layer) in contact with the parent material.

(c) Welding procedure specifications resulting in weld metal or heat-affected zone hardness values in excess of 350 HV shall be evaluated to determine that they are suitable for the avoidance of hydrogen-induced cracking.

(d) The measured hardness values of the base metal, weld metal and heat-affected zones shall be recorded on the Procedure Qualification record.

9.7 Carbon Equivalent Testing

The carbon equivalent (CE) for both the carrier pipe and branch or component shall be established using the formula specified in CSA Z662 from mill test certificates or from chemical analysis. This chemical analysis shall be performed using traditional wet chemistry (i.e., titration methods) or using the inductively coupled plasma (ICP) method. The carbon equivalent shall be recorded on the Procedure Qualification record with copies of the test certificates attached.

10. QUALIFICATION OF WELDERS

10.1 General

(a) Each welder producing welds shall be entitled to work in the jurisdiction where the work is performed.

(b) Welders shall be qualified for the work they will perform – butt-welds, branch connection welds or fillet welds – in accordance with the applicable requirements of CSA Z662, or ASME BPV Section IX where permitted by CSA Z662.

(c) Welders working on flowing gas/liquid pipelines shall also be qualified in accordance with the requirements CSA Z662 Clause 10.9.2.2 using a cooling rate induced by flowing water through a pipe or by water spray on the carrier pipe coupon ID.

(d) Welder qualification test welds for fillet welding, branch connection welding and buttering shall be destructively tested in accordance with the requirements of CSA Z662.

(e) Qualification of welders shall be conducted in the presence of a representative of the Company.

(f) Welders shall be instructed by, or on behalf of the Company on the prevention of hydrogen induced cracking the procedure requirements of in-service welding.

(g) Welders shall review, and demonstrate their understanding of, this specification and the applicable welding procedure prior to starting training and welder testing.

10.2 Test Weld Acceptability for Welder Qualification

(a) Welders shall be considered qualified when they produce a test weld that:

(i) is made in accordance with the requirements of the welding procedure specification;

(ii) meets the in-process and final visual inspection requirements for production welds given in Paragraph 12; and

(iii) meets the destructive testing requirements of CSA Z662 Clause 7.8, and where applicable Clause 10.9.2.2.2.

(b) Test welds failing to meet the visual inspection requirements shall not be submitted for destructive testing.

10.3 Practice Weld for In-service Branch Connections

Except when they have used the same welding procedure within the previous three months, prior to welding on a pipeline that is in-service, welders shall review the welding procedure specification and produce a practice weld in accordance with the welding procedure that is applicable to the installation. When the procedure requires more than one welder, each welder shall produce the applicable segment of the practice weld.

11. PRODUCTION WELDING

11.1 Compliance with Specifications

(a) Records of welding parameters used for production welding, and of the resolution of any non-conformance, shall be maintained to demonstrate compliance with the requirements of this specification and the welding procedure datasheet. Consideration shall be given to implementing an in-process inspection checklist to produce such records. Such records shall be available to the Company.

(b) The Company reserves the right to measure welding parameters on any production weld. When the parameters measured on a weld do not comply with the specified values, the Company reserves the right to reject such weld and any weld made after the last compliant record, unless the party responsible for the Work can demonstrate such welds are in compliance.

(c) Non compliance with the requirements of this specification and of the welding procedure datasheet shall be cause for weld rejection.

11.2 Branch Pipe Location

(a) Except as permitted in (b), welds shall not be located within 50 mm of any carrier pipe seam weld or circumferential girth weld. In addition, full encirclement reinforcement saddles shall not cover a circumferential girth weld and the edge of the saddle shall not be located within of 50 mm of the girth weld.

(b) At locations where the design options require the branch connection weld to cross, or be within 50 mm of, the long seam weld, such seam weld shall be inspected using

ultrasonic inspection to ensure it is free of defects. The inspected area shall extend to a minimum of 100 mm on either side of the proposed weld location.

(c) The long seam weld at the location of the reinforcement saddle shall be examined by ultrasonic inspection techniques, before removal of the weld reinforcement, to ensure the weld is free of porosity and/or lack of fusion discontinuities.

11.3 Sleeve/Stopple Location

(a) The complete length of the long seam weld at the location of the sleeve/stopple fitting installation shall be examined by ultrasonic inspection techniques, before removal of the weld reinforcement, to ensure the weld and HAZ are free of toe cracks or surface breaking solidification cracks. Magnetic inspection may be used at locations where the corroded condition of the pipe prevents the use of ultrasonic inspection.

(b) Fillet welds at the ends of sleeves/stopple shall not be located within 100 mm of a circumferential girth weld.

(c) At locations where the fillet welds cross the long seam weld, the long seam weld shall be inspected using ultrasonic inspection to ensure it is free of defects. The inspected area shall extend to a minimum of 100 mm on either side of the proposed weld location.

11.4 Carbon Equivalent

(a) The carbon equivalent of the carrier pipe calculated using the formula specified in CSA Z662 shall be determined to ensure compliance with the maximum qualified value of the welding procedure specification. Such determination shall be based on mill test certificates, or chemical analysis of the actual pipe.

(b) The coupon removed during the hot tapping operation shall be submitted for chemical analysis.

11.5 Pipe Cleaning

(a) Except in the case of fusion bond epoxy (FBE), the coating on the carrier pipe shall be removed in the proposed area of the full encirclement reinforcement saddle, sleeve or stopple fitting and for a length extending to 300 mm on either side of the proposed area.

(b) The exposed pipe shall be cleaned by wire brushing or sand blasting for a distance extending 150 mm from the edges of the proposed area of the reinforcement saddle, sleeve or stopple fitting installation. Any area of coating disbondment shall be inspected for stress corrosion cracking using wet magnetic particle techniques.

(c) The carrier pipe surface shall be visually inspected for surface discontinuities.

(d) The area where the attachment welds are to be made shall be cleaned to bare metal to remove all coatings, mastic, etc.

(e) The location on the carrier pipe where welding is to take place shall be inspected for stress corrosion cracking using wet magnetic particle techniques.

(f) Where there is an undue delay between this cleaning and the start of welding, the appropriate areas shall be suitably protected and cleaning shall be repeated if necessary before welding.

11.6 Lamination and Wall Thickness Check

The area where the attachment welds are to be made shall be subjected to 100% ultrasonic inspection over a minimum band width of 100 mm, centered over the proposed weld location. This area shall be free of laminations and have a wall thickness of not less than 90% of the value specified on the drawings.

11.7 Assessment of the Cooling Rate

The cooling shall be assessed using the procedure given in Appendix A. The measured times shall exceed the values specified on the welding procedure datasheet to ensure that cooling conditions are less severe than during procedure qualification.

11.8 Adjustment of the Welding Machines

Welding machines shall be adjusted to the parameter ranges specified on the Welding Procedure Data Sheet. Welders shall confirm, and record the welding amperage and voltage settings and values prior to welding on the in-service pipe (refer to paragraph 11.1).

11.9 Alignment and Fit up

(a) The branch piping shall be aligned so that it is perpendicular to the axis of the carrier pipe and level within the tolerance specified on the installation drawing to ensure the proper line up of the valve and Hot Tapping equipment.

(b) The carrier pipe and branch pipe shall be supported as specified on the installation drawing to minimize the stress/strain applied at the branch connection weld.

(c) For 610 mm OD (NPS 24) and larger branches, a pilot drill guide shall be centered and welded to the carrier pipe to ensure proper placement of the cutter.

(d) For 610 mm OD (NPS 24) and larger branches and stopples, a 406.4 mm OD (NPS 16) stiffening ring shall be welded to the carrier pipe to prevent the area to be removed from distorting and binding against the opening upon removal.

(e) Welding of the pilot drill guide and stiffening ring shall be completed using the temper bead technique and the fillet portion of the weld procedure specified for the branch connection weld.

(f) Alignment shims are recommended when lining up branch pipe 508 mm OD (NPS 20) and larger or where the branch to carrier ratio is larger than 67%.

(g) Sleeves and stopple fittings shall be installed to minimize the gap between them and the carrier pipe. Areas of wide gap may require weld build up on the carrier pipe (buttering) to allow for the completion of the fillet weld (See Figure 5). A small internal bevel or a counterbore and taper may be required on the stopple fitting to ensure the ends fit onto the buttering pad and the root of the fillet weld does not come in contact with the carrier pipe.

11.10 Grounding

(a) Grounding devices shall be designed to prevent arcing, and shall not have bronze or copper in contact with the pipe or welds.

(b) Welding cables and connections shall be insulated to prevent arcing to the pipe surface.

11.11 Weather Conditions

It shall be permissible to use portable enclosures to make conditions satisfactory for welding.

11.12 Preheating

(a) For buttered branch connection, sleeve and stopple fitting welds the cooling effect of the flowing gas/liquid makes it impractical to maintain the conventional preheat of 100°C in most cases, however the area of welding shall be preheated locally to completely dry the surface. Refer to the appropriate welding procedure datasheet of more information.

(b) For branch connection and sleeve welds in non-flowing gas conditions, the minimum preheat and interpass temperature shall be 100°C. If the interpass temperature falls below 100°C, welding shall stop and not resume until the minimum preheat temperature is restored. If the interpass temperature is measured above 200°C, welding shall stop and not resume until the temperature falls below 200°C.

11.13 Start of Welding

Welding shall not commence until all parts are secured against relative movement.

11.14 Number of Welders

Except for the buttering layer, a minimum of two welders shall be required for branch connections welds of 323.9 mm OD (NPS 12) and larger. A minimum of two welders shall be required for sleeves, split tees and stopple fittings.

11.15 Removal of Alignment Shims

Where used, alignment shims shall be completely removed by grinding.

11.16 Cleaning between Passes

Weld bead start/stops, high points, slag and starting porosity shall be removed by grinding prior to depositing weld metal over them.

11.17 Interruptions in Welding

Welding of individual welds in branch connection, sleeve, split tee and stopple fitting installation shall continue without interruption except where a delay is specified on the welding datasheet to facilitate inspection of a buttering layer.

12. INSPECTION AND TESTING OF PRODUCTION WELDS

12.1 Visual Inspection

Welds covered by this specification shall be visually inspected and any imperfections shall be assessed using the Standards of Acceptability given in Paragraph 13.

It shall be permissible to repair defects in the cap or root pass detected by visual inspection before nondestructive testing, provided:

(i) the repair work is approved by the company;

(ii) welding is done in accordance with the welding procedure used for production; and

(iii) a visual inspection of the weld is performed after the repair is completed.

12.2 Non Destructive Inspection

12.2.1 Butter Layers

(a) Butter layers shall be inspected for 100% of their surface or circumference, using wet magnetic particle techniques (black on white contrast or fluorescent) and any imperfections shall be assessed using the Standards of Acceptability given in Paragraph 13.

(b) Butter layers for 323.9 mm OD (NPS 12) and larger branch piping shall also be ultrasonically inspected and any imperfection shall be assessed using the Standards of Acceptability given in Paragraph 13.

(c) Butter layers welded for pipes and components 60.3 mm OD (NPS 2) and larger shall be re-inspected after a minimum delay of 12 hours following completion of welding using the requirements of Paragraph (a) above and, where applicable, Paragraph (b) above.

12.2.2 Branch Connection Welds

(a) Branch connection welds shall be inspected for 100% of their circumference using wet magnetic particle techniques (black on white contrast or fluorescent) and any

imperfections shall be assessed using the Standards of Acceptability given in Paragraph 13.

(b) Branch connection welds for 323.9 mm OD (NPS 12) and larger branch piping shall also be ultrasonically inspected and any imperfection shall be assessed using the Standards of Acceptability given in Paragraph 13.

(c) Branch connection welds smaller than 60.3 mm OD (NPS 2) shall be re-inspected after a minimum delay of 6 hours following completion of welding using the requirements of Paragraph (a) above.

12.2.3 Fillet Welds

(a) Fillet welds shall be inspected using wet magnetic particle inspection (black on white contrast or fluorescent) and any imperfection shall be assessed using the Standards of Acceptability given in Paragraph 13.

(b) Fillet welds completed on stopple fittings, split tees or pressure-containing sleeves shall also be ultrasonically inspected and any imperfection shall be assessed using the Standards of Acceptability given in Paragraph 13.

12.2.4 Groove Welds

(a) Groove welds completed on sleeves, split tees and stopple fittings shall be ultrasonically inspected and any imperfection shall be assessed in accordance with the requirements of CSA Z662.

12.3 Non-Destructive Inspection Methods

(a) Ultrasonic inspection shall be performed in accordance with the applicable requirements of ASME BPV Section V, Article 4.

(b) Magnetic particle inspection shall be performed in accordance with the requirements of ASME BPV Section V, Article 7. The direct current method of magnetization shall not be used.

12.4 Qualification on Non Destructive Inspection Personnel

Personnel conducting magnetic particle inspection or ultrasonic inspection shall be qualified in accordance with the applicable requirements of Level II of CAN/CGSB-48.9712. The Company requires that technicians be trained and have experience with the joint configurations on branch connections, sleeves and stopples.

13. STANDARDS OF ACCEPTABILITY

13.1 Standards of Acceptability

(a) The standards of acceptability shall be the applicable Standards of Acceptability given in CSA Z662 Clause 7.11 for visual inspection and magnetic particle

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inspection, and those given in CSA Z662 Clause 7.15.10 for ultrasonic inspection, with the following additional requirements.

(i) Cracking - Cracks are not acceptable. If cracking is present, the pressure within the line shall be reduced by 20% of the pressure at the time of welding and action in accordance with the Company's procedure shall be taken.

(ii) Arc burns are not acceptable.

(iii) Incomplete penetration and lack of fusion are not acceptable.

(iv) Exposed slag inclusions/slag lines are not acceptable.

(v) Pinholes shall be evaluated as spherical porosity.

(vi) Stop/Start locations identified by ultrasonic inspection are acceptable provided they are confined to a single pass in depth and do not exceed 3 mm in length determined using the 6 dB drop, or maximum amplitude sizing method.

(vii) Undercut depths less than 0.5 mm or 6% of the nominal wall thickness whichever is the lesser, shall be acceptable regardless of length, provided an appropriate mechanical method is used for assessing the depth of undercut (e.g., needle pit gauge).

(viii) The cumulative length of undercuts exceeding the depth specified in (vii) above in any 300 mm length of weld shall not exceed 50 mm, except that for welds less than 300 mm long the cumulative length shall not exceed 16% of the weld length.

13.2 Reporting

The results of visual inspection, magnetic particle inspection, and ultrasonic inspection shall be reported in writing and properly referenced in a report dated and signed by the non-destructive inspection personnel.

14. REPAIR OF WELDS CONTAINING DEFECTS

14.1 Cracks

Welds containing cracks, regardless of size and location, shall be cut out and replaced.

14.2 Approval of Repair and Procedure

Repair of defects in production welds shall

(i) require approval of the Company;

(ii) be performed by qualified welders in accordance with the welding procedure used during production; and

(iii) be recorded on the inspection reports.

14.3 Removal of Defects

(a) Welds containing defects exceeding the allowable limits of the Standards of Acceptability given in Paragraph 13 shall be repaired, or cutout and replaced.

(b) Defects in welds shall be removed by grinding.

14.4 Inspection of Repairs

(a) All repairs shall be inspected using the methods and procedures specified in Paragraph 12.

(b) Any imperfections shall be assessed using the Standards of Acceptability given in Paragraph 13.

(c) Where a buttering layer technique is used, repairs shall be completed and accepted before the delayed inspection period begins.

15. SELECTION OF WELDING PROCEDURES

Welding procedures shall be selected using procedure, TEP-WELD-BC 'Selection of Branch Connection Welding Procedures Datasheets'. This selection procedure does not include the actual welding procedures datasheets but will assist in ensuring the correct ones are issued for the project.

APPENDIX A: COOLING RATE ASSESSMENT PROCEDURE

BACKGROUND

Attention is drawn to the rapid cooling effect of the gas/liquid flow. Heat dissipation from the weld area will be dependent on flow conditions at the time of attachment and may vary during the welding cycle. On liquid or flowing gas in-service pipelines the cooling effect has to be assessed using the procedure given below and compared to the qualified value prior to proceeding with the application.

PROCEDURE

Equipment Required:

- Chalk or soapstone
- Oxy-acetylene torch with "rosebud" tip
- Digital contact thermometer
- Stopwatch.

Steps:

1) Measure and record the initial pipe temperature T_i in °C
2) Using chalk or soapstone, scribe a 2-in.-diameter circle on the pipe in the area where welding is to be performed.
3) Use the gas torch in a circular motion to quickly heat the entire circle above the minimum heating temperature T_h calculated as $T_h = T_i + 275°C$. The maximum temperature should not exceed 325°C (617°F).
4) After attaining a temperature above T_h, remove the torch and apply quickly the contact thermometer to the center of the circle.
5) While holding the thermometer in contact with the pipe, using a stopwatch, measure and record:
   a. the time required to cool from 250 to 100°C (482 to 212°F), and
   b. the time-temperature measurements every 10°C during cooling from $T_s = T_i + 80°C$ down to $T_f = T_i + 10°C$.
6) If more than one measurement is required and the pipe is still warm from the previous measurements, wait until normal temperatures are restored before repeating steps 2 to 5.

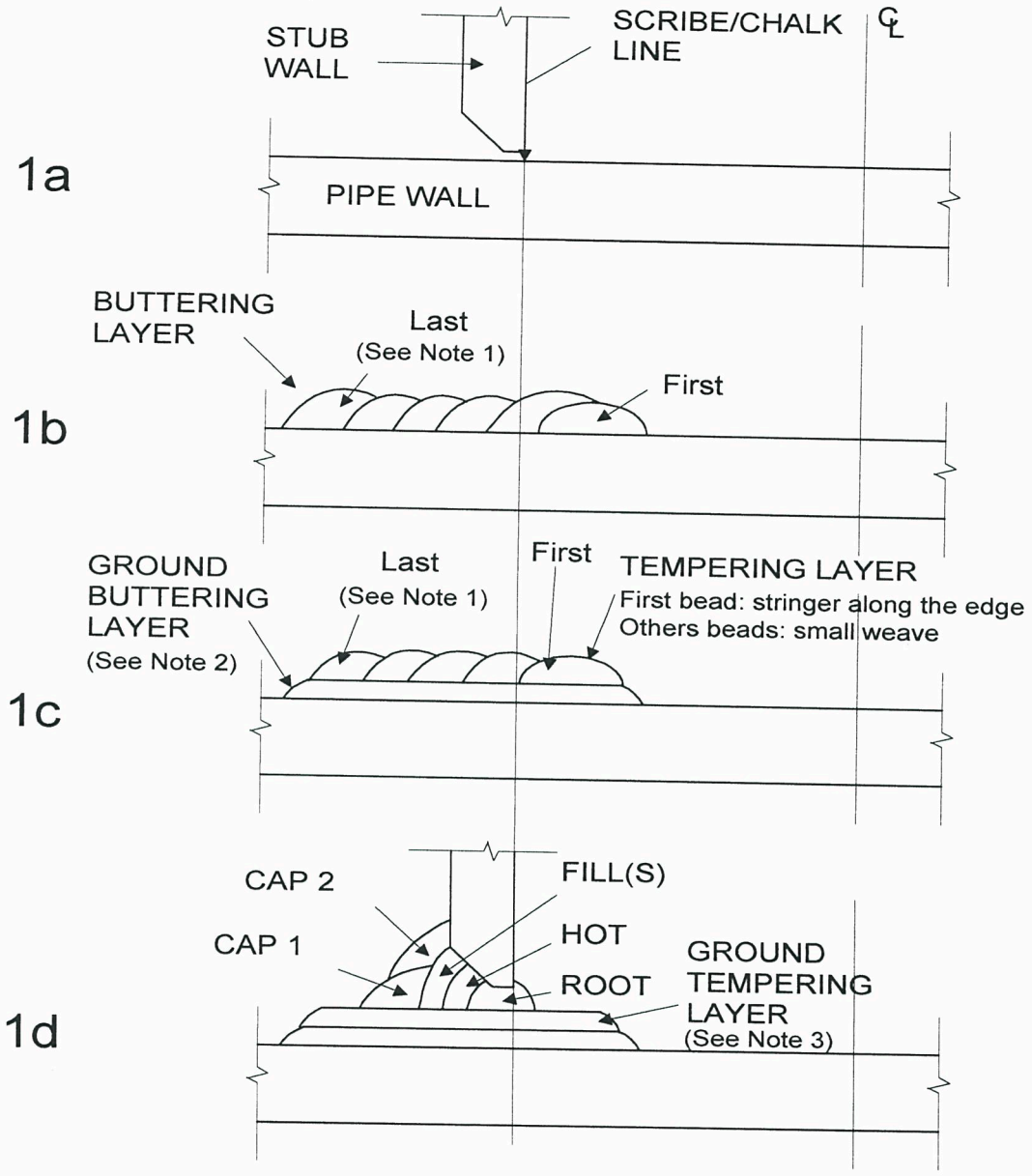

FIGURE 1: WELDING DETAIL AND SEQUENCE – STUB BRANCH CONNECTION WELD

Notes:

1) Number of beads in buttering & tempering layers varies with stub diameter and wall thickness
2) Layer thickness after grinding 1.5 to 2.5 mm. No feathering of edges.
3) Total layer thickness after grinding 2.5 to 3.5 mm. No feathering of edges.
4) Minimum distance from outside edge of butter layer to toe of fillet weld is 6.4 mm.

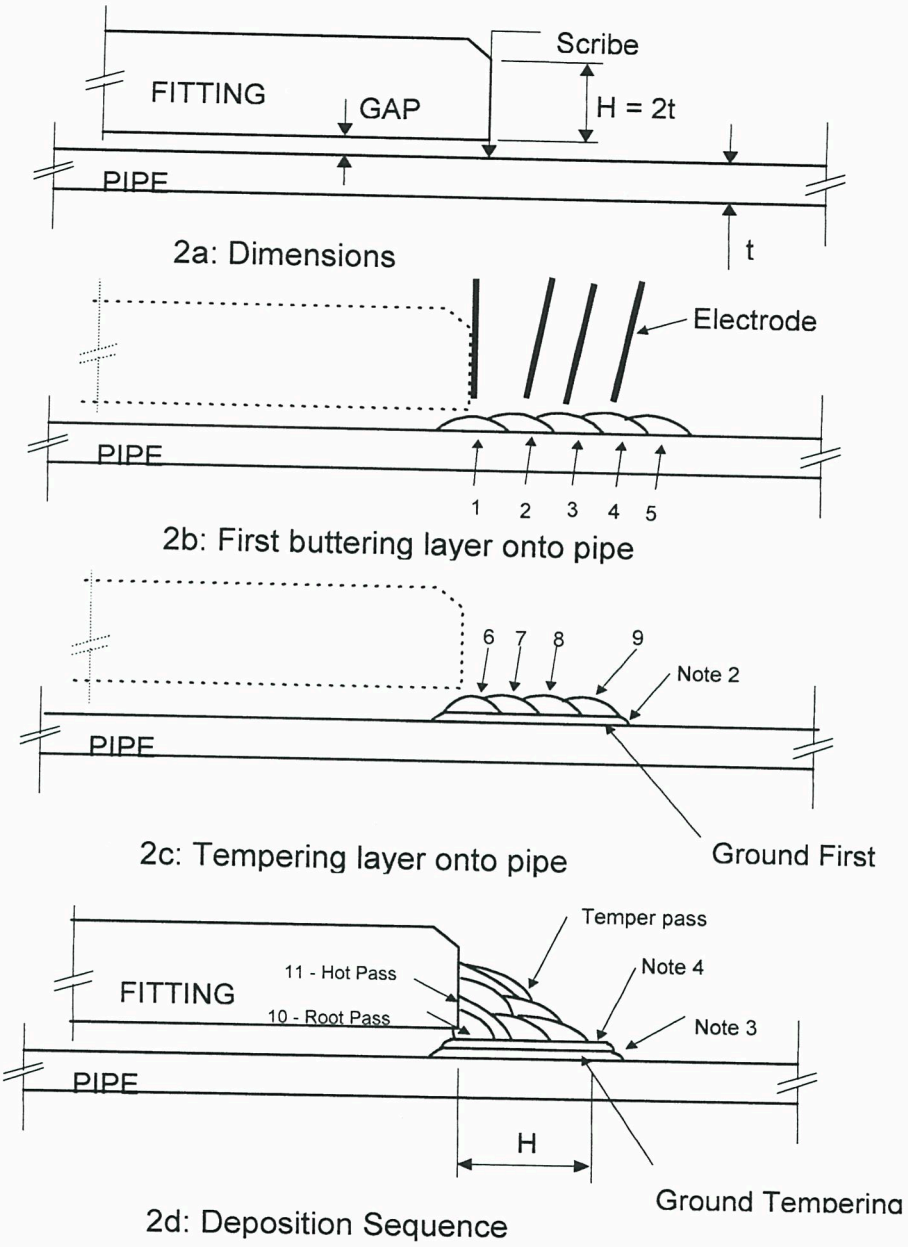

FIGURE 2: WELDING DETAIL AND SEQUENCE – SPLIT TEE / STOPPLE WELD

Notes:

1) Number of buttering runs varies with the size of fillet weld required.
2) Layer thickness after grinding 1.5 to 2.5 mm. No feathering of edges.
3) Total pad thickness after grinding 2.5 to 3.5 mm. No feathering of edges.
4) Minimum distance between toe of fillet weld and edge of buttering pad is 6.4 mm.

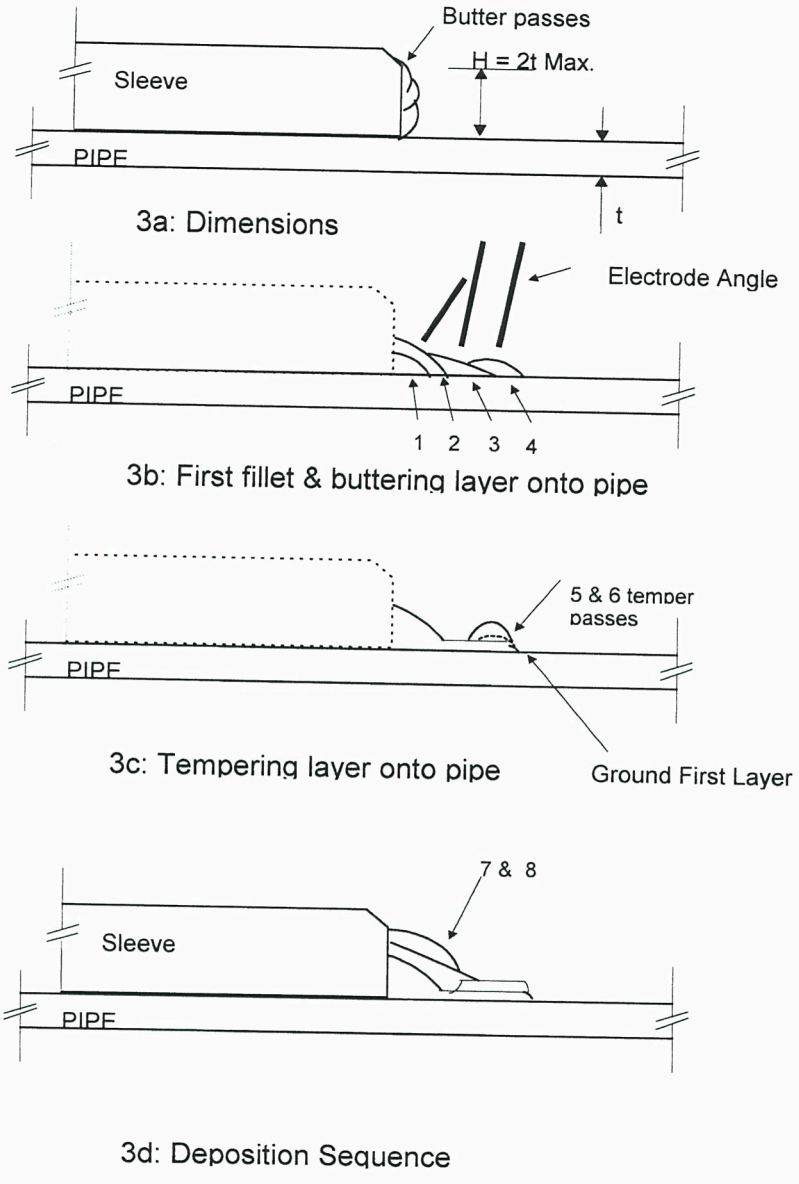

FIGURE 3: WELDING DETAIL & SEQUENCE – PRESSURE CONTAINING SLEEVE

Notes:

1) Number of buttering runs varies with the size of fillet weld required.
2) **Minimum fillet size is the wall thickness of sleeve.**
3) 1st Layer thickness after grinding 1.5 to 2.5 mm. No feathering of edges.
4) Minimum distance between toe of fillet weld and edge of buttering pad is 6.4 mm.
5) Increased gap will increase the minimum fillet weld throat thickness by the same value.
6) See paragraph 7(e) for buttering of fitting.

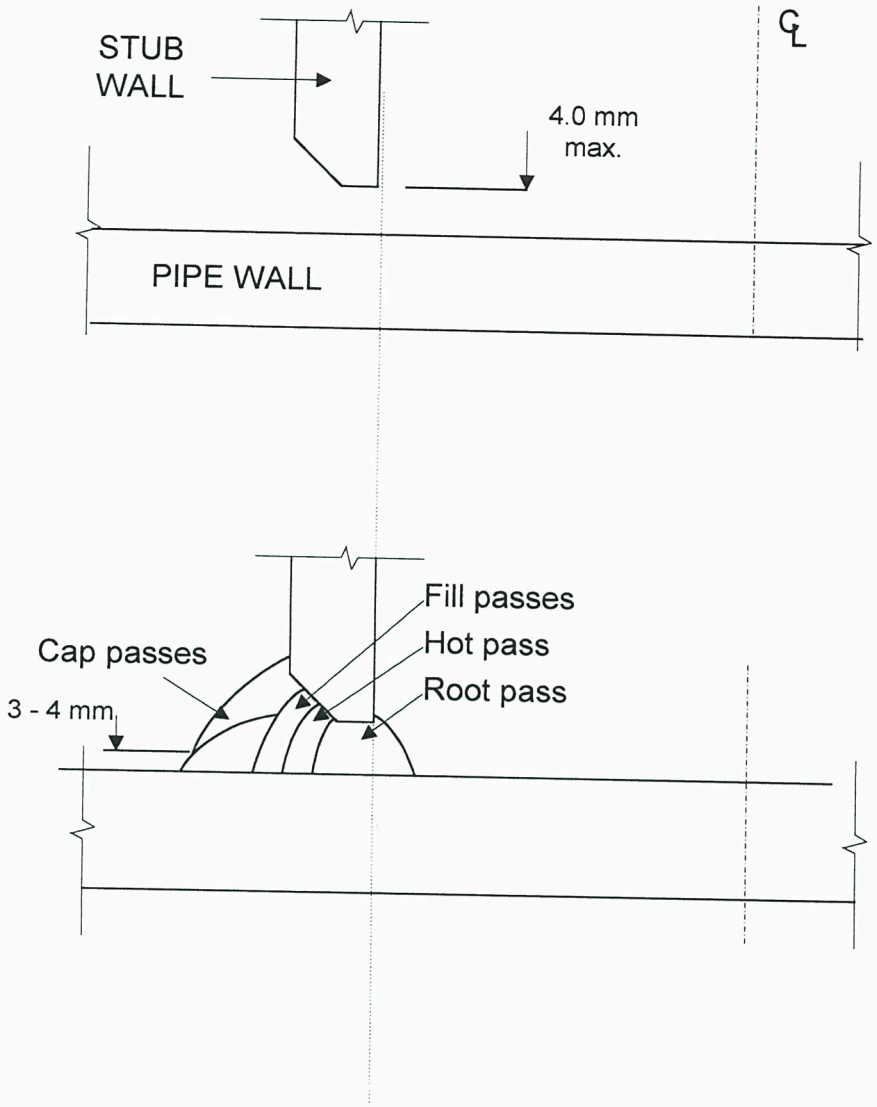

FIGURE 4: WELDING DETAIL AND SEQUENCE – TEMPER BEAD TECHNIQUE

Notes:

1) Number of beads varies with branch (stub) wall thickness.
2) Minimum size of fillet reinforcement is 6.4 mm.
3) Bevel angles will vary around the branch pipe with a maximum of 45°.

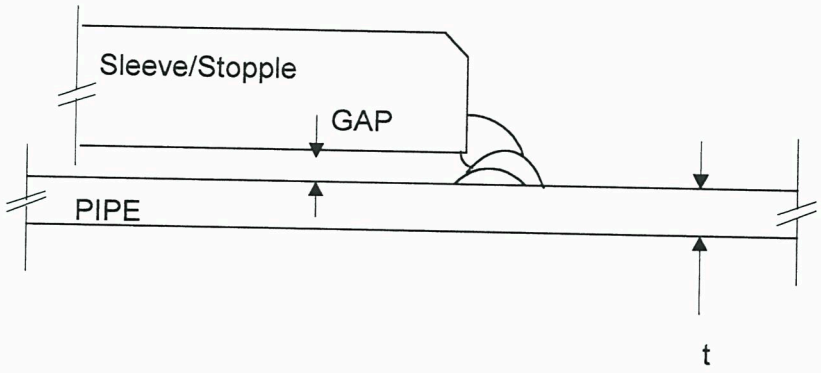

FIGURE 5:
ROOT DEPOSITION TECHNIQUE TO BE USED WHERE THE GAP EXCEEDS 2 MM

From: Joel Forrest
Sent: Friday, May 27, 2011 9:51 AM
To: Patricia Zuczek; Maja Bruggencate; Evan Vokes; Mark Mulder
Cc: Robert Lazor
Subject: RE: Harbour Landing - Fabricator NDE

Hello all
I have had a chance to review this with Kevin Thrasher who dealt with inspection non-compliances on Keystone and the outcome is that we must contract directly for inspection of NDE in the fabrication process. The company representative can be a third party but we must contract directly with them for their services as opposed to relying on the fab shop or the contractor to provide that service. They cannot further sub-delegate that responsibility either.

Joel

From: Patricia Zuczek
Sent: Friday, May 27, 2011 8:04 AM
To: Maja Bruggencate; Evan Vokes
Cc: Joel Forrest; Robert Lazor
Subject: RE: Harbour Landing - Fabricator NDE

Maja, I briefly talked with Joel about the fab shop NDE the other day and this requires further discussion. See the wording below from a recent IR on Hidden Lake and Moody Creek compressor station.

Evan, we will need to get our response filed with the NEB for Harbour Landing within the next week and I'm not sure if that enough time to figure out how to deal with independent fab shop NDE. Are you ok with us filing the NDE plan as is, with the understanding that we need to be prepared that the NEB may question us on this issue?

Hidden Lake North and Moody Creek Compressor Station
NEB IR 2.4:

Please provide confirmation that the company or the company's selected third party (independent agent) will perform non-destructive examination of all compressor station piping, including shop fabricated piping.

From: Maja Bruggencate
Sent: Thursday, May 26, 2011 2:54 PM
To: Evan Vokes; Patricia Zuczek
Subject: FW: Harbour Landing - Fabricator NDE

Below is the answer I've received. Please let me know if you have any questions.

Thanks,
Maja

From: Nathan Burgess
Sent: Thursday, May 26, 2011 9:20 AM
To: Maja Bruggencate
Subject: RE: Harbour Landing - Fabricator NDE

Hi Maja,

016292

The short answer is the fabricator hires a subcontractor to do the NDE; TransCanada does not specify who the fabricator will use. This is standard practice across all our fabricators; Abraxus, Triton, Lockerbie & Hole, etc. TransCanada's third party inspector ensures the NDE is qualified via the fabricators quality manual which is approved through ABSA. The process varies when the prime contractor subs out the fabrication.

Nathan Burgess, EIT
TransCanada Pipelines Ltd.
Phone: 403.920.6647

From: Maja Bruggencate
Sent: Wednesday, May 25, 2011 12:53 PM
To: Nathan Burgess
Subject: Fw: Harbour Landing

From: Patricia Zuczek
Sent: Wednesday, May 25, 2011 12:49 PM
To: Maja Bruggencate
Cc: Robert Lazor; Joel Forrest; Evan Vokes
Subject: RE: Harbour Landing

Maja, can you confirm fab shop NDE for Harbour Landing?

Thanks, Patricia

From: Evan Vokes
Sent: Wednesday, May 25, 2011 11:12 AM
To: Patricia Zuczek
Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Patricia
I have been looking at the OPR rules a lot lately and we do not make the claim that we hire the inspection independently as per s. 54 OPR99
What TC have written does not make a specific claim about how the inspection is hired but there is a bit of a catch and you could get asked to prove compliance with this letter.
I did not make a reference to it as I could not make this independence claim until the fabshop NDE was confirmed.

The background
The good folks in meter stations let the genie out of the bottle on s.54 on inspection and closure welds and it is only a matter of time till the in depth inspection comes just like the board did for Cutbank after the Groundbirch submission. My view is they caught us on Groundbirch WPS and then waited for a new project and then they went in depth with WPS review. I don't know if they will revisit the hydrotest at Kearl as it is in the code not the regulation but compliance with s54 is the new question and if we do not hire NDE in the fabrication shop we are in noncompliance as per the board ruling at Westpath.
Further to the Westpath ruling, TC developed the Audit procedure to achieve the conditions of the OPR 99 guidance notes which was confirmed last week as not accepted by NEB for the prime hiring NDE on two occasions by a single project manager. I know the board has to have rejected the audit procedure in lieu of direct hiring the NDE more than twice as we have more than one project manager.

If the fabshop hires NDE, I still object and suggest we at least pay the NDE to overcome the boards concerns. Only Keystone and our competition KM, Enbridge comply with this regulation.
We seem to be on the path of begging forgiveness more than asking permission because we do not like the answer and the problem keeps getting worse.

016293

The ship ran aground twice last week while we are playing a word games on independence but we haven't got the message that we need to control our process.

You can send the letter to the board in this form and it may be accepted but it might not be as well in which case we will have to brush up our act.

From: Patricia Zuczek
Sent: Wednesday, May 25, 2011 10:26 AM
To: Evan Vokes
Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Evan,

Does the fab shop NDE affect the wording in the document? I've attached the latest draft.

Thanks, Patricia

From: Evan Vokes
Sent: Tuesday, May 24, 2011 12:06 PM
To: Patricia Zuczek
Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Patricia
This is way too early in the process to have inspection designs
We need a contractor first.
Please check with Maja as the document was sent Aril 27th but it contained a question on fab shop NDE that needs to be answered.

Have a good day
Evan

From: Patricia Zuczek
Sent: Tuesday, May 24, 2011 9:41 AM
To: Robert Lazor; Evan Vokes
Subject: RE: Harbour Landing

Robert, I never received the Inspection Designs from Evan. I am planning to file our response with the Board on Thursday at the latest. Please let me know if I can expect to receive these within the next day.

Thanks, Patricia

From: Robert Lazor
Sent: Wednesday, May 04, 2011 6:05 PM
To: Patricia Zuczek; Evan Vokes
Subject: RE: Harbour Landing

Patricia,

I apologize for not getting back to you sooner. I had put this aside when I became stalled putting together some of the supporting pdf files, and only this afternoon have I had the chance to finish this.

The attached files include the Joining Program and Nondestructive Examination Plan.

James had sent you the Materials and QA practices. I am assuming that Vivian has sent you the Pressure Testing Program.

Please let me know if you require additional details.

Evan,

Have you provided the Inspection Designs?

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From: Robert Lazor
Sent: Wednesday, May 04, 2011 10:45 AM
To: Patricia Zuczek
Subject: Re: Harbour Landing

Will get back to you this afternoon

From: Patricia Zuczek
Sent: Wednesday, May 04, 2011 10:42 AM
To: Robert Lazor
Subject: RE: Harbour Landing

Hi Robert,

I have only received information from James for the Harbour Landing project. Will the other information be coming soon?

Thanks, Patricia

From: James Ferguson
Sent: Friday, April 29, 2011 4:01 PM
To: Patricia Zuczek
Cc: Robert Lazor
Subject: RE: Harbour Landing

Hello Patricia,

It might be best if we could get an example from another recent project (i.e. Horn River) just to see how they word the response.

In terms of specifications for the pipe and fittings to be used on the site:

14. A company shall develop specifications for the pipe and components to be used in the pipeline and shall submit them to the Board when required to do so.

TransCanada has several specifications depending upon the commodity. These are the applicable materials specifications for the Harbour Landing Pipe Replacement Project:

- Pipe
  - TES-PIPE-SAW, which has requirements in addition to those of CSA Z245.1;
- Fittings
  - TES-FITG-LD, which has requirements in addition to those of CSA Z245.11;
- Flanges
  - TES-FLGE-LD, which has requirements in addition to those of CSA Z245.15;
- Valves
  - TES-VALV-LD, which has requirements in addition to those of CSA Z245.12;

NOTE: All of these specifications apply for larger diameter componenets (i.e. NPS 16 and above), and all of these should already be on file with the NEB. If it is below this size, then TransCanada has different standards, as outlined in TES-MATL-MD1.

15. A company shall develop a quality assurance program for the purpose of ensuring that the pipe and components to be used in the pipeline meet the specifications referred to in section 14.

TransCanada has a Quality Management System for Pipeline Projects (QMS), TED-QMS-MAN. The relevant Clause of the QMS is Clause 7.4, which is copied below:

7.4 Purchasing, Manufacturing and Transportation

7.4.1 Purchasing Process

Pipeline Projects and Engineering ensures the appropriate specifications (industry standards and Company) are provided to Supply Chain Operations and Commercial Support for purchasing the specified materials and inclusion in the design and construction contracts.

Engineering, Supply Chain Operations and Commercial Support ensure the commodities (materials and services) purchased conform to specified requirements. The type and extent of control applied to the suppliers and the purchased commodities is dependent on the effect of the commodity on the pipeline project's ability to meet Customer Requirements.

7.4.1.1 Supplier Qualification

Supply Chain Operations coordinates the supplier qualification process, with the exception of that used for construction inspection services. Suppliers are evaluated and selected based on their ability to supply materials and services in accordance with Company technical requirements and their capability regarding safety, finance and quality. The goal of the qualification process is to identify and approve suppliers, and ensure there are an adequate number of suppliers in each commodity (materials and services) area.

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For commodities requiring a technical evaluation (i.e., where a Company specification exists or for services considered strategic) Engineering or other appropriate technical areas are responsible for the technical evaluation procedures and any supporting documents such as technical questionnaires. For example, Pipeline Projects is the technical area responsible for the qualification of construction contractors.

Supply Chain Operations is responsible for maintaining the list of commodities requiring technical evaluations and the responsible technical area, maintaining the supplier evaluation forms and maintaining the records related to supplier evaluations and qualification status.

Construction Management Services is responsible for the process related to sourcing and selection of site construction and inspection personnel. These personnel are evaluation and selected based on their qualifications and experience and their ability to fulfill industry and Company specified inspection requirements.

References to supplier qualification procedures, including the criterion used are referenced in the QMS Procedures.

7.4.1.2 Pipe

Engineering and Commercial Support ensure high quality pipe material is manufactured and delivered to construction sites by utilizing sound engineering practices and quality assurance activities including:

a) Pipe mill assessment and qualification
b) Pipe standards and Company specifications
c) Preproduction and specification review meeting
d) Third party surveillance
e) Pipe qualification tests, supplier certification of conformance to specified requirements
f) Pipe handling, transportation and stockpiling specifications

7.4.1.3 Components

Engineering and Supply Chain Operations ensure high quality components (e.g., fittings, flanges and valves) are manufactured and delivered to construction sites by utilizing sound engineering practices and quality assurance activities including:

a) Supplier assessment and qualification
b) Preproduction and specification review meeting when introducing new product or where Company Specifications have been revised
c) Third party surveillance
d) Supplier certification of conformance to specified requirements
e) Component and fabricated assembly testing and physical verification, status and final reporting
f) Component and fabricated assembly handling, storage, packaging, preservation and delivery specifications

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7.4.2 Purchasing Information

Pipeline Projects provides materials purchasing information for the pipeline project to Supply Chain Operations and Commercial Support.

Supply Chain Operations and Commercial Support, with support from Engineering, ensure purchasing information describes the products and services to be purchased, including where appropriate:

a) Requirements for approval of product, procedures, processes, and equipment

b) Requirements for qualification of personnel

c) Management system requirements

The adequacy of specified purchase requirements are ensured prior to their communication to the supplier by performing technical and commercial reviews. Prior to order placement, purchase order data is reviewed for commercial accuracy by Supply Chain Operations and Commercial Support. Purchase order technical data for components (including catalogue descriptions) are reviewed by Engineering for accuracy. Pipe and component order technical requirements are also reviewed with the supplier at a preproduction and specification review meetings as required. Additional details regarding purchasing information for pipe and components are included in the QMS Procedures.

7.4.3 Verification of Purchased Product

Suppliers of pressure containing and engineering components are required to maintain registered quality systems (i.e., ISO 9001, etc.) and are responsible for product quality. Supply Chain Operations and Commercial Support, with Engineering's support, verify its suppliers' capability to produce quality products by implementing surveillance activities at the supplier facilities during product manufacture.

Where Supply Chain Operations intends to perform surveillance at the supplier's premises, the intended verification arrangements and method of services is stated in the purchasing information to the supplier. This is confirmed and acknowledged with the supplier during the pipe order specification review and preproduction meeting. This is also reviewed and acknowledged with the supplier for the component order during the preproduction meeting if new product/ special order or review of revised Company specifications is being specified.

Please let me know if you have any other questions.

Sincerely,

TransCanada
In business to deliver

OFFICIAL SUPPLIER
FOURNISSEUR OFFICIEL

James Ferguson, P.Eng.
TransCanada
450 - 1st Street S.W.
Calgary, AB T2P 5H1
Phone: 403.920.6009
Cell: 403.462.3313

From: Robert Lazor
Sent: Friday, April 29, 2011 7:02 AM
To: James Ferguson; Evan Vokes; VIVIAN Liu
Subject: FW: Harbour Landing

I had misplaced the printed copy, but Patricia has provided me with her request. She had initially asked to get this to her today, Friday 29 April. Please address the following:

ames,

016298

- Materials specifications for the pipe and fittings to be used on the site (s.14 OPR-99)

- A description of the quality assurance activities carried out by TCPL to ensure that the pipe and components meet the specifications referred to in the above (s.15 OPR-99)

Evan,

- The non-destructive examination plan for the project (s.17 OPR-99)

Vivian,

- The pressure testing program for the pipe replacements (s.23 OPR-99)

I will do the joining program.

Let me if you cannot get this done today. Thanks.

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From:
Sent: Thursday, April 28, 2011 4:23 PM
To: Robert Lazor
Subject: Harbour Landing

Hi Robert, could you please give me an update on where you are at with the joining program, pressure testing program, etc. for Harbour Landing?

Thanks, Patricia

Patricia Zuczek, P.Eng.
Regulatory Services, Law & Regulatory Affairs
TransCanada Pipelines Ltd.
Tel: 403.920.5378
Fax: 403.920.2347
Email: patricia_zuczek@transcanada.com

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Patricia,
I've had a look at the O&M notification submitted on 2 March 2011 for a pipe replacement on Lines 3 and 4 near the Harbour Landing development in Regina Sk. I see that the work is scheduled to commence in July 2011. Pursuant to section 7 and the below referenced clauses of the *Onshore Pipeline Regulations, 1999* (OPR-99) I request that thirty (30) days prior to commencing construction TCPL submit the following information to the NEB:

- Materials specifications for the pipe and fittings to be used on the site (s.14 OPR-99)

- A description of the quality assurance activities carried out by TCPL to ensure that the pipe and components meet the specifications referred to in the above (s.15 OPR-99)
- The joining program for the pipe replacement (s.16 OPR-99)
- The non-destructive examination plan for the project (s.17 OPR-99)
- The pressure testing program for the pipe replacements (s.23 OPR-99)
- A detailed construction schedule for the project.

Please do not hesitate to contact me if you have any questions or concerns with this request.

Regards,
Graham Emmerson, P.Eng. PMP
Compliance Program Manager - Integrity | Gestionnaire du programme de conformité - Intégrité
Operations Business Unit | Secteur des Operations

National Energy Board | Office national de l'énergie
444 Seventh Avenue SW | 444, Septième Avenue S.-O., Calgary, AB Canada T2P 0X8

016300

From: David Taylor
Sent: Thursday, February 17, 2011 7:35 AM
To: Evan Vokes
Cc: Robert Lazor
Subject: RE: Weld Procedures - NPS 16 and above

Hi Evan,
I am glad Ron and Jim like talking to us!! We need the welding team to be aligned with the project requirements on these things. If we can make the case for shop fabrication to the project that is great, but if they decide to field weld with SMAW we should be fine with that as well.

Dave

From: Evan Vokes
Sent: Wednesday, February 16, 2011 8:20 PM
To: David Taylor
Cc: Robert Lazor
Subject: RE: Weld Procedures - NPS 16 and above

Nothing wrong with them having SAW on site, I just did not know anyone did it.
We had influenced the last three compression projects with John and Richard to fabricate in the shop were practicable. Trent took care of this when he first started with our group. Things went really smooth by way of comparison to Paul Lake.

Actually Bens lake was the first of this group and it worked out very well, station (I believe this is when we got Abraxus) 1703 was a bit of problem with Comstock but other than that things have gone much better
Wooden house, Miekle projects worked very well even though Academy wanted to weld Meilkle in a shop that had no subarc
(DL Flange was on this compressed schedule)

Officially compression projects have not revised the spec to reflect this but I keep trying to convince them to put it in the contract
Just happy Ron and Jim like talking to us

From: David Taylor
Sent: Tuesday, February 15, 2011 9:34 AM
To: Evan Vokes
Cc: Robert Lazor
Subject: RE: Weld Procedures - NPS 16 and above

Evan,
I need to understand what direction we are setting for the compressor station welding and inspection. I believe the welding specifications and the welding procedure datasheets we have allow for the contractors to use GMAW/SAW/FCAW and SMAW processes in the shop or the field. Does the specification now state that we shall weld pipe to components in the shop? We used to restrict the final tie-ins to pipe to pipe, but I have read the specification lately.

Just trying to understand where we are going and I want us all singing from the same song sheet!

Thx
Dave

016301

From: Evan Vokes
Sent: Monday, February 14, 2011 7:23 PM
To: Jim Platt
Cc: David Taylor; Ron Wong
Subject: RE: Weld Procedures - NPS 16 and above

I am often accused of giving to much information but there is pretty good reason for this one.
Your schedule cannot afford any errors or hard times. Art was at Paul Lake and can give you some insight on some of the construction problems he used to phone about. Fred was there too but he had to go to a different project before things got fully in swing. The second compressor station
If your prime does not have fabrication capacity, let them use our resources and give them a very short list of approved fabricators. If we coordinate this with Harry, he know project loading of the approved shops so we can make this as efficient as possible. Under that capacity, we can reduce inspection cost as we can leverage Frank Tse as well.
The key to this is designing the pipe spools to maximize construction efficiency and make sure you will not have any really difficult pipe to component welds.
We can help with this especially if we compare the schematics to the stress. It might not be perfect but it is better than no plan.

From: Jim Platt
Sent: Monday, February 14, 2011 7:08 PM
To: Evan Vokes
Cc: David Taylor; Ron Wong
Subject: RE: Weld Procedures - NPS 16 and above

Thanks Evan

I'll try to digest all of this. I agree that I'd prefer to use SAW on all of the pipe spools, and SMAW in the field, but some of the contractors we have qualified as Prime do not have the capacity to do SAW in their fab shops (I wanted to make sure this wasn't a reason to exclude them).

Jim

From: Evan Vokes
Sent: Monday, February 14, 2011 5:31 PM
To: Jim Platt
Cc: David Taylor; Ron Wong
Subject: RE: Weld Procedures - NPS 16 and above

Hello Jim
Not a dumb question at all and certainly one that it took me a while to understand the implications of. Contractually we would like you to have the most cost effective method so under our specifications, it is permissible to do all the welding in the field as a SMAW process. (stick welding) Since you are on the shortest ever construction schedule it would pay you to read the lengthy explanation below.

So Stick welding is acceptable but conversely, it has been documented that schedule improves if you use a fabshop with higher productivity methods of welding. Submerged Arc welding is a very high productivity process that is limited to fabrication shops; similarly labor saving welding positioners are not typically found in the field. The Achilles heel of this field welding philosophy is that some of the welds can be technically very hard to do in the field and even for general fabrication some of the welds that would take a couple hours with SAW in the shop can take a "day" in the field. There is more than one argument of how compressor station fabrication under ASME should be performed but the best quality, time and schedule generally comes from using the fab shop with SAW and welding positioners. If we consider the economics a SMAW vertical up weld is a slow thing to accomplish in the field and if your alignment is less than perfect because you have a tee or elbow creating an alignment problem, it is a long day.

The best practice that we borrow from pipeline is that we prefer pipe to pipe welds in the field as they are a lot easier to deal with. Large diameter fittings such as tees are very stiff when we are using external clamps and we can never

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backweld these when we are on site. In the fab shop the welders get a lot more done in a day especially in a camp situation and with site weather conditions always being a factor. In the fab shop most welds can be rolled for speed and quality and it is pretty easy to backweld in the shop if they have a program for this.

Things are more complicated on a compressor site than than on a pipeline and even when you fabricate in the shop, you will always have some pipe to component welds that you need in the field. You will likely have pups that have to be installed that are less than a meter long. What we had Richard Coglon and John Riley write into their contracts is that understanding the difficulties of field fabrication; the preference is for shop welded pipe to pipe welds where practicable and all valves greater than NPS 12 will be rolled. Large valves have been successfully position welded in the past but cutting out a position weld on a valve is a really big deal. I was cautioned before on where the functional cost and quality overruns are on compressor stations.

Best practice is to have most assemblies prewelded so there is mostly large diameter pipe to pipe as and a few pipe to component welded would do a lot for your schedule especially when you have a compressed timeline as Gold Creek does, I would lean towards prefabricated pieces for all the NPS 12 and larger. While our inspectors cannot tell you the commercial impact, they can tell you about schedule. Art Harris has been on both prefabricated and pieced together large inch compressor station and he can tell you on a day to day basis why you would want prefabricated assemblies in your compressor station. His contact info is 780 208 3655. Fred Kubke has some opinion on this subject as well as it becomes a real chore to keep heat in with propane torches when you weld pipe to component. His number is 780 554 9261.

Below is what I sent John Riley in 2008 after the vortex breaker issue. Since the header is fabricated before hand, you might want to look at some of these past problems related to the vortex breaker. It is really important where the seam on the can is located on the header. Additionally Tom Thrall had written his valve fab and welding instructions since 2008 but I cannot remember the name of the document. If you have the contractor use approved fab shops, Harry Fenton and Frank Tse should be brought in as it will really help your project schedule.

Another thing that makes me glad is that when we build assemblies in the shop, we can RT most of them by a method called single wall single image for good quality images. In the field they generally limit the radiography to Double Wall Double Image which comes at the price of resolution and cost, as it is slower. If we were allowed direct control of the NDE, we could possibly implement Phased Array S scan ultrasonics as it is acceptable to ASME. There are some limitations but if most of the welding is held to pipe to pipe welds, we can gain an immense production gain as we do not have to tie up the site to inspect welds. You should only put this option out if we are directly involved as we have not written a specification for this method of ultrasonic yet. This would cut down the number of welds that need to be inspected with radiography.

Technically if you are fabricating in a shop, you could skip the hydrotest in the shop as you will have to do it for most of your site anyways but most fabricators will not release the pipe unless it is hydrotested. Make sure that the closure weld procedure is only used on welds where it is absolutely required such as when you would have to hydro against a valve. This will save you time later.
Have a good day
Evan

Technical welding details to consider in a contract

Pipe to Component field welds with large diameter, HSLA piping materials, through experience, has been determined to be a technically poor practice.
Contractor should consider the possible problems and schedule implications that may arise from such fabrications. All proposed field welding of Pipe to Component or Component to Component will be accompanied by a detailed welding plan which as a minimum will include instructions for:

a) Management of Heat input, preheat, interpass temp and cooling rate of weld under field conditions (implementation only not details covered by weld procedure)
b) Necessity for back-welding (TCPL will not accept high/low beyond the permissible range)
c) External stress minimization (support, pipefitting etc)
d) NDE

Contractor should consider using a TCPL approved fabrication shop or submit a fabrication shop for approval. Unapproved fabricators will be subjected to full time inspection rather than surveillance.

Welders shall be qualified to pressure weld within the jurisdiction that pressure welding is taking place. Contractor will be obligated to produce proof of welder qualification

016303

Additional good practice considerations
It is forbidden to perform temporarily weldements on transmission pipe (for purposes of jigging, rigging etc)
It is forbidden to place a weld parallel to an existing weld on transmission pipe due to stress affect on heat affected zones.
Parallel welds must be separated by at least 50mm between weld caps.

1) The location of a long seam shall be considered when Vortex spoilers are to be installed. Ensure Vortex spoiler details are complied with while project is in the pipefitting stage.
2) The location of a long seam shall be considered when Contoured Insert Fittings (CIF) are to be installed. The orientation of the CIF compared to the long seam should not be overlooked when project is in the pipefitting stage.

Valves balls and seats shall be physically protected from debris while welding (plywood is good for this)
Valves will be pressure tested with all extensions on
Valves greater than NPS 16 and less than NPS 24 should be roll welded
Valves greater than NPS 24 will be roll welded

From: Jim Platt
Sent: Monday, February 14, 2011 9:24 AM
To: Evan Vokes
Cc: David Taylor; Ron Wong
Subject: Weld Procedures - NPS 16 and above

Evan

This may fall under the dumb question category, but does the attached document permit the contractor to "stick" weld the piping for a compressor facility either in the fab shop or on site. I was under the impression that to use a SAW procedure, you needed a welding machine?

I want to make sure we don't include anything in the contract erroneously and have the correct expectations of our prime contractors.

Thanks

Jim Platt
Project Manager, Compression Projects
Phone: (403) 920-5942
Cell: (403) 585-7248

TransCanada
In business to deliver

016304

From: Evan Vokes
Sent: Wednesday, April 06, 2011 10:54 AM
To: Michael Martens
Cc: Rick Ostrom; James Ferguson
Subject: FW: Counter-bore and taper versus back-bevel

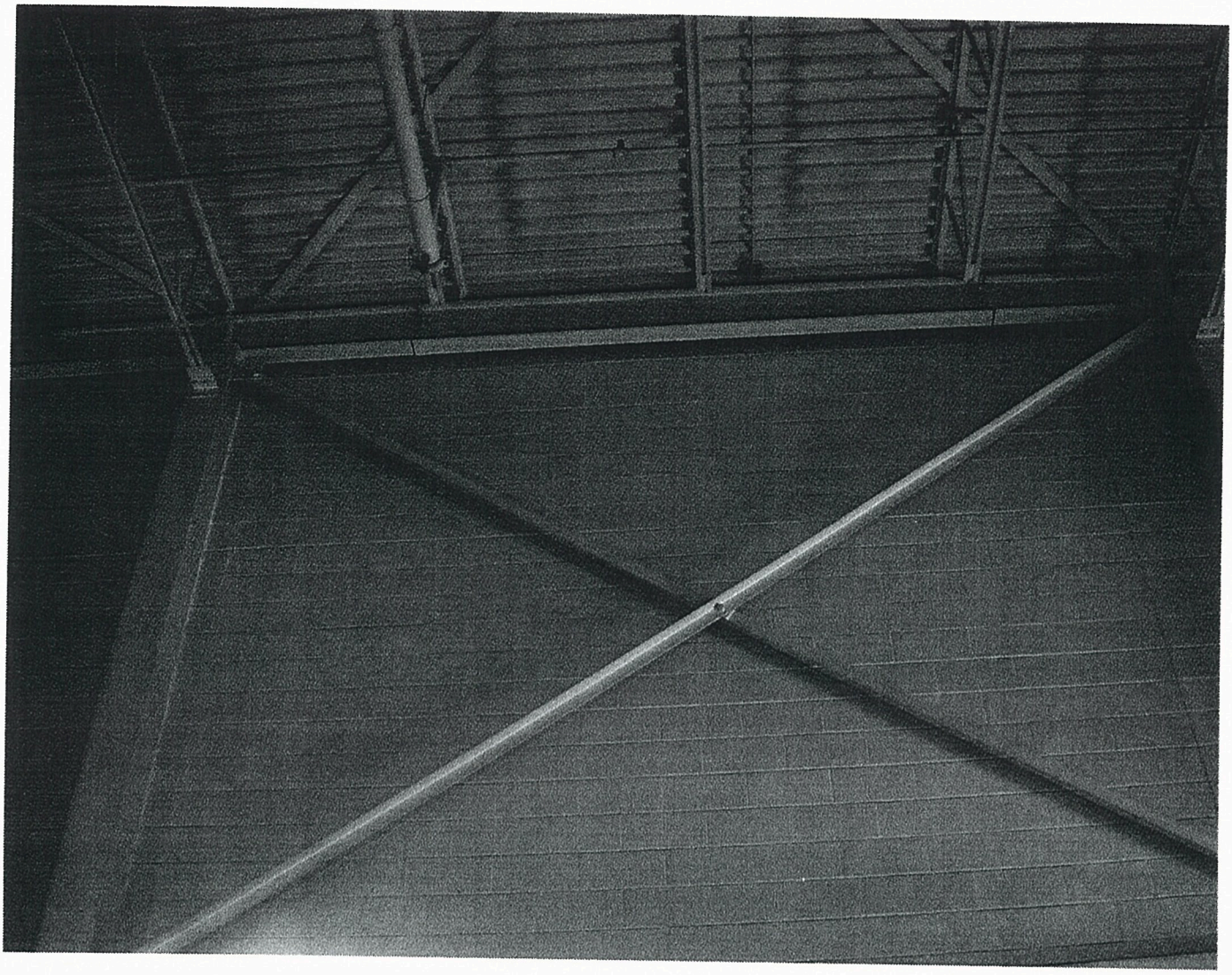
Thanks Mike
I felt very slighted as I had put a lot of work into this and I felt very undermined so thank you for coming by. This is my work, my conception of putting it together and will remain that way.

This has frustrated me from the days of the "one page welding program" and is why I brought my mechanics of material book to work to look at this problem.
The severity of the problem and my understanding of the connection to stress began when Frank Tse sent a picture of an unintended failure of a transition and then I realized how detrimental the bending moment was. I had asked about TES MECH TRAN for this reason as the formula had to have a background
The problem that took the longest to understand was why was there always an undetected LOF in the root on the thin side so some of the evidence from history was put together by listening Dave Hodgkinson's experiences of where to look for the serious defects and reverse engineering to see where the origin of "cant weld the thin side" came from

This is my work no one else's and it gives enough background to start and I have given you the examples of construction failures and in-service failures so we know that the most important parts to support this exist. I have plenty more to add as I have the economics figured out. Adrian Met at UTQ was shocked two weeks ago when I showed his high priced team how the welding NDE and stress all work together.
I am pretty advanced from convincing Guadalajara and Bison (below) to adopt good engineering practice but this is what I had sent them. There are a bunch of things missing such as the flange angles that need to get in there.

We need to go through my fabrication presentation again as I keep refining it which is where the attached slide comes from. The stress case is pretty simple in concept but harder to communicate in words. I can draw the stress problem out quick but writing is another story.
It has matured a long ways from the one piece of paper welding plan but I can still draw that one. I wanted to get the diagrams for uniform load and the subsequent bending moment diagram drawn out in my presentation for the below case but I never got around to it. I also need Mohrs circle for the stress state of the bolts so we can show that the bolt loading is not shear

016305



The fracture part needs a lot of work to get it down to show I explain it on the board as it is easier to draw than write about as Mr Anderson proved.

From: Evan Vokes
Sent: Monday, April 26, 2010 4:34 PM
To: Claude Albert
Cc: Ron Curle; Veronique Cantin; Rick Ostrom; Salvatore Delisi
Subject: RE: Counter-bore and taper versus back-bevel

I have seen Kenneth's presentation before and that whole business is avoidable but one of the big problems is TCPL never made counter bore mandatory because there is a real upfront cost.
His recommended practice for 3-D bends is on the right path but not entirely there. As you would have seen in my presentation, we do not cellulosic weld X 80 with E9010 because your preheat requirement would have to be too high. Bainitic microstructures don't like this. Keep in mind that we use the same specifications for our AIV lines and do not have problems we see down south.
I should have included counter-bores in my presentation to Bison months ago .

016306

The primary importance of the TES MECH TRANS is at the welding side of the contracts but it has a very large implication for probability of detection for NDE.
I consider back beveled transitions with what I call the three strike rule:
a) Average welder has trouble welding the root and cannot field back-weld (welding ease)
b) NDE is compromised as we can not get good radiography and we can not use AUT (NDE compromised)
c) Bending moment applies maximum stress to the weld (mechanical stress)

The welders don't admit it but they like us when we do counter-bore as equal wall thicknesses, the pipes are much easier to weld; this is because the heat sink is different for both sides. I used to have a hard time understanding why the LOF and cracking were predominant on the thin wall side but the welder must concentrate the heat of the root pass on the thick side or there will be a massive root defect. As a consequence we often have IP and other planar defects on the thin wall side. Since we have likely used a cellulosic rod, we now have the conditions to promote cracking; Susceptible material, Stress, and Hydrogen. The reason why it works so well in the shop is that our components can often be back-welded. If you were to have a hydro-test failure in the shop it is not on PHMSA's radar as much as a ROW failure.
Welding contractors should love it as if you make the counter-bore 5 inches deep, the internal clamp can work and you have a regular SMAW poor boy or GMAW mainline weld as compared to a slow SMAW tie-in with external clamps ($$$$) . Louisbourg and Ledcor both do this as it is so fast to do in the field but we can not apply an ECA to the weld unless we specifically quality one for this.

Before we delve into NDE, we need to look at fracture mechanics. Kt is an indication of geometry on strength to propagate an indication. (YS/kt) Volumetric indications have a kt =3, planar indications kt =6 and cracks kt =27. Planar indications and cracks have a massive effect on strength and radiography is good at finding volumetric indications not planar indications or cracking.

When we use counter-bores I can have a good film with radiography or I can have excellent AUT. One of the big problems we run into with NDE is that if we **do not** counter-bore we must use Double Wall Single Image (DWSI) radiography, as the weld must be performed with an external clamp with all the attendant engineering concerns that are associated with this condition. The physical requirement for a tie-in weld dictates the DWSI RT and this will give poorer resolution with X ray and worse with gamma. This is related to the fact that radiography is knocking out different wavelength of photons and X-ray has a wider band than gamma. You just have to look at the light spectrum to see the problem. Just because we can see the wires does not mean we have found all the out of plane LOF and cracking. When I have materials over 16mm I really need some concentrated energy to penetrate the material so I have to move to gamma. The different elements for gamma sources; Cs, Co Se etc all have different ranges which is why the gamma sources give different resolutions. Co is the worst for resolution as it gives a very narrow spectrum but with a extremely strong penetration. The problem with X ray is powerful units are very large where as gamma sources are very small and so strong X-ray sources are hard to make field portable. The next problem is the film. High energy gamma sources suffer from two sources of un-sharpness. The geometric un-sharpness is related to diffraction off sharp features which muddles the film. Film un-sharpness is high energy from gamma radiation inadvertently exposes film next to the areas of proper exposure so now I have two concerns for un-sharpness of the film on a technique that is sensitive to volumetric indications. If I counter-bore, I can use AUT and see everything the first time with no messing about regardless of thickness.

Counter-boring also moves the bending moment from welds that contain defects into the parent metal. IF you look at a weld on flange they have very strict requirements for angle to move the bending moment past the weld so very similar, by counter-boring, we are moving the bending moment. This was proven many years ago and we still get leaks at road-bores with back beveled transitions. If you have access to the S drive there are a couple of delayed failure reports one from Red Deer and another one from Crossfield (right on highway 2) and I am waiting to see the Manitoba failure from last summer. What I often do when I draw the problem out on the whiteboard or paper is to show a roof structure of a large steel framed industrial building such as Costco or any number of others. When we look at the roof we see that the bolted connections are made several feet to the side of the columns. This is to make sure that the bolts are a) in the neutral axis of the bending moment, b) bolts are half as strong in shear as they are in tension so we do not want to apply a shear stress. (I will send a picture later). Becky, we could probably get you to draw this out with a moment diagram to show people. In our case we use counter bore shape to shed the load to apply the bending moment outside the welded area.

There are two problems with this
1) The contractors love to flay the skin from our projects for requesting something so silly when in truth each transition is to their benefit. The counter-bores can be supplied to a project as heavy wall counter-bore transition pups for a small job where they do not want to mobilize a field counter-bore Cat.(in Kenneth's presentation)
2) Often time's contractors do a horrible job of machining the transitions and the resulting surface causes diffuse reflection rather than the desired specular reflection which is a pain for AUT.

016307

As you probably realize History has shown us that many construction hydro test failures are at back-beveled transitions shot with gamma and Keystone proved it. The laws of gravity have not changed in recent history either. You might get a way with back bevels and using gamma for inspection but you must accept that a hydrotest failure is now an inherent risk.

We have paid for AUT, lets exploit it, buck up for the counterbores and have worry free project.

Hope this helps
Evan

From: Claude Albert
Sent: Monday, April 26, 2010 2:56 PM
To: Evan Vokes
Cc: Ron Curle; Veronique Cantin
Subject: FW: Counter-bore and taper versus back-bevel
Importance: High

Evans

I forgot to copy you on these e-mails, what is your take on this?

Cheers,

Claude Albert
Construction Quality Manager
Bison Pipeline Project
Tel: 713 354 6292
Cell: 832 588 0112

From: Ron Curle
Sent: Thursday, April 22, 2010 6:06 PM
To: Claude Albert; Veronique Cantin; Gerard Lalonde; Gary Babich; Joanne Unger
Subject: FW: Counter-bore and taper versus back-bevel
Importance: High

Veronique

What field welds (of different WTs) do we currently allow back-bevel?

Then let's make an estimate of qty, so that we can evaluate Claude's proposal

$first – decision second – it might be "Chicken S"

Please reply-all

Thanks!

Ron

From: Claude Albert
Sent: Thursday, April 22, 2010 4:34 PM
To: Ron Curle
Cc: Veronique Cantin; Shane Megoran; Gary Babich; Joanne Unger
Subject: FW:
Importance: High

Ron

The attached is the third bulletin received from PHMSA concerning welds of different wall thickness. As you know, today we had the visit from PHMSA at PG yard, to review out Welding Procedure Qualification process, of which they were very happy with, I will submit the meeting note tomorrow.

During the meeting with PHMSA, they express their concern on welds between pipes of different wall thickness, using a back bevel of transition.

I recommend we ONLY weld pipe of different wall thickness, all welds not only golden welds, using counter bore to ensure the welds will always be done on same wall thickness. It could be a counter bore done in the field using acceptable field equipment or a counter bore pup, which could be done in a shop.

This would eliminate PHMSA's concern on the subject, and would allow the project to adequately use AUT for the welds,

Cheers,

Claude Albert
Construction Quality Manager
Bison Pipeline Project
Tel: 713 354 6292
Cell: 832 588 0112

From: kenneth.lee@dot.gov [mailto:kenneth.lee@dot.gov]
Sent: Monday, April 19, 2010 10:00 AM
To: Claude Albert; Shane Megoran
Cc: stephen.bender@dot.gov; chris.hoidal@dot.gov
Subject:

Attached is a presentation I gave last month on PHMSA girth weld construction concerns your review. I welcome any comments or questions you may have. I'll see you Thursday in Houston.

Thanks,
Ken

Kenneth Y. Lee
Office of Pipeline Safety
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE, Room E22-205
Washington, DC 20590
Office: 202-366-2694
Cell: 202-573-1546
E-mail: kenneth.lee@dot.gov

016309

Evan

From: Kevin Lemke
Sent: Thursday, April 21, 2011 1:43 PM
To: Evan Vokes
Cc: Neil Milne; Ken Sortland; Gary Herd
Subject: Bison AUT Scan Analysis

Hi Evan,

We are currently trying to establish the longitudinal weld seam location for 8 joints of pipe. Caliper pig inspection has shown that these joints have dents, and we need to establish whether the dents affect the weld. We're hoping to use the AUT scans and x-rays (only available on the 25th floor of Hanover) to establish the longitudinal seam location. I contacted Robert Lazor, and he provided your name as the person to provide this analysis.

I've attached the spreadsheet which summarizes the dents and the AUT scans that apply.

Please provide your input on this.

Thanks,

Kevin Lemke
EIT - Major Projects
TransCanada
403-827-7307

016310

From: Gary Herd
Sent: Friday, November 12, 2010 12:18 PM
To: David Taylor; Ron Curle; Evan Vokes
Cc: Mark Yeomans
Subject: RE: this is where i was going

Dave,

No problem. Please nominate a call in number and Ron & I will call in at 2:00PM. Ron can receive emails, but not send.

Thank you,

Gary

From: David Taylor
Sent: Friday, November 12, 2010 12:16 PM
To: Gary Herd; Ron Curle; Evan Vokes
Cc: Mark Yeomans
Subject: RE: this is where i was going

Gary, Ron,
Can we set up a conference call (amongst ourselves) to deal with the letter below. Evan and I have talked at length this morning on the issue and are drafting up a resolution we want to propose to you both.

Can you both be available at 2:00 pm this afternoon (mst). I can set up a conference call from my office phone – just need the numbers to call.

Ron, do you want to come over to my office to participate in the call?

Dave

From: Gary Herd
Sent: Friday, November 12, 2010 9:30 AM
To: David Taylor
Subject: FW: this is where i was going

Ron requested we forward a copy of Evans email to your attention.

Congratulations, on the 2 deer!

Gary

From: Gary Herd
Sent: Thursday, November 11, 2010 3:39 PM
To: Joanne Unger

Cc: Ron Curle; Mark Yeomans; Ken Sortland
Subject: RE: this is where i was going

I would like to caution everyone about over reacting to this email. We are working through the process of review with RTD and there is content herein that did not need to be stated.

Gary

From: Evan Vokes
Sent: Thursday, November 11, 2010 2:58 PM
To: Gary Herd
Cc: Ron Curle; Mark Yeomans; Joanne Unger; Ken Sortland; dhodgkinson@telus.net
Subject: FW: this is where i was going

Hello Gary
Further to our conference call with Dave Hodgkinson today:

I must remind everyone that the purpose of having Dave Hodgkinson assess the spread one data was to establish if there was a systemic problem as there was no effective onsite TC review of the data and anomalies were noted during the field visit. This assessment's scope did not separate out a list of rejectable welds but was to assess the extent of systemic problems noted with the gate settings and the operator's ability to separate out features. The probability we have an injurious defect is very low but the review shows that we have a code compliance issue. If the scope of this review was to audit for how many welds are rejectable to code, the list will be extensive. The goal of the audit request to Mark Werner is to ensure TransCanada will not expect to have liability for work that RTD had completed early in the project. A review will likely turn up a weld (s) that will have to be repaired but that is a risk.

From Dave's assessment, he gave us guidance for the methodology and resolution.

> If by using data from all root sequences including TOFD, Applus RTD can confirm that full volumetric coverage of the welds has been achieved then the Applus RTD senior level III ultrasonic (AUT) specialist must sign off on the final assessment for record and regulator purposes. Applus RTD must supply a full accounting of all welds which do not have 100% volumetric coverage or do not meet the API 1104 defect acceptance criteria.

Directions for Mark
What Bison needs from Mark Werner is a confirmation that under his guidance, a review of the data was complete and he can accept full technical responsibility for the data such that any injurious defects have been found and the scans are defendable to the regulator. This audit must include the spread ½ SMAW weld data and should extend to the other spreads to confirm the approach is consistent. Particular attention needs to be paid to accumulation defects and scans completed with short gate times. The final assessment should indicate that the data was less than perfect but is acceptable and why.

If we can arrange the conference call tomorrow once he understands what we need.

Thank you
Evan

From: Evan Vokes
Sent: Monday, August 09, 2010 4:08 PM
To: Salvatore Delisi; YIN Qu; Robert Lazor
Subject: RE: TES-WELD-AS-US version 02.doc

This is a problem we run into all the time and different construction managers handle it different ways and some inspectors would like a statement in the spec
From a stress point of view, this is of concern to Mike Martens as the welds may handle a lot of load and as Sal stated you don't want a crazy amount of welds without a good reason especially since they are often DWSI gamma shots.
Even though a minimum of one diameter is good practice, it is not always practicable when you are welding in a station so we always have some short ones.

Short pups welded to components are really hard to line up on large diameter pipes but are sometimes necessary but short pups welded to each other is just poor practice.
When we did Hardesty interconnect, the correct answer to one of these problems was to cut the pipe out and replace it with the correct length.

Another item that is not in the spec is flame straightening using shrinkage principles even though API has an RP.
This is poor practice and should be excluded from your contract as an acceptable method of obtaining a pump alignment.
Our specifications and the code to not make strong statements on wrinkle bends as they are know to just be poor practice and this is in the same category of poor construction methods.

From: Salvatore Delisi
Sent: Monday, August 09, 2010 12:37 PM
To: YIN Qu; Robert Lazor
Cc: Evan Vokes
Subject: RE: TES-WELD-AS-US version 02.doc

Not from any known specification.

It was a 'rule of thumb' that ANR has used in the past and practice I've used in a former lifetime to keep the number of welds from becoming unreasonable.

Welds closer thar 50 mm should definitely be avoided but the remainder is a way to keep the number and locations of welds in check.

Sal

From: YIN Qu
Sent: Monday, August 09, 2010 1:32 PM
To: Salvatore Delisi; Robert Lazor
Cc: Evan Vokes
Subject: RE: TES-WELD-AS-US version 02.doc

Is this in a spec? should we be adding this to the welding spec? the exception would be if design calls for a closer spacing between the two welds, then it's acceptable, correct?

From: Salvatore Delisi
Sent: Monday, August 09, 2010 11:24 AM
To: YIN Qu; Robert Lazor

016313

Cc: Evan Vokes
Subject: RE: TES-WELD-AS-US version 02.doc

Yin,

- Minimum distance: Not less than 12" (30 cm)
- At least 18" (45 cm) distance for NPS 14 and below
- At least two pipe diameters distance for NPS 16 and above

A 'case by case approval from MEGaQM' clause could be added to allow flexibility for transition pups, etc.

Sal

From: YIN Qu
Sent: Monday, August 09, 2010 1:05 PM
To: Robert Lazor; Salvatore Delisi
Cc: Evan Vokes
Subject: RE: TES-WELD-AS-US version 02.doc

Thanks guys.
I also have a question: is there any comment in the spec regarding minimum spacing between welds during construction?

From: Robert Lazor
Sent: Friday, August 06, 2010 4:50 AM
To: YIN Qu
Cc: Evan Vokes; Salvatore Delisi
Subject: RE: TES-WELD-AS-US version 02.doc

I will have to look on my return trip tonight.

From: Salvatore Delisi
Sent: Friday, August 06, 2010 3:24 AM
To: YIN Qu
Cc: Evan Vokes; Robert Lazor
Subject: FW: TES-WELD-AS-US version 02.doc

Yin,

Per your request, I've forwarded a marked-up copy of TES-WELD-AS-US.

At this time, I have no way of knowing where this document stands in the review process or whether the changes suggested will be part of the final document.

Sal.

Salvatore J. Delisi
Materials Engineering Governance
and Quality Management
TransCanada
5250 Corporate Drive
Troy, Michigan 48098
Office: (248) 205-4595
Mobile: (313) 268-7203
Fax: (248) 205-4695

VIA EMAIL

June 28, 2010

Mr. Jeffrey Wiese
Associate Administrator for Pipeline Safety
US Department of Transportation
Pipeline and Hazardous Materials Safety Administration
1200 New Jersey Avenue, SE E22
Washington, DC 20590

Mr. Alan Mayberry
Director, Engineering and Emergency Support
United States Department of Transportation
Pipeline and Hazardous Materials Safety Administration
East Building, 3rd Floor
Mail Stop: E32-303
1200 New Jersey Ave., SE
Washington, DC 20590

Re: Request for Investigation of Possible Use of Substandard Steel in the Keystone Pipeline

Dear Sirs:

We have reason to believe that TransCanada Keystone Pipeline, L.P., ("TransCanada") may have used defective steel pipe in the construction of the recently completed Keystone Pipeline. Documents released by you indicate that Welspun Corp. Ltd ("Welspun") supplied a significant amount of defective steel to the steel pipe market in 2007 and 2008. During this period, Welspun supplied TransCanada with almost half of the steel pipe used to construct the Keystone Pipeline. While we cannot be certain that Welspun provided defective steel to TransCanada, the facts indicate that further investigation and testing by the Pipeline and Hazardous Materials Safety Administration ("PHMSA") is ncessary, and that reasonable precautions should be implemented pending a final resolution of this matter.

Our conclusions are based on review of the 3,710 pages of information provided by PHMSA in response to our Freedom of Information Act Request of September 2, 2009 ("FOIA Request"). This request concerned Advisory Bulletin ABD-09-01, entitled "Potential Low and Variable Yield and Tensile Strength and Chemical Composition Properties in High Strength Line Pipe" ("Advisory Bulletin"), issued by PHMSA on May 21, 2009. It sought all documents related to your issuance of the Advisory Bulletin and your efforts to investigate and respond to the low-strength steel problem. You provided documents in response to the FOIA Request in March and May 2010, over six months after we submitted the request to you. We sincerely appreciate the efforts PHMSA's staff undertook to respond to our request, but are concerned that the passage of time has nonetheless hindered our timely participation in your efforts.

P.O. BOX: 251 VERMILLION, SD 57069
T: 605 659 0298 / 605 675 9268 F: 866 484 2372 E: info@plainsjustice.org W: http://plainsjustice.org
Printed on recycled paper

From our review, it seems likely that PHMSA has additional documents related to this matter that have not been disclosed. Since we do not have access to a full record, we do not know the answers to a number of important questions or the full extent of PHMSA's efforts. Regardless, the information you provided contains sufficient evidence to justify further inquiry. After reviewing the FOIA documents, we produced the attached report entitled, "Use of Substandard Steel by the Pipeline Industry from 2007 to 2009." This report summarizes the information disclosed to us by PHMSA.

In 2007 and 2008 Boardwalk Pipeline Partners, L.P. ("Boardwalk") and Kinder Morgan, Inc, received substantial amounts of defective pipe and used this pipe to construct a number of high-pressure natural gas pipelines. This defective pipe failed to comply with the American Petroleum Institute Grade 5L X70 standard ("API 5L X70 Standard"). Due to low-strength, at least one and possibly two pipe joints ruptured when subjected to required hydrotesting. Hundreds of other joints did not rupture, but did expanded beyond PHMSA standards indicating that they were fabricated with substandard steel. To fix this problem, PHMSA required Boardwalk and Kinder Morgan to remove and replace hundreds of pipe joints.

Although a number of pipe and steel mills are implicated, it appears that Welspun, an Indian steel pipe manufacturer, produced the lion's share of this defective pipe. Welspun, for example, was responsible for 88% of the expansion anomalies found in the Boardwalk pipelines. However, at least one other pipe mill produced substantial amounts of substandard pipe using steel from two steel mills, and a few other mills produced small amounts of low-strength pipe. The problem was widespread enough that PHMSA issued the Advisory Bulletin industry-wide.

Of concern to us is not primarily what PHMSA has done, but rather what PHMSA may have left undone. Specifically, the FOIA documents contain no determination by PHMSA of the root cause of the defective steel problem. Further, there is no description of a systematic effort by PHMSA to track the distributiuon of potentially defective pipe from the responsible pipe mills to U.S. pipelines constructed between 2007 and 2009. While PHMSA may have taken these actions, we are concerned because the documents provided by PHMSA do not indicate that it has done so.

The evidence you provided indicates that there is good reason for PHMSA to undertake a systematic industry-wide investigation of this problem. Yet the documents you provided relate only to your investigation of certain Boardwalk and Kinder Morgan pipelines and contain little to no indication of investigations of pipelines constructed by other companies between 2007 and 2009. For example, we are aware that PHMSA issued a document entitled, "Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength for Liquid Pipelines," on October 6, 2009. This document describes how pipeline companies should investigate this problem. However, neither it nor any other document reviewed by us describe which, if any, pipeline operators are required to comply with these "guidelines." Given this uncertainty, we seek clarification that PHMSA's review has been both systematic and thorough.

Reasons for Concern that the Keystone Pipeline May Contain Defective Pipe Steel

We are specifically concerned about the Keystone Pipeline, which was completed late last year and is just about to start operations. None of the FOIA documents indicate that

016316

PHMSA conducted any investigation of the possible use of defective pipe in the Keystone Pipeline.

This being said, we recently learned in a phone call with PHMSA that it has decided to require TransCanada to conduct a high resolution deformation scan of the Keystone Pipeline. We are also aware that PHMSA has decided to require that a related pipeline, TransCanada's Keystone XL Pipeline, conduct a high resolution deformation tool run. We are somewhat surpised to learn of your investigation of the Keystone Pipeline, since none of the FOIA documents indicate any review of this pipeline. Further, we have no documentation about the nature of the test you will perform, the timing of the test, or TransCanada's agreement to conduct this test. We support PHMSA's decision to conduct high resolution deformation testing of both Keystone Pipelines, but, given the following facts, believe that additional investigation and precautionary actions are warranted.

Much of the Keystone Pipeline Was Constructed Before Discovery and Full Investigation of the Defective Steel Problem

As shown below, the Keystone Pipeline was constructed in the same timeframe as the seven Boardwalk and Kinder Morgan pipelines investigated by PHMSA, most of which were proven to contain defective steel. Further, PHMSA did not discover this problem until early 2009 and did not complete data collection and testing until the second half of 2009, well after most of TransCanada's pipe was in the ground. No press reports indicate that TransCanada rejected or returned any pipe to Welspun in 2009, nor have we heard of any excavation of pipe after construction, so presumably TransCanada installed all of the pipe provided to it by Welspun.

Pipeline	Sub-standard Pipe?	3Q 07	4Q 07	1Q 08	2Q 08	3Q 08	4Q 08	1Q 09	2Q 09	3Q 09	4Q 09
TransCanada Keystone Pipeline	?										
Kinder Morgan Louisiana Pipeline	Yes										
Kinder Morgan Midcontinent Express Pipeline	Limited										
Kinder Morgan Rockies East Pipeline	No										
Boardwalk East Texas Pipeline	Yes										
Boardwalk Gulf Xing/MS Loop Pipeline	Limited										
Boardwalk Southeast Pipeline	Limited										
Boardwalk Fayetteville/Greenville Pipelines	Yes										

016317

Almost Half of the Pipe Used in the Keystone Pipeline Was Made by Welspun

According to a *New York Times* article published on April 16, 2009, Welspun fabricated 47% of the pipe in the Keystone Pipeline. As noted above, Welspun was responsible for a very large proportion of the defective pipe provided to Kinder Morgan and Boardwalk.

Welspun Fabricated Pipe for TransCanada at About the Same Time as it Fabricated Defective Pipe for Boardwalk and Kinder Morgan

Photos of Welspun pipe joints used in the Keystone Pipeline show that they were fabricated between early 2007 and late 2008. This likely was the same period during which Welspun fabricated defective pipe for Boardwalk and Kinder Morgan. It is reasonable to assume that Welspun's quality control failures may have affected production of pipe for TransCanada.

The Steel Pipe in the Keystone Pipeline Was Fabricated to the Same Industry Standard as that Required by Boardwalk and Kinder Morgan

The pipe in the Keystone Pipeline was fabricated to the same API 5L X70 Standard as the Boardwalk and Kinder Morgan pipelines. The documents PHMSA provided suggest that the root cause of the defective pipe may have been mis-formulation of steel or mis-fabrication during the pipe steel rolling process, both of which are unrelated to the diameter of the pipe produced or the ultimate purpose of the pipeline. Although the Keystone Pipeline is a 30-inch diameter crude oil pipeline and the known defective pipe was installed in 36-inch and 42-inch diameter natural gas pipelines, it is our understanding that the size difference and the ultimate type of product carried do not change steel or pipe mill quality control processes. An API 5L X70 Standard steel pipe can be used to contain either natural gas or oil.

PHMSA Ordered Boardwalk and Kinder Morgan to Remove Hundreds of Joints of Defective Pipe and Reduce Operating Pressures Pending Repair

PHMSA ordered the excavation, testing, removal, and replacement of hundreds of pipe joints. Boardwalk agreed to remove and replace 305 pipe joints, and Kinder Morgan removed and replaced 7,100 feet of defective pipe joints. Further, pending repair, PHMSA down-graded the maximum pressure of impacted pipelines from an 80% design factor to a 72% design factor. The nature of this response indicates that the defects were significant and potentially dangerous.

Hydrotesting Alone Is Not Sufficient to Discover Defective Pipe

The extent of the low strength steel pipe problem in the Kinder Morgan and Boardwalk pipelines was not detected by hydrotesting, which suggests that hydrotesting alone does not provide adequate assurance of steel quality. Instead, PHMSA required high resolution deformation testing. As noted, we support PHMSA's decision to require high resolution deformation testing of the Keystone Pipeline.

016318

Market Conditions May Have Adversely Impacted Industry Quality Control

TransCanada allegedly experienced large development cost overruns during construction of the Keystone Pipeline. Three of TransCanada's shippers stated in sworn court filings that TransCanada claimed a 145% cost overrun in Canada and a 92% cost overrun in the U.S. Any remedial efforts by TransCanada to investigate possible low-strength steel would exaserbate these cost overruns. Further, the industry has stated that pipeline construction market conditions were "almost unprecedented" over the past few years. For example, Welspun's steel pipe sales figures grew by almost 50% in both 2007 and 2008. Given these market conditions, there is a substantial risk that production of defective pipe was not an isolated problem but rather resulted from systemic quality control failures.

The Keystone Pipeline Is Very Large and Designed to Operate at Very High Pressures and Therefore Is Dangerous

The 30-inch diameter Keystone Pipeline runs 1,025 miles from the Canadian border to Illinois and will operate at nearly 1,500 psi, making it one of the longest, largest, and highest pressure crude oil pipelines in the country. The force exerted by the crude oil on the pipe steel is tremendous. PHMSA granted the Keystone Pipeline a waiver to stress its pipe steel up to 80% of its maximum strength, rather than up to 72%, as required by existing regulations. Any major rupture would have substantial human and environmental impacts, and even a pinhole leak could severely harm property and the environment. Given the size and operating pressure of the Keystone Pipeline, PHMSA must require that it conform to the highest construction and operational standards.

In these circumstances, it is reasonable to be concerned that TransCanada may have used defective steel pipe in the construction of the Keystone Pipeline, and that such use could pose a serious risk to people and property along the pipeline. Yet none of the documents sent by PHMSA mention any investigation of the Keystone Pipeline. In all the thousands of pages of FOIA documents, the Keystone Pipeline is mentioned only once, specifically in the title of a document included in a list of reference materials provided in a report produced by a Boardwalk consultant. TransCanada, the operator of the Keystone Pipeline, is mentioned only in a list of companies participating in industry responses to the Advisory Bulletin. None of the documents provided by PHMSA as late as May 2010 state that PHMSA has made any effort to investigate the quality of the steel used in the Keystone Pipeline.

Industry Response to Defective Pipe Steel

We also find no comfort in the industry response to the pipe steel problem, as described in the FOIA documents. Specifically, the Interstate Natural Gas Association of America Foundation ("INGAA Foundation") responded to the Advisory Bulletin by preparing a White Paper. None of the documents you provided showed an organized response by an oil company trade association, suggesting that the industry's response to this problem is being coordinated by the natural gas industry through the INGAA Foundation.

016319

The White Paper contains the industry's recommended approach for its members' investigations of whether or not their existing pipelines (including the Keystone Pipeline) contain defective steel:

1) based on experience during normal operations, determine whether there is a known history of low mechanical properties or excessive expansion of steel pipe;
2) if such history exists, then conduct an in-line inspection ("ILI") during the next regularly scheduled assessment of the pipeline; and
3) if the ILI shows expansions greater than "X%" amount ("X%" is not specifically defined by the White Paper, which states only that it may be about 1%) then the company must "evaluate and mitigate" the expansions, apparently within one year of the analysis; however, the industry has not identified what "evaluate and mitigate" means, when the one-year period tolls, or what actions might be required based on differing degrees of pipe failings.

Thus, the industry recommends that TransCanada conduct an inspection of the Keystone Pipeline for expansion anomalies only if its "normal" review of pipe data or information discovered during normal operations indicates that a threat of expanded pipes exists. However, the industry makes no recommendations about the type of in-line inspection required, and it specifically states, "This step does not contemplate extraordinary evaluations or inspections, but rather relies on those normally conducted as operations and maintenance activities." It also does not draw any line for when pipe is so weak that it must be removed or specify a timeframe for removal.

The White Paper recommends a business-as-usual approach. It does not call for any special investigation unless and until normal operations discover the existence of low-strength pipe. It recommends that pipeline companies be allowed to decide for themselves whether to inspect, how to inspect, and when and how to repair pipelines if low-strength steel is discovered. It ignores evidence related to the production of substandard pipe by specific steel and pipe mills as this evidence might be applied to specific pipeline construction projects. In short, as regards pipelines constructed between 2007 and 2009, the industry seems to have an "if it ain't broke don't fix it" attitude.

TransCanada's response to the Advisory Bulletin appears to be very much in accordance with the industry response. TransCanada described its response to the Advisory Bulletin in a June 1, 2009, letter to the South Dakota Public Utilities Commission ("SDPUC"), sent twelve days after PHMSA issued the Advisory Bulletin. In this letter TransCanada generally asserts that:

- it is already in compliance with the Advisory Bulletin;
- its quality control requirements meet or exceed the API 5L X70 Standard;
- it has taken the steps outlined in the Advisory Bulletin for "over 30 years;"
- "There have been no hydrostatic test failures on line pipe that have occurred in the pipe mills producing pipe for the Keystone order;" and
- it has "considered whether it is advisable to utilize expansion detection methods and has determined that such methods are not necessary or advisable."

016320

TransCanada provides no description of how its quality control measures differed from those implemented by Boardwalk and Kinder Morgan, or how they exceed the API 5L X70 Standard.

Given that this letter was written just twelve days after publication of the Advisory Bulletin, it appears that TransCanada did not intend to change any of its quality control measures or conduct any detailed investigation of this risk. Also, it appears that TransCanada did not intend to conduct high resolution deformation testing of the Keystone Pipeline.

As for TransCanada's statement that "There have been no hydrostatic test failures on line pipe that have occurred in the pipe mills producing pipe for the Keystone order," we first note that this statement is far from clear. It may be an assertion that neither of the two hydrotests caused by weak Kinder Morgan and Boardwalk pipe were in pipe fabricated by one of the Keystone Pipeline's suppliers. The veracity of this statement depends on whether the Kinder Morgan hydrotest failure was caused by weak pipe not provided by Welspun. Since PHMSA provided us with no detailed information about this hydrotest, we are unable to determine if TransCanada's statement is correct. Regardless, we note that TransCanada did not acknowledge that one of its pipe suppliers, Welspun, was deeply involved in the weak pipe problem.

This letter gives all appearance that TransCanada intended to take no steps beyond its normal procedures to ensure that the Keystone Pipeline complied with federal pipe steel requirements. Such response is completely inadequate in light of the FOIA documents and the potentially deadly results of a catestrophic failure of the Keystone Pipeline.

Requested Phmsa Actions

The landowners who host the Keystone Pipeline on their properties have good cause to be concerned about the integrity of this pipeline. PHMSA has a duty to fully investigate whether the Keystone Pipeline contains low-strength steel pipe. Therefore, we request that PHMSA investigate the possible use by TransCanada of defective steel in the Keystone Pipeline by taking the following actions:

- Require TransCanada to conduct a high resolution in-line inspection of the Keystone Pipeline before the start of regular operations and provide the results of such high resolution in-line inspection to the public;

- Reduce the operating pressure of the Keystone Pipeline to a design factor of 72% or less pending completion of all testing and any required remediation.

- Require TransCanada to disclose to PHMSA and the public the identity of all steel and pipe mills whose products were used in Keystone Pipeline;

- Disclose all communications between PHMSA and TransCanada related to its possible use of defective pipe steel, its compliance with the Advisory Bulletin, and any testing or remediation efforts related to low strength steel, including but not limited to deformation testing of the Keystone Pipeline;

- Disclose all hydrotest results for the Keystone Pipeline;

- Disclose all unreleased data related to production of defective pipe steel by pipe mills, including but not limited to Welspun, and any steel mills that provided defective steel plate or coil for API 5L X70 or higher grade steel pipe for use in U.S. hazardous liquid and natural gas pipelines construction between 2007 and 2009;

- Disclose all data related to the root cause of the low strength pipe steel; and

- Publish a public report that identifies the root cause of the low strength pipe steel and describes the measures taken by PHMSA and the pipeline industry to ensure that undiscovered defective steel did not end up in U.S. pipelines.

If you have already performed such investigation and/or imposed any additional requirements on the Keystone Pipeline but failed to provide us with relevant documents, we request that you provide these documents as soon as possible. We also request that you meet with us to discuss this matter, so that we can provide our clients and constituents with assurance that their persons, families, and properties are safe.

Any use byTransCanada of defective steel in the Keystone Pipeline would be a violation of federal law. Absent investigation and appropriate near-term mitigation, there is good cause to believe that TransCanada may be in violation of Conditions 1 through 9 of its April 30, 2007, Special Permit, and therefore in violation of 49 U.S.C. 60118(c) and 49 CFR § 190.341.

As importantly, should the Keystone Pipeline contain defective steel, it would put the safety, welfare, and property of adjacent landowners and communities at risk.

We appreciate your consideration of this matter and urge your prompt response.

Very truly yours,

Paul C. Blackburn
Staff Attorney

att: Report, *Use of Substandard Steel by the Pipeline Industry from 2007 to 2009*

016322

From: Evan Vokes
Sent: Thursday, June 02, 2011 3:23 PM
To: David Taylor
Cc: Robert Lazor
Subject: RE: NDE in fabrciation shops

The only form of NDE interpretation certifications recognized in Z662 is GCSB so this must weigh in on our conversation. If I was the board, I would never accept a persons NDE opinion that is untrained in a formal sense as you cannot prove competence as per 54 (2).

Keystone phase II pump stations completed the NDE for pump station fabrication by hiring our own NDE. They had brought in Acuren to both Cord and Abraxus but I had asked Rob Stewart at the time but he did not know how it came about. We hadn't discussed that whole regulation thing yet and so he didn't understand the nuances of my request at that time.

Shane Watt was the welding inspector for this portion and also reviewed all the film. I did not know the NDE was independent till Shane asked me to visit Cord to confirm that some of the DWSI shots and gamma shots were in accordance to the specification. We had looked at his welding records and NDE records at the time. John Riley, Steve Leong and Richard Coglon had transferred over to Keystone but I don't know how they got around to the independence

I had talked to Frank Tse about what he does for fabrication.
Frank is a NAIT material engineering technologist. He reviews the film but does not audit. Frank carries no formal training beyond what he learned in his post secondary schooling.
I could not round him up today for details

Yesterdays conversation with Fred Kubke was pretty convenient as he confirms, that he is not formally trained but he reviews film and knows what too look for with density and wire sensitivity. Fred was very clear that it is not an audit and was relieved to find out that I had written "review" in my memo. This is what he does when he goes into fabshops but I have never seen tools for reviewing field fabrication film in a TC construction trailer or witnessed a review yet so the assumption is the task must take place in the darkroom.

When we started reviewing Fabrication shops in 2007 I was ignorant of any requirement for independence of NDE as I was working off the old spreadsheets that Gerard gave me. This was permissible for NGTL systems as they fell under ERCB and ABSA rules but we had never expanded the scope of fabrication approvals in any of the provinces that fell under the NEB. The only related check we did was to look at ability to qualify and handle subcontractors The only comment I have made on NDE during a fabrication qualification before is I asked Maloney to hire PT and MT through their subcontracted vendor as the Maloney build vessels had cracked fillet welds on internals in the past. We have reviewed zero NDE procedures as we are only occasionally involved with fabrication. Harry had over a hundred projects and we never issued one hundred different WPS nor did we review and approve hundreds of procedures and technique sheets. The project guidelines are pretty specific about how the welding inspector looks at this but no where is there ever a reference to having a trained inspector look at NDE. It was Crimtech in Red Deer that raised the questions two years ago which is when I found out about the significance of rule 54. Apparently Dave Hodgkinson wrote a memo on this subject that disappeared into the annals of time. This was subsequent to the WestPath ruling but I have never seen this email but from what I gleaned the subject matter was that, " it is not permissible to let any NDE be hired by a construction contractor" and the outcome is that Integrity PMs know that they must hire their own NDE, even for pipe replacements.

There was a very definite reason why the first memo dealt with audit. I know Doug Brunning had submitted two applications to the board for permission to audit Prime contractor hired NDE and he was turned down on both occasions. Either audit is in or out but I cannot be counseled both ways.
It is not an option that has been accepted by the Board so I had included the option in the first memo.

016323

From: David Taylor
Sent: Thursday, June 02, 2011 8:23 AM
To: Evan Vokes
Cc: Robert Lazor
Subject: NDE in fabrciation shops

Please find out how Keystone completed the NDE for fabrication in Canada? Also find out from Harry or Frank what the process is for evaluating the NDE? Do we upon the review of fabrication shops review there NDE sub-contractors and related procedures?

Dave

016324

From: Evan Vokes
Sent: Tuesday, October 25, 2011 10:07 AM
To: Grant Kowpak
Subject: Bison
Attachments: RE: NDT Meeting; RE: old RMS designs; RE: Counter-bore and taper versus back-bevel

Thought you might like to see Bison background emails before I drop the incomplete binder off.
.
What you need to understand from my POV is that Shane is fully aware of what was happening on Bison and made decisions based on this knowledge
Shane was the person pushed to have RTD hired, Shane had Kevin Theisen of Universal Ensco setup the AUT, witness the qualification and approve the setups on behalf of TransCanada. We were able to have some input into the design but that is where it stopped. Although I was sent AUT calibration scan when I was in Mexico, I had never worked with or was trained on the user interface. You cannot tell correctly what is going on without physically being there for the setup before construction starts and that option to witness was never extended to core TC personal.

There was no review of the RTD procedure as Shane assured us would happen, the recommendations on checking the velocity as per the specification was ignored and last communication was to address the issue of wide caps which thankfully they did listen too as they needed this detail. This was the single technical query that ever came out of Bison which was resolved. The point of all of this is the AUT system was setup and approved outside the TC specification without our knowledgeable staff being involved.

The email from Claude shows that he is on the side of quality and was so until Shane quit and Claude left on stress leave. The string shows that Ken Lee of PHMSA initiated it to support the PHMSA advisory on counter bores.. .

There was very little contact with Bison till I got off the plane to be greeted by Claude and Ralf Hoffman and tasked with firing RTD. I had no experience on the new RTD user interface when this started so I was of limited use for the first while but it is hard to fault RTD for a setup that the Bison project approved and never acted upon to correct. What RTD was pretty technically bad, but not to the level of engineering skill demonstrated by the project team. The only thing that didn't happen is we never fired RTD much to the chagrin of some one in the project team as Shaw was lined up before I even got there.

The question now becomes one of what happened to Dan Kelly's reports and why did the project not act upon this. There were a lot of underlying unrecorded incidents that happened as only witnessed by personal that quit or got fired. My point I was making is that when I visited PG Spread 4, I was shown technical queries on NDE by the chief inspector that I told the chief inspector still needed to be sent to the project because that is the correct channel but the answers were technical in nature and should answered in Calgary. I never did see these question but the results were clearly answered in policy that appeared on the pipeline while I was there. I got RTD on the path to improving the quality although it was a pretty rough road and we proved that the welding quality was poor and the oversight was limited when we first came to site. Things were much better on week three.

How could I control a technical process when I have no meaningful input?
How is this different that the current Keystone philosophies?

From: Russell Wong
Sent: Monday, October 24, 2011 8:55 PM
To: Evan Vokes
Subject: Re: Keystone quality

Why u working so late?
Cheers,
Russell
Sent from my Blackberry

From: Evan Vokes
Sent: Monday, October 24, 2011 06:15 PM
To: Grant Kowpak
Cc: Russell Wong
Subject: Keystone quality

Hi Grant

I have run out of time with everything that is going on but still I care so much about what we do. If you follow the string on AUT Audit, I had Russell send me that AUT audit note last week as he did not know what was happening and I needed to get this inspection audit quality issue documented. I suspected that no one was hired for AUT audit so I needed to make sure as it is critical as there was not a requirement for an AUT supervisor audit from the project nor would I ask for one for such a small job. .

This AUT audit response is a complete contradiction to what the guidance of how the project quality management was going to proceed with audit on July 19th. I never had time to follow up with as I have a hundred PMs and the plan was cast in stone. Tom was going to take the lead in Canada and the USA so I was wholly unprepared to deal with their quality management problem right before we kicked off construction. When I have been allowed, I arrange AUT audit on projects but in this case, I was never allowed and Russell was never given permission or kept in the loop. I took it upon myself to arrange for an audit last week, while welding is still going on so the PM Doug Brunning and Russell Wong have not been compromised in our duties. I made arrangements for an auditor on keystone QMs behalf over the weekend.

Russell: I included you as courtesy so you are not surprised when the questions come. Please keep this email to Grant Evan and Russell unless Grant tells you otherwise. Grant may ask you some questions on Keystone quality management and the question of back bevel vs counter bores in USA. Answer honestly about who made the decisions and how they were addressed as he is not out to harm you.

Thank you
Evan

016326

From: Russell Wong
Sent: Monday, October 24, 2011 11:35 AM
To: Evan Vokes
Subject: Fw: AUT Audit - Michels HDD

I am at airport going to reno for conference. This is what I have to deal with.
Cheers,
Russell
Sent from my Blackberry

From: Tom Hamilton
Sent: Friday, October 21, 2011 04:03 PM
To: Russell Wong
Subject: RE: AUT Audit - Michels HDD

Ha Ha Ha.

From: Russell Wong
Sent: Friday, October 21, 2011 4:00 PM
To: Tom Hamilton
Subject: RE: AUT Audit - Michels HDD

Evan does not have time and he was under impression that we would supply our own NDE auditor.

Russell Wong
TransCanada
Ph: 403-920-6716

From: Tom Hamilton
Sent: Friday, October 21, 2011 3:25 PM
To: Russell Wong
Subject: FW: AUT Audit - Michels HDD

Did you ever get an answer from Evan?

From: Russell Wong
Sent: Tuesday, October 18, 2011 10:01 AM
To: Evan Vokes
Cc: Tom Hamilton; Scott Boker
Subject: AUT Audit - Michels HDD

Hi Evan

As you probably know, Michels has commenced welding of pipe for HDD work that was recently completed. Following welding is AUT aspect of it. Scott Boker will be conducting an quality audit at the site soon. Can you advise me who be overseeing audit work for AUT?

016327

I look forward to your response. Thanks

Russell Wong
TransCanada
Ph: 403-920-6716

From: Russell Wong
Sent: Tuesday, July 19, 2011 9:29 AM
To: Evan Vokes
Cc: David Taylor; Tom Hamilton
Subject: RE: Quality Field Personnel (NDE Auitors)

Hi Evan

Thanks for your feedback of the issues surrounding AUT auditors versus engineers/technologists not having necessary skills. And you are right Evan. That is why Tom and I agreed that we will be contracting AUT auditors. I have spoken with Team and UT Quality and they will be willing to provide AUT auditors for full duration of the construction work. We will require 4 auditors for US spreads and each will report into the four QA Lead Auditors. So I believe the next step is to issue RFP to them followed by evaluation of their resumes, probably an interview and then award. I will need to engage SCM as how the RFP process will work or would it be just conversion of the current Canadian contracts to US contract.

Nevertheless, we shall keep you in the loop of our progress.

Cheers
Russell

From: Evan Vokes
Sent: Monday, July 18, 2011 6:06 PM
To: Russell Wong
Cc: David Taylor
Subject: RE: Quality Field Personnel (NDE Auitors)

Hi Russell
The position is for a person in excess of my skill which is a lot harder to find than you would imagine and you wont find this as an E3. In my experience this is the subject area that is least understood by project management but creates more than its share of problems.

Engineers are not normally qualified to ASNT level II or CGSB level II as we generally have to go for the certified ASNT level III due to the practical experience requirement. It is much easier to find CETs that have these level II qualifications. Audit that is acceptable to TC is expected to come from my group Material Engineering for acceptance.

There are two parts to the audit that we need to talk about: a) the technical audit where you need a person who has the technical understanding to follow the requirements of the Audit spec TEP NDT ADT b) an overseeing auditor that can train where needed and can verify that the audit requirements are in fact being followed.

In the USA, there is a pretty small market of suitable AUT auditors in group a) as the auditors tend to be AUT hands that are auditing their friend's relatives etc. this is how we end up with audits that don't take calibrations into account and auditors that do not understand AUT so I would caution that we need to ensure that we need to hire auditors that are good at auditing the particular NDE technique at hand. The shear quantity of Data that is available will preclude looking at very many files so group a) needs to be picked so that each auditor can have a workload at most of about 350 welds a day at a 15% audit coverage. This would be a full time job for an AUT auditor. Any more welds that that and we know they are not looking at the electronic data and in the case of phased array, that means they are not auditing the calibrations, rather just the interpretation.

The second part is the posting shows Keystone is looking for a quality engineer, an NDE engineer and a welding engineer in one person. Even in our specialist group, we would not be able to satisfy your job posting. You will find several engineers and technologists that have offshore experience but there are some real differences with onshore pipelines as we do not make thousands of welds without any changes on wall thickness, types of welding etc. I can send you an engineering resume that meets the description but a technical challenge would find that this person does not understand AUT at all.

016329

The big challenge I see that you must overcome is hiring a person that understands NDE enough to direct the hiring and management of auditors. You might want to limit the scope to this subject as there are not a lot of people that can fit your job description at an E5 or T6 level. For your overall description, the selected person should be able to ensure that the NDE specifications are adhered too and are the data collected is auditable by TC Material engineering. The theory is that Kevin Thiessen does this task of organizing AUT auditors for us as described above. Kevin's qualifications are a good starting point for this job of quality field personnel.

Have a good day
Evan

From: Russell Wong
Sent: Wednesday, July 13, 2011 5:31 PM
To: Evan Vokes
Subject: FW: Quality Field Personnel (NDE Auitors)

Please review.....

From: Tom Hamilton
Sent: Wednesday, July 13, 2011 1:39 PM
To: Russell Wong
Subject: Re: Quality Field Personnel (NDE Auitors)

Well, write it up anyhow.

From: Russell Wong
Sent: Wednesday, July 13, 2011 12:53 PM
To: Tom Hamilton
Subject: RE: Quality Field Personnel (NDE Auitors)

This will be a scope addition to RFP that went to 22 inspection companies. Obviously they will need to be Level 2 ASNT certified with AUT experience. Evan is on holidays and will be back next week. AUT may not be recognized by ASNT. CGSB does not recognize AUT other than someone having UT certification.

From: Tom Hamilton
Sent: Wednesday, July 13, 2011 12:50 PM
To: Russell Wong
Subject: Fw: Quality Field Personnel (NDE Auitors)

Please write up, with Evan's help if you need, a position decription for this role, similar to the welding and coatings auditors. Obviously they will need to be Level 2 ASNT certified.
Thanks,
Tom

From: Tom Hamilton
Sent: Wednesday, July 13, 2011 12:30 PM
To: Russell Wong
Subject: Re: Quality Field Personnel (NDE Auitors)

We will be hiring one per State here in the US regardless of what Ken does in Canada.

From: Russell Wong
Sent: Wednesday, July 13, 2011 12:28 PM
To: Tom Hamilton
Subject: RE: Quality Field Personnel (NDE Auitors)

Typically NDE auditing is handled by Materials Eng by couple of individuals and actual work is often contracted to NDE for auditing.

From: Tom Hamilton
Sent: Wednesday, July 13, 2011 12:23 PM
To: Russell Wong
Subject: Fw: Quality Field Personnel (NDE Auitors)

I discussed this with Stephen this morning.
The NDE auditors need to be added to our team.

From: Tom Hamilton
Sent: Tuesday, July 12, 2011 04:41 PM
To: Stephen Marr
Cc: David Penning; Darryl Sandquist
Subject: RE: Quality Field Personnel (NDE Auitors)

Let's talk about this tomorrow.

It feels natural that the NDE auditors, since they're auditors, should be in the audit organization and not report through the inspection organization, but perhaps I'm missing something?

Tom

From: Stephen Marr
Sent: Tue 7/12/2011 8:00 AM
To: Tom Hamilton
Cc: David Penning; Darryl Sandquist
Subject: RE: Quality Field Personnel (NDE Auitors)

Tom,

NDE auditors were used on Phases 1 and 2, and are included in the inspection organization for each spread on Phase 4, reporting to the Chief Inspector. I just checked with David and he does not call out NDE auditors specifically on his Phase 3 org chart but they are included generically as part of the utility inspector head count.

That being said NDE auditors were omitted from the current RFP for U.S. inspection services – this was an oversight. We could correct that once we have responses from those contractors that would supply field quality personnel (i.e. probably not much point burdening environment inspection companies with a RFP amendment). A position description will need to be prepared.

Steve

From: Tom Hamilton
Sent: Monday, July 11, 2011 1:38 PM
To: David Penning; Stephen Marr
Subject: Quality Field Personnel

During our discussions last week about the makeup of the field quality organization, I understood that there was agreement regarding the provision of a state based team consisting of a quality manager, an OQ coordinator, and quality auditors for coatings and welding, and one for other pipelining tasks.

I think it would be prudent to add to that list an auditor for NDE, in light of our intentions to have the NDE contractor report directly to the prime Contractor.

Your thoughts?

Tom

T.A. Hamilton, P. Eng.
Manager, Quality and Compliance
Keystone Oil Pipeline
Office 403.920.5649 | Cell 403.827.3846
tom_hamilton@transcanada.com

From: Robert Lazor
Sent: Monday, September 26, 2011 5:41 AM
To: Evan Vokes
Cc: David Taylor
Subject: RE: Braeside vessels

Please provide the meeting minutes from the Braeside meeting.

Related to UT, are we now going to have to have a witness for all manual UT? Who will do the witnessing, a Level II or Level III? How can this cost be justified?

Where is the deficiency in the inspections for the Braeside vessel? Which clause in TES-MATL-PV1 did they not follow for inspection?

Related to code requirements, the manufacturer should have a clause in their Quality Manual stating that they have reviewed the new Code edition and that they have made the necessary changes to their QA program if necessary.

Prequalified NDE Contractors - From previous conversations, I know that you are not prepared to review and qualify all NDE contractors. What do you propose can work to your satisfaction? You have to keep in mind that many inspections are in remote areas and in many instances you cannot get an NDE company to travel a day in each direction to do one or two welds. Can we not rely upon CGSB or ASNT qualifications for certain weld categories?

What is happening with the re-inspection of the Braeside vessels? Please pass along their re-inspection reports?

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From: Evan Vokes
Sent: Thursday, September 22, 2011 4:30 PM
To: David Taylor
Cc: Robert Lazor
Subject: RE: Braeside vessels

I am put in between a rock and a hard place but what we are looking at is a code violation that we never caught during the inspection process. This is a serious issue and is not likely a single vessel and its not the first time.

First some recent background.
The evidence from the V202 and V203 inspection reports Edson Gas storage showed that all the Cat D nozzles were inspected with manual ultrasonics in 1 hr. During the refurbishment, Andrew from TEAM took the more than an hour to scan a single 2 inch cat D with a K bevel. The 24 inch Cat D took more than 2 hrs to do a single side when one side was already inspected. At the post mortem meeting after Edson gas storage, one of the important items that was "dictated" was this lack of inspection problem was not to happen again . The only way we can ensure traditional manual UT scan results is to physically witness the scan. The assurances were put forward that it would not happen and today we are having this conversation.

The evidence from the inspection reports from Braeside show that four Cat D nozzles were inspected in ½ hr with the wrong calibration block. These vessels are only welded from the outside so thickness is not the problem, but the geometry is still hard to work with. Within this ½ hr two indications were evaluated and since Cat Ds are slow to inspect so I fail to see how IRIS could repeat these results. The subsequent inspection with by a second technician showed one nozzle inspected in one hour so that time line would not have been to far off if it was a code compliant inspection. Regardless of

016333

how many years IRIS has been in business, IRIS had two different inspectors on two different occasions perform inspections that did not meet code. My understanding is that Bill Yang will have to inform ABSA of this inspection failure as ABSA has their QC manual.

In the past, apparently NOVA had a dedicated inspector that looked at Cat D nozzles but currently the methodology is that ABSA QA manual puts inspection responsibility in SMS care who sends a 3PI request to Moody whom is supposed to witness. As per the SCL Moody never made a site visit and even if they did we would probably still have non-code compliant Cat D nozzle inspection problems exactly the same as we have now as there was no mandate to ensure quality of this weld type.. Moody did not conform to the requirements of SCM SCL documentation and their audit did not reveal any shortcomings. The OPR requirements for section 15 are in effect for pressure vessels under the material program; the provinces only administrate them so did the delivered vessel have a sufficient quality assurance system to meet the material specification and code of construction.

Under the category of how we inspect vessels, we have a witness point for a four hour hydrotest that has a chart recorder but we don't have a witness point for the Cat D manual ultrasonics that have proven to be a problem in the past. By way of comparison of how other manufacturers handle this inspection, Maloney specifies Sectoral Scan for Cat D so there is permanent interpretable record and it is way faster. If TransCanada does not want to witness to ensure quality requirements imposed by NEB are met, then TransCanada needs an interpretable record for ultrasonics so we can audit. However, we don't dictate how our manufacturing shall inspect Cat D nozzles regardless of whether by manual UT or Sectoral Scan. We are farther ahead to witness Cat Ds and audit the pressure test, as we proved that we at least have auditable pressure test results.

The re-inspection of the vessel through Harry's program was the quickest response and the most reasonable for the company so Jim could get to get a code inspection before it went to the field and Peerless agreed to this in the meeting. This item is in the meeting minutes and to my knowledge has already happened. If code rejectable indications are found, there may be a dispute but Peerless knows they can witness the inspections and the vessel would have to return to Braeside for repair anyways.

The TransCanada TES MATL PV1 contains a promise to the board is to inspect the Cat D nozzles. The question is did we achieve the goal of OPR 99 section 15? There are only yes or no answers for goal oriented regulations.

From: David Taylor
Sent: Thursday, September 22, 2011 7:35 AM
To: Evan Vokes
Cc: Robert Lazor
Subject: RE: Braeside vessels

See my comments below;

There are steps you need to take within my comments. Please confirm you have address them.

Thank you

From: Evan Vokes
Sent: Friday, September 16, 2011 3:35 PM
To: Jim Platt; Greg Szuch; Ross Ennion
Cc: Cindy Guan; David Taylor
Subject: Braeside vessels

To follow up on our action items from the Peerless meeting
We need to inspect the nozzle quickly to get your vessel on site and we need to make sure any other vessels on Gold Creek or other compressor stations that have been accepted since Jan 2011 were inspected correctly. Moody did not perform this review of UT function well as an auditor, so I might find someone else to look at this and we might be able to get Sal, Evan or Dave H to look at this if there are not too many.
- Are we now having an inspector sit and watch every CGSB Level II UT operators that are completing a manual UT weld examination?

Ross, can you find someone to generate a list of vessels and find the inspection records as that is key. - Good to have SCM find out who they order from – should also recommend that they request the manufacturer to confirm the new code requirements were met (in writing)
If we have to quarantine vessels this should happen sooner than later.

I have never received a SIQ to qualify IRIS and therefore we cannot have them on our site so I suggested that Greg drop the problem in Harry Fenton's program as he has the resources to arrange removal of the coating and have it inspected with a prequalified vendor. – I do not agree with this approach – we need to find a solution that is reasonable for the company. Did we tell the manufacturer that they needed to use our pre-qualified contractors before this work was done? Evan you need to look for an alternative approach; IRIS had been doing this type of work for years. Also you can generate a SIQ to complete a review or even complete a project specific review to avoid re-work.

I can help technically but I don't think you will need too much of a hand as it is not that difficult to do and we can back-charge Peerless for this and they agreed. – TransCanada may be able to back charge some reasonable costs back to the manufacturer – the key is the costs have to be reasonable and justified.
The trick is since there is no record produced in a manual UT scan, someone needs to witness the inspection is performed with the correct block and the indications are acceptable. I suggested Harry's program as Frank Tse is the perfect resource. – See my comment above – what you are now dictating is that all (100%) of manual UT scans needs to have an inspector present to confirm they actually did the work (inspecting the inspector) – Is that a reasonable approach? Is it needed? I am not convinced!

The only solution if rejectable indications are found is to ship this vessel back for rework but the good news is there is no PWHT on this vessel so than makes life a lot easier. If there are rejectable indications, I would expect that Lorne Spate at Braeside may ask to see the indications or alternately he will reexamine them at his shop so make sure you have closed the repair issue and it is finalized before it is shipped back. Bottom line, make sure you have confirmation in writing from Peerless and Braeside before any return as there is enough evidence that the schedule may drag. – What really should be happening is that Braeside and Peerless should arrange for the inspections to be completed. If in fact these were completed incorrectly they are responsible to arrange for the appropriate inspection not TransCanada. By ensuring they do the inspections you avoid any argument about whether the weld is acceptable or not.

From: Evan Vokes
Sent: Friday, August 05, 2011 5:52 PM
To: Sukhi Gill
Subject: RE: NDT vendors

They are but what happens is the setups are highly technical so we require that they prove the setups before they go to the field.
This normally takes a couple of days but the last one was one week.

They got the cal blocks Thursday afternoon so this is a record time to take the new blocks, bring in operators and I have never seen one setup work the first day yet and the truck is scheduled to leave Sunday. If we cant make it work, it looks like the failure is in my Team but really it is in projects

This is why I am so jaded as TC project management just cant get that physics is always the same. We cannot contract, legislate demand that gravity change. It always remains the same
Similarly Materials welding and NDE always require the same care on every project or schedule does not work.

You could see the trail of broken glass since the ground birch ECA submission last year, it keeps getting worse. I think they are trying to tell us we have a gravity problem but it doesn't seem to be working

Time to change management philosophies in my opinion

From: Sukhi Gill
Sent: Friday, August 05, 2011 5:35 PM
To: Evan Vokes
Subject: RE: NDT vendors

Evan,

I thought UT Quality was qualified??

From: Evan Vokes
Sent: Friday, August 05, 2011 5:32 PM
To: Sukhi Gill
Subject: RE: NDT vendors

I am scared to death of this weekend as if UT Quality fails and is not ready and Gordondale will not have approved NDE for welder training
Any idea where the responsibility will lie?

From: Sukhi Gill
Sent: Friday, August 05, 2011 5:22 PM
To: Evan Vokes
Subject: RE: NDT vendors

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Haha, we can figure it out on Monday. Have a good weekend Evan!

From: Evan Vokes
Sent: Friday, August 05, 2011 5:07 PM
To: Sukhi Gill
Subject: RE: NDT vendors

Ians out of office is till August 12
This could be fun

From: Evan Vokes
Sent: Friday, August 05, 2011 2:05 PM
To: Sukhi Gill
Subject: FW: NDT vendors

From: Evan Vokes
Sent: Thursday, July 28, 2011 6:08 PM
To: Sandy Situ; Darin Tucker; Adam Phillips
Cc: Harry Fenton; Salvatore Delisi; Hiran Ganguli
Subject: RE: NDT vendors

Hello Sandy Adam and Darin
This is not a new legal requirement but finally we will conform to the Canadian OPR regulations. Additionally; Inspection, of which NDE is an inspection method, is a covered Engineering task under our permit to practice Engineering and was always required to be hired for our Joining program under OPR 99. What we are ordering in fab shop NDE is a service that falls under engineering practice and often has additional engineering requirements to meet our Joining Program commitments to the NEB.

There is a problem with the NDE Company listing in the email string below.
The SCM listing below were in place for the integrity dig programs. As an example, we do not use MFL in fab shops. Unfortunately there are a smattering of SCM listings in the database is giving me grief so we put effort into developing a more comprehensive NDE listing.
The description of the current NDE listing is attached in Gina's email. (I need to have NDT changed to the official title NDE).

I did intentionally list the commodities in a general sense as the commodities are used in every area of TC business units and fabrication is just one area. If we are looking for specific commodities such as fab shop RT under NDE, this will show up as a shortcoming but if I search a RT vendor and consult with the engineering standard, the database becomes self regulating with the commodities that are listed. For instance, the database lists RT but the engineering specification requires X ray and Gamma so if an RT vendor cannot offer X ray services, they cannot do the work so it balances out. For this reason, we need Engineering standards in all NDE contracts with the clause that they will be updated from time to time. A similar thing if we need pipeline Xray with a crawler as some companies will never offer this service but many do. This will keep a requirement for Projects SCM and Engineering to communicate regularly.

The goal for NDE must be to keep a list of vendors that are qualified for commercial purposes, safety and technical competence so we do not have PMs that bypass the system and run us into compliance problems.

I have been preparing for this inevitable time and now there are 3 applicable vendors we can write a blanket fabrication contract with right now in the database
-Acuren
-TEAM
-RTD

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All of these vendors have national coverage sutiable for fabricators which is what we need at this time. I need to get more NDE vendors into the database but in the meantime; WAV is a local shop in brooks that cannot supply the sort of fabrication shop service I am looking for in a general fab shop service contract. If there is another vendor that anyone would like to use, lets get SIQs issued so we can get these problems cleaned up.

Soon we have several NDE entities in the USA that we are working on as well and hope to have exactly the same database accessibility.

Let me know if there is anything you need from me
I am not going to be here on Tuesday but I will be involved with this.

Have a good day
Evan

From: Harry Fenton
Sent: Thursday, July 28, 2011 8:22 AM
To: Evan Vokes
Subject: FW: NDT vendors

Hello Evan,

When you get some time we need to discuss how to get Supply chain on board for a plan to hire NDE companies directly. See below & give me a call when you can.

Harry
780-962-7345

From: Sandy Situ
Sent: Thursday, July 21, 2011 3:15 PM
To: Darin Tucker
Cc: Harry Fenton; Hiran Ganguli; Adam Swallow
Subject: RE: NDT vendors

Hi Darin:

After speaking with Harry on the phone with regards to the "new" requirement/initiative as per Adam's original email, my understandings are as follows:

- Current process is that shop fabricators hires & schedules NDE vendors on their own to perform shop work where TC just pay the fabricators only.
- New requirement is to have TC in control of the NDE vendors that the shop fabricators are utilizing and TC to take care of the invoicing and payment of the NDE vendors instead of the fabricators.
- Harry and Hiran is working towards a processes where the new initiative can be put in place and is in need of process in put from supply chain to best work this out.

I have suggested that if the shop NDE vendors are to be used on a regular basis that the best approach is to have contracts with these vendors where work can be release under blanket contracts. Because it will be the shop fabricators that will be doing the scheduling, SCM will not be hit with the requisition for this work till after the fact which makes having a contract in place with the vendor even that much more important in terms of risk exposures. As my departure from the group draws near, I have suggested that Harry and Hiran to be in touch with you with regards to coming up, together, a process/plan to best approach this new initiative. Please advise your thoughts as Harry and Hiran looks forward to hearing your thoughts.

Thank you,

Sandy Situ, Contract Analyst
Supply Chain Management, Canada
TransCanada PipeLines Limited
450 - 1st Street SW
Calgary, AB T2P 5H1
Phone: 403.920.2810

From: Sandy Situ
Sent: Wednesday, July 20, 2011 8:39 AM
To: Adam Swallow
Cc: Harry Fenton
Subject: RE: NDT vendors

Hi Adam:

NDT Suppliers we have contracts with and their scope are as per below:

7913 Acuren (SCC & MFL, and the reporting of the two)
8236 WAV (SCC & MFL, and the reporting of the two)
3931 RTD (SCC Corrosion, DAP and Radiography)

Thank you,

Sandy Situ, Contract Analyst
Supply Chain Management, Canada
TransCanada PipeLines Limited
450 - 1st Street SW
Calgary, AB T2P 5H1
Phone: 403.920.2810

From: Adam Swallow
Sent: Monday, July 18, 2011 3:53 PM
To: Sandy Situ
Cc: Harry Fenton
Subject: NDT vendors

Sandy,

Can you put together a quick list of NDT vendors we have under contract and also note if they perform both field and shop work? There is a "new" requirement coming into effect for shop fabricated work and how the NDT services are sourced. This will most likely have a decent sized effect on the spend against your contracts.

Thanks,

Adam Swallow, B.Comm
Contract Analyst
Canadian Supply Chain Services
TransCanada
450 - 1 St. SW
Calgary, AB T2P 5H1
Ph: (403) 920-6701
adam_swallow@transcanada.com

From: Al Drew <aldrew@telus.net>
Sent: Wednesday, August 03, 2011 6:45 PM
To: Evan Vokes
Subject: Re: South Lateral Line Lowering and Cut Out Project (NPS 24)

Yes, would you please send me the spreadsheets for Welder Qualification Test Report, Manual Weld Parameters, and Piping Report (4 weld if possible). I have these spreadsheets from the Keystone Conversion project but I don't know if they are still valid and some of the cells are locked. Thanks
Regards
Al
From: Evan Vokes
Sent: Wednesday, August 03, 2011 5:15 PM
To: Azmina Dhalla ; aldrew@telus.net
Cc: Robert Lazor ; Rick Ostrom ; Chris Penniston ; David Booth
Subject: RE: South Lateral Line Lowering and Cut Out Project (NPS 24)

I can give you some philosophy on this one Azmina and Al

With the previous points, qualification on the E8010 electrode is essential as welders trained on E6010 often undercut the roots when they switch to E8010 without practice. This will increase your likelihood of a high rate of weld rejection which adds to the schedule time and hard feelings because the welder has never been called for undercut before. The physical meaning is when we use E8010, an untrained welder will likely increase the amount of undercut and RT can find undercut very well. If you are unfamiliar with the E8010 defects, rod angle and technique are very important and Rick can give pointers of how to prod the contractor if undercut shows up in the roots at qualification. We have had some interesting cutouts due to this small detail so it is in the spec to make execution smoother. Nothing quite matched the happiness of having one projects 14 week lead eccentric reducer mangled by a welder that had never burned E8010 before. Much easier to spend some time on welder qualification and have one RT shot per production weld.

These production problems are the spirit and intent of the specification as many of these specification points are good engineering practice but more importantly an oversight on points in the specification may affect schedule. We know that the contractor does not get paid for repairs but it is just a drag on the whole project as everything lags and costs always increase. This is very similar to why we want temporary welds for hydrotest examined as it costs a lot of money and time if we blow one out and we cannot replace time or lives.

Always remember that the TES WELD PL is our promise to the board so when a project is audited, the code and the TC specification must be complied with entirely. Welder qualification parameter records and production parameter records are a good place to start so make sure that V, A and ts are recorded. (we can send a spreadsheet if you want) If you can't comply with the spec for some reason, please send us in the variance form ASAP so we can deal with the problem rather than visit the board for non-compliance issues later.

It is not a code or specification requirement but we cant tell what the mechanical properties of the final tie in weld by NDE and this weld is not strength tested. We can use proof by reference by using the closure weld parameter form as a good way of proving due diligence on the mechanical properties of a final tie in weld. We didn't want to promise the board we will do this in our spec as it is too easy to be found in noncompliance but it is still good practice.

Just double check to make sure that TEAM brings an X ray tube before they get to site as too often, the dispatcher is more versed at herding cats than the practice of NDE and sends gamma as they don't understand the technical difference. I recommend that you use the word "tube" in your conversation so they understand. Jason knows what is required, it is just the dispatcher I am worried about and I always hate to get the resulting phone call.

OPR 99 rule 53 states "shall audit" but does not give us any specific requirement. I would recommend that you pick one of: digging, welding, nde or coating and have the relevant engineer/tech visit to get an audit record. If you want to desktop

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NDE Audit of RT film to meet the audit requirement, I can arrange that for you. With your watercourse location, someone that looks at geotech is a good audit idea as well.

Hope this helps

Evan

From: Chris Penniston
Sent: Wednesday, August 03, 2011 4:07 PM
To: Rick Ostrom; Azmina Dhalla
Cc: Robert Lazor; Evan Vokes; 'aldrew@telus.net'
Subject: RE: South Lateral Line Lowering and Cut Out Project (NPS 24)

The only thing I would add is we should qualify PLASSE-15-RP as well, since this uses an uphand root as opposed to the downhand root of PLNEW-16.

In addition, the wording of TES-WELD-PL 7.1 (c) "The following changes from the conditions used in their test weld shall necessitate re-qualification of the welders:" (v): "Change of consumables within the same electrode covering but different strength class. i.e. same ASME F grouping, E6010 to E8010". This would seem to imply that PLASSE-14 should also be qualified since it uses a E6010 root rather than the E8010 of PLNEW-15.

That being said, I would be inclined to allow PLNEW-15-ML to qualify for PLASSE-14-ASSY due to their general similarities.

Chris

From: Rick Ostrom
Sent: Wednesday, August 03, 2011 3:58 PM
To: Azmina Dhalla
Cc: Robert Lazor; Chris Penniston; Evan Vokes; 'aldrew@telus.net'
Subject: RE: South Lateral Line Lowering and Cut Out Project (NPS 24)

Azmina,

Regarding your first question, I have removed wording within our TES-WELD-PL and CSA Z662 to give an explanation. Our specification states that we will follow the requirements stated within CSA Z662. Please refer to the note below within 7.8.1.3 within CSA Z662

"Check tested" will be a re-qualification.

Our TCPL specification TES-WELD-PL states;

7.1 General, (g) The Company may exempt from qualification welders who can produce proof of

current qualification for the Work in accordance with the requirements of CSA Z662

Clause 7.8.

CSA Z662-07 states;

7.8.1.3..... Welders continuously employed by a company and regularly making welds shall be required to requalify at

intervals of not greater than 2 years. Welders not so employed shall be required to requalify at intervals not

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greater than 1 year.

Note: *Notwithstanding the requirement for requalification at intervals of either 1 or 2 years, company-employed welders who have not made welds for a period in excess of 3 months since they last qualified should be at least check-tested.*

Regarding welder qualification tests, each welder will be required to qualify with a pipe to pipe procedure weld and a repair procedure weld.

Pipe material grade or CE are not essential variables with respect to welder qualification, but as the qualification pipe (new pipe) is grade 483 and carbon equivalent comes into effect, please qualify using each of; PLNEW-15-ML and PLNEW-16-RP.

They do not need to qualify with each of the WPDS provided.

Robert, Chris, Evan…anything to add?

Rick Ostrom

TransCanada Pipelines

Engineering and Asset Reliability

Office: 403 920 7971

Mobile: 780 996 9678

From: Azmina Dhalla
Sent: Wednesday, August 03, 2011 1:36 PM
To: Rick Ostrom
Cc: Robert Lazor; Chris Penniston; Evan Vokes; 'aldrew@telus.net'
Subject: RE: South Lateral Line Lowering and Cut Out Project (NPS 24)

Hi Rick,

A few question from our welding inspector:

- If the welders were tested this year on the same procedures, do they have to be re-tested?

- Does each welder have to be tested on all 4 of the procedures?

Thanks,

Azmina

From: Rick Ostrom
Sent: Tuesday, May 31, 2011 1:58 PM
To: Azmina Dhalla

Cc: Robert Lazor; Chris Pennlston; Evan Vokes
Subject: South Lateral Line Lowering and Cut Out Project (NPS 24)

<< File: South Lateral Line Lowering and Cutout Project.doc >> << File: PLASSE-14-ASSY.pdf >> << File: PLASSE-15-RP.pdf >> << File: PLNEW-15-ML.pdf >> << File: PLNEW-16-RP.pdf >>

Azmina,

Attached are the welding procedure data sheets (WPDS) to be used for welding construction for your project.

Also attached is an outline of the application for each WPDS.

Have you selected a construction contractor as of yet?

Please call Robert, Chris or myself if you have any questions.

Regards,

Rick Ostrom

TransCanada Pipelines

Engineering and Asset Reliability

Office: 403 920 7971

Mobile: 780 996 9678

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From: Evan Vokes
Sent: Friday, May 27, 2011 6:02 PM
To: Patricia Zuczek
Cc: Maja Bruggencate
Subject: RE: Harbour Landing - Fabricator NDE

Hello Patricia
No update on the Fabshop inspection as that will be next week but we can deal with the audit.

I found out that subsequent to the Westpath ruling, in accordance with the OPR 99 guidance notes, one project manager had applied twice to have the prime hire the NDE and TC would audit according to TEP NDT ADT. Of the two applications, letting the prime contractor hire NDE with a TC audit was turned down on both occasions and that was several years ago. With this many project managers, I am pretty sure that more than one project manager has applied for permission but I always seem to be kept in the dark until someone needs help desperately.

The board does not object to the audit procedure TEP NDT ADT and has accepted it for rule 53 compliance numerous times. To my knowledge the only audit of Prime Contractor hired NDE the board accepted was the one Dave Hodgkinson did to resolve Westpath. Unless someone can produce evidence to the contrary, the response is that the board has only accepted TEP NDT ADT for internal use only.

From a purely engineering point of view, If you want to know where the line of what fabrication is in Canada, it shows in the code of construction.
The intent of the regulation rule 16 joining program is to cover activities governed under Z662 of which NDE in rule 17 belongs.
Fabricated parts are built under Z245, ASME VIII, API 5L and other codes fall into rule 14 in OPR99 where we are required to have a sufficient quality plan as per rule 15 and as such do not constitute part of our joining program.

For the joining program the fabrication and inspection of the pipeline is clearly Z662 so that is not in dispute.
The problem occurs when we use ASME codes of construction and there are two cases.
Fabrication of pipeline assemblies is under Z662 which allows the use of ASME B31.3.
Fabrication of a compressor station is still under Z662 which allows the use of ASME B31.3
There is no exemption for ASME B31 code of construction as they do not meet the intent of the rule 14 materials program.

Have a good day
Evan

From: Patricia Zuczek
Sent: Friday, May 27, 2011 10:40 AM
To: Evan Vokes; Maja Bruggencate
Subject: RE: Harbour Landing - Fabricator NDE

Thanks Evan, can you please update the attached document (using track changes) to include the appropriate wording regarding inspection? Maja can then review and provide comments.

Also, what is the audit document that was turned down by the Board? In the attached response TEP-NDT-ADT is referenced and I want to make sure that we are not referring to a document/process that is known to be rejected by the Board.

Thanks, Patricia

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From: Evan Vokes
Sent: Friday, May 27, 2011 9:53 AM
To: Maja Bruggencate; Patricia Zuczek
Subject: RE: Harbour Landing - Fabricator NDE

As Harry knows, in my professional opinion this fabrication procedure doesn't meet the regulation and as Lockerbie and Hole pointed out, the fabricators that do work for other NEB regulated businesses know we are not in compliance.
Note that the 3PI does not make sure that our RT specification is followed in the following claim. I know this to be true as there is no test shot for the problem at L&H last week
To me, it is proof that the problem is systemic when the board has ruled against it.
As a PEng, if I counsel you to follow the status quo when I know it does not meet the rulings of the board, then I would be complicit of an offence.

Like I told Sanam yesterday, everyone in Hollywood wants the cool chants and neat bracelets but no one wants to do the hard work of compliance with Kabbalah.
Pretty similar to TransCanada where we have cool statements of compliance but we don't make any attempt

I have Acuren and TEAM on the approved vendor list and am finishing up two more NDE contractors.
If you are having your fab done at L&H they use TEAM so you can arrange to directly contract and pay TEAM as L&H can schedule the work.
I believe Abraxus uses TEAM as the default as well.

From: Maja Bruggencate
Sent: Thursday, May 26, 2011 2:54 PM
To: Evan Vokes; Patricia Zuczek
Subject: FW: Harbour Landing - Fabricator NDE

Below is the answer I've received. Please let me know if you have any questions.

Thanks,
Maja

From: Nathan Burgess
Sent: Thursday, May 26, 2011 9:20 AM
To: Maja Bruggencate
Subject: RE: Harbour Landing - Fabricator NDE

Hi Maja,

The short answer is the fabricator hires a subcontractor to do the NDE; TransCanada does not specify who the fabricator will use. This is standard practice across all our fabricators; Abraxus, Triton, Lockerbie & Hole, etc. TransCanada's third party inspector ensures the NDE is qualified via the fabricators quality manual which is approved through ABSA. The process varies when the prime contractor subs out the fabrication.

Nathan Burgess, EIT
TransCanada Pipelines Ltd.
Phone: 403.920.6647

From: Maja Bruggencate
Sent: Wednesday, May 25, 2011 12:53 PM
To: Nathan Burgess
Subject: Fw: Harbour Landing

From: Patricia Zuczek
Sent: Wednesday, May 25, 2011 12:49 PM
To: Maja Bruggencate
Cc: Robert Lazor; Joel Forrest; Evan Vokes
Subject: RE: Harbour Landing

Maja, can you confirm fab shop NDE for Harbour Landing?

Thanks, Patricia

From: Evan Vokes
Sent: Wednesday, May 25, 2011 11:12 AM
To: Patricia Zuczek
Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Patricia
I have been looking at the OPR rules a lot lately and we do not make the claim that we hire the inspection independently as per s. 54 OPR99
What TC have written does not make a specific claim about how the inspection is hired but there is a bit of a catch and you could get asked to prove compliance with this letter.
I did not make a reference to it as I could not make this independence claim until the fabshop NDE was confirmed.

The background
The good folks in meter stations let the genie out of the bottle on s.54 on inspection and closure welds and it is only a matter of time till the in depth inspection comes just like the board did for Cutbank after the Groundbirch submission. My view is they caught us on Groundbirch WPS and then waited for a new project and then they went in depth with WPS review. I don't know if they will revisit the hydrotest at Kearl as it is in the code not the regulation but compliance with s54 is the new question and if we do not hire NDE in the fabrication shop we are in noncompliance as per the board ruling at Westpath.
Further to the Westpath ruling, TC developed the Audit procedure to achieve the conditions of the OPR 99 guidance notes which was confirmed last week as not accepted by NEB for the prime hiring NDE on two occasions by a single project manager. I know the board has to have rejected the audit procedure in lieu of direct hiring the NDE more than twice as we have more than one project manager.

If the fabshop hires NDE, I still object and suggest we at least pay the NDE to overcome the boards concerns. Only Keystone and our competition KM, Enbridge comply with this regulation.
We seem to be on the path of begging forgiveness more than asking permission because we do not like the answer and the problem keeps getting worse.
The ship ran aground twice last week while we are playing a word games on independence but we haven't got the message that we need to control our process.

You can send the letter to the board in this form and it may be accepted but it might not be as well in which case we will have to brush up our act.

From: Patricia Zuczek
Sent: Wednesday, May 25, 2011 10:26 AM
To: Evan Vokes

Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Evan,

Does the fab shop NDE affect the wording in the document? I've attached the latest draft.

Thanks, Patricia

From: Evan Vokes
Sent: Tuesday, May 24, 2011 12:06 PM
To: Patricia Zuczek
Cc: Robert Lazor; Maja Bruggencate
Subject: RE: Harbour Landing

Hi Patricia
This is way too early in the process to have inspection designs
We need a contractor first.
Please check with Maja as the document was sent Aril 27th but it contained a question on fab shop NDE that needs to be answered.

Have a good day
Evan

From: Patricia Zuczek
Sent: Tuesday, May 24, 2011 9:41 AM
To: Robert Lazor; Evan Vokes
Subject: RE: Harbour Landing

Robert, I never received the Inspection Designs from Evan. I am planning to file our response with the Board on Thursday at the latest. Please let me know if I can expect to receive these within the next day.

Thanks, Patricia

From: Robert Lazor
Sent: Wednesday, May 04, 2011 6:05 PM
To: Patricia Zuczek; Evan Vokes
Subject: RE: Harbour Landing

Patricia,

I apologize for not getting back to you sooner. I had put this aside when I became stalled putting together some of the supporting pdf files, and only this afternoon have I had the chance to finish this.

The attached files include the Joining Program and Nondestructive Examination Plan.

James had sent you the Materials and QA practices. I am assuming that Vivian has sent you the Pressure Testing Program.

Please let me know if you require additional details.

Evan,

Have you provided the Inspection Designs?

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From: Robert Lazor
Sent: Wednesday, May 04, 2011 10:45 AM
To: Patricia Zuczek
Subject: Re: Harbour Landing

Will get back to you this afternoon

From: Patricia Zuczek
Sent: Wednesday, May 04, 2011 10:42 AM
To: Robert Lazor
Subject: RE: Harbour Landing

Hi Robert,

I have only received information from James for the Harbour Landing project. Will the other information be coming soon?

Thanks, Patricia

From: James Ferguson
Sent: Friday, April 29, 2011 4:01 PM
To: Patricia Zuczek
Cc: Robert Lazor
Subject: RE: Harbour Landing

Hello Patricia,

It might be best if we could get an example from another recent project (i.e. Horn River) just to see how they word the response.

In terms of specifications for the pipe and fittings to be used on the site:

14. A company shall develop specifications for the pipe and components to be used in the pipeline and shall submit them to the Board when required to do so.

TransCanada has several specifications depending upon the commodity. These are the applicable materials specifications for the Harbour Landing Pipe Replacement Project:

- Pipe
  - TES-PIPE-SAW, which has requirements in addition to those of CSA Z245.1;
- Fittings
  - TES-FITG-LD, which has requirements in addition to those of CSA Z245.11;
- Flanges
  - TES-FLGE-LD, which has requirements in addition to those of CSA Z245.15;
- Valves
  - TES-VALV-LD, which has requirements in addition to those of CSA Z245.12;

NOTE: All of these specifications apply for larger diameter componenets (i.e. NPS 16 and above), and all of these should already be on file with the NEB. If it is below this size, then TransCanada has different standards, as outlined in TES-MATL-MD1.

15. A company shall develop a quality assurance program for the purpose of ensuring that the pipe and components to be used in the pipeline meet the specifications referred to in section 14.

TransCanada has a Quality Management System for Pipeline Projects (QMS), TED-QMS-MAN. The relevant Clause of the QMS is Clause 7.4, which is copied below:

7.4 Purchasing, Manufacturing and Transportation

7.4.1 Purchasing Process

Pipeline Projects and Engineering ensures the appropriate specifications (industry standards and Company) are provided to Supply Chain Operations and Commercial Support for purchasing the specified materials and inclusion in the design and construction contracts.

Engineering. Supply Chain Operations and Commercial Support ensure the commodities (materials and services) purchased conform to specified requirements. The type and extent of control applied to the suppliers and the purchased commodities is dependent on the effect of the commodity on the pipeline project's ability to meet Customer Requirements.

7.4.1.1 Supplier Qualification

Supply Chain Operations coordinates the supplier qualification process, with the exception of that used for construction inspection services. Suppliers are evaluated and selected based on their ability to supply materials and services in accordance with Company technical requirements and their capability regarding safety, finance and quality. The goal of the qualification process is to identify and approve suppliers, and ensure there are an adequate number of suppliers in each commodity (materials and services) area.

For commodities requiring a technical evaluation (i.e., where a Company specification exists or for services considered strategic) Engineering or other appropriate technical areas are responsible for the technical evaluation procedures and any supporting documents such as technical questionnaires. For example, Pipeline Projects is the technical area responsible for the qualification of construction contractors.

Supply Chain Operations is responsible for maintaining the list of commodities requiring technical evaluations and the responsible technical area, maintaining the supplier evaluation forms and maintaining the records related to supplier evaluations and qualification status.

Construction Management Services is responsible for the process related to sourcing and selection of site construction and inspection personnel. These personnel are evaluation and selected based on their qualifications and experience and their ability to fulfill industry and Company specified inspection requirements.

References to supplier qualification procedures, including the criterion used are referenced in the QMS Procedures.

7.4.1.2 Pipe

Engineering and Commercial Support ensure high quality pipe material is manufactured and delivered to construction sites by utilizing sound engineering practices and quality assurance activities including:

a) Pipe mill assessment and qualification

b) Pipe standards and Company specifications

c) Preproduction and specification review meeting

d) Third party surveillance

e) Pipe qualification tests, supplier certification of conformance to specified requirements

f) Pipe handling, transportation and stockpiling specifications

7.4.1.3 Components

Engineering and Supply Chain Operations ensure high quality components (e.g., fittings, flanges and valves) are manufactured and delivered to construction sites by utilizing sound engineering practices and quality assurance activities including:

a) Supplier assessment and qualification

b) Preproduction and specification review meeting when introducing new product or where Company Specifications have been revised

c) Third party surveillance

d) Supplier certification of conformance to specified requirements

e) Component and fabricated assembly testing and physical verification, status and final reporting

f) Component and fabricated assembly handling, storage, packaging, preservation and delivery specifications

016350

7.4.2 Purchasing Information

Pipeline Projects provides materials purchasing information for the pipeline project to Supply Chain Operations and Commercial Support.

Supply Chain Operations and Commercial Support, with support from Engineering, ensure purchasing information describes the products and services to be purchased, including where appropriate:

a) Requirements for approval of product, procedures, processes, and equipment

b) Requirements for qualification of personnel

c) Management system requirements

The adequacy of specified purchase requirements are ensured prior to their communication to the supplier by performing technical and commercial reviews. Prior to order placement, purchase order data is reviewed for commercial accuracy by Supply Chain Operations and Commercial Support. Purchase order technical data for components (including catalogue descriptions) are reviewed by Engineering for accuracy. Pipe and component order technical requirements are also reviewed with the supplier at a preproduction and specification review meetings as required. Additional details regarding purchasing information for pipe and components are included in the QMS Procedures.

7.4.3 Verification of Purchased Product

Suppliers of pressure containing and engineering components are required to maintain registered quality systems (i.e., ISO 9001, etc.) and are responsible for product quality. Supply Chain Operations and Commercial Support, with Engineering's support, verify its suppliers' capability to produce quality products by implementing surveillance activities at the supplier facilities during product manufacture.

Where Supply Chain Operations intends to perform surveillance at the supplier's premises, the intended verification arrangements and method of services is stated in the purchasing information to the supplier. This is confirmed and acknowledged with the supplier during the pipe order specification review and preproduction meeting. This is also reviewed and acknowledged with the supplier for the component order during the preproduction meeting if new product/ special order or review of revised Company specifications is being specified.

Please let me know if you have any other questions.

Sincerely,

TransCanada
In business to deliver

OFFICIAL SUPPLIER
FOURNISSEUR OFFICIEL

James Ferguson, P.Eng.
TransCanada
450 - 1st Street S.W.
Calgary, AB T2P 5H1
Phone: 403.920.6009
Cell: 403.462.3313

From: Robert Lazor
Sent: Friday, April 29, 2011 7:02 AM
To: James Ferguson; Evan Vokes; VIVIAN Liu
Subject: FW: Harbour Landing

I had misplaced the printed copy, but Patricia has provided me with her request. She had initially asked to get this to her today, Friday 29 April. Please address the following:

James,

- Materials specifications for the pipe and fittings to be used on the site (s.14 OPR-99)

- A description of the quality assurance activities carried out by TCPL to ensure that the pipe and components meet the specifications referred to in the above (s.15 OPR-99)

Evan,

- The non-destructive examination plan for the project (s.17 OPR-99)

Vivian,

- The pressure testing program for the pipe replacements (s.23 OPR-99)

I will do the joining program.

Let me if you cannot get this done today. Thanks.

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From:
Sent: Thursday, April 28, 2011 4:23 PM
To: Robert Lazor
Subject: Harbour Landing

Hi Robert, could you please give me an update on where you are at with the joining program, pressure testing program, etc. for Harbour Landing?

Thanks, Patricia

Patricia Zuczek, P.Eng.
Regulatory Services, Law & Regulatory Affairs
TransCanada Pipelines Ltd.
Tel: 403.920.5378
Fax: 403.920.2347
Email: patricia_zuczek@transcanada.com

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Patricia,
I've had a look at the O&M notification submitted on 2 March 2011 for a pipe replacement on Lines 3 and 4 near the Harbour Landing development in Regina Sk. I see that the work is scheduled to commence in July 2011. Pursuant to section 7 and the below referenced clauses of the *Onshore Pipeline Regulations, 1999* (OPR-99) I request that thirty (30) days prior to commencing construction TCPL submit the following information to the NEB:

- Materials specifications for the pipe and fittings to be used on the site (s.14 OPR-99)

- A description of the quality assurance activities carried out by TCPL to ensure that the pipe and components meet the specifications referred to in the above (s.15 OPR-99)
- The joining program for the pipe replacement (s.16 OPR-99)
- The non-destructive examination plan for the project (s.17 OPR-99)
- The pressure testing program for the pipe replacements (s.23 OPR-99)
- A detailed construction schedule for the project.

Please do not hesitate to contact me if you have any questions or concerns with this request.

Regards,
Graham Emmerson, P.Eng. PMP
Compliance Program Manager - Integrity | Gestionnaire du programme de conformité - Intégrité
Operations Business Unit | Secteur des Operations

National Energy Board | Office national de l'énergie
444 Seventh Avenue SW | 444, Septième Avenue S.-O., Calgary, AB Canada T2P 0X8

From: Evan Vokes
Sent: Thursday, August 04, 2011 5:08 PM
To: Tanya Rolston
Subject: RE: Counter-bore and taper versus back-bevel

Hi Tanya
Just following up
Did the admission that the two keystone hydrotest failures occur come through while I was on vacation?
Its is a pretty open secret with the additional impact that hydrotest failures look bad to the regulator

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From: Evan Vokes
Sent: Monday, June 20, 2011 1:28 PM
To: Tanya Rolston
Subject: FW: Counter-bore and taper versus back-bevel

From: Evan Vokes
Sent: Monday, April 26, 2010 4:34 PM
To: Claude Albert
Cc: Ron Curle; Veronique Cantin; Rick Ostrom; Salvatore Delisi
Subject: RE: Counter-bore and taper versus back-bevel

I have seen Kenneth's presentation before and that whole business is avoidable but one of the big problems is TCPL never made counter bore mandatory because there is a real upfront cost.
His recommended practice for 3-D bends is on the right path but not entirely there. As you would have seen in my presentation, we do not cellulosic weld X 80 with E9010 because your preheat requirement would have to be too high. Bainitic microstructures don't like this. Keep in mind that we use the same specifications for our AIV lines and do not have problems we see down south.
I should have included counter-bores in my presentation to Bison months ago .

The primary importance of the TES MECH TRANS is at the welding side of the contracts but it has a very large implication for probability of detection for NDE.
I consider back beveled transitions with what I call the three strike rule:
a) Average welder has trouble welding the root and cannot field back-weld (welding ease)
b) NDE is compromised as we can not get good radiography and we can not use AUT (NDE compromised)
c) Bending moment applies maximum stress to the weld (mechanical stress)

The welders don't admit it but they like us when we do counter-bore as equal wall thicknesses, the pipes are much easier to weld; this is because the heat sink is different for both sides. I used to have a hard time understanding why the LOF and cracking were predominant on the thin wall side but the welder must concentrate the heat of the root pass on the thick side or there will be a massive root defect. As a consequence we often have IP and other planar defects on the thin wall side. Since we have likely used a cellulosic rod, we now have the conditions to promote cracking; Susceptible material, Stress, and Hydrogen. The reason why it works so well in the shop is that our components can often be back-welded. If you were to have a hydro-test failure in the shop it is not on PHMSA's radar as much as a ROW failure.
Welding contractors should love it as if you make the counter-bore 5 inches deep, the internal clamp can work and you have a regular SMAW poor boy or GMAW mainline weld as compared to a slow SMAW tie-in with external clamps ($$$$) . Louisbourg and Ledcor both do this as it is so fast to do in the field but we can not apply an ECA to the weld unless we specifically quality one for this.

016354

Before we delve into NDE, we need to look at fracture mechanics. Kt is an indication of geometry on strength to propagate an indication. (YS/kt) Volumetric indications have a kt =3, planar indications kt =6 and cracks kt =27. Planar indications and cracks have a massive effect on strength and radiography is good at finding volumetric indications not planar indications or cracking.

When we use counter-bores I can have a good film with radiography or I can have excellent AUT. One of the big problems we run into with NDE is that if we **do not** counter-bore we must use Double Wall Single Image (DWSI) radiography, as the weld must be performed with an external clamp with all the attendant engineering concerns that are associated with this condition. The physical requirement for a tie-in weld dictates the DWSI RT and this will give poorer resolution with X ray and worse with gamma. This is related to the fact that radiography is knocking out different wavelength of photons and X-ray has a wider band than gamma. You just have to look at the light spectrum to see the problem. Just because we can see the wires does not mean we have found all the out of plane LOF and cracking. When I have materials over 16mm I really need some concentrated energy to penetrate the material so I have to move to gamma. The different elements for gamma sources; Cs, Co Se etc all have different ranges which is why the gamma sources give different resolutions. Co is the worst for resolution as it gives a very narrow spectrum but with a extremely strong penetration. The problem with X ray is powerful units are very large where as gamma sources are very small and so strong X-ray sources are hard to make field portable. The next problem is the film. High energy gamma sources suffer from two sources of un-sharpness. The geometric un-sharpness is related to diffraction off sharp features which muddles the film. Film un-sharpness is high energy from gamma radiation inadvertently exposes film next to the areas of proper exposure so now I have two concerns for un-sharpness of the film on a technique that is sensitive to volumetric indications. If I counter-bore, I can use AUT and see everything the first time with no messing about regardless of thickness.

Counter-boring also moves the bending moment from welds that contain defects into the parent metal. IF you look at a weld on flange they have very strict requirements for angle to move the bending moment past the weld so very similar, by counter-boring, we are moving the bending moment. This was proven many years ago and we still get leaks at road-bores with back beveled transitions. If you have access to the S drive there are a couple of delayed failure reports one from Red Deer and another one from Crossfield (right on highway 2) and I am waiting to see the Manitoba failure from last summer. What I often do when I draw the problem out on the whiteboard or paper is to show a roof structure of a large steel framed industrial building such as Costco or any number of others. When we look at the roof we see that the bolted connections are made several feet to the side of the columns. This is to make sure that the bolts are a) in the neutral axis of the bending moment, b) bolts are half as strong in shear as they are in tension so we do not want to apply a shear stress. (I will send a picture later). Becky, we could probably get you to draw this out with a moment diagram to show people. In our case we use counter bore shape to shed the load to apply the bending moment outside the welded area.

There are two problems with this
1) The contractors love to flay the skin from our projects for requesting something so silly when in truth each transition is to their benefit. The counter-bores can be supplied to a project as heavy wall counter-bore transition pups for a small job where they do not want to mobilize a field counter-bore Cat.(in Kenneth's presentation)
2) Often time's contractors do a horrible job of machining the transitions and the resulting surface causes diffuse reflection rather than the desired specular reflection which is a pain for AUT.

As you probably realize History has shown us that many construction hydro test failures are at back-beveled transitions shot with gamma and Keystone proved it. The laws of gravity have not changed in recent history either. You might get a way with back bevels and using gamma for inspection but you must accept that a hydrotest failure is now an inherent risk.

We have paid for AUT, lets exploit it, buck up for the counterbores and have worry free project.

Hope this helps
Evan

From: Claude Albert
Sent: Monday, April 26, 2010 2:56 PM
To: Evan Vokes
Cc: Ron Curle; Veronique Cantin
Subject: FW: Counter-bore and taper versus back-bevel
Importance: High

016355

Evans

I forgot to copy you on these e-mails, what is your take on this?

Cheers,

Claude Albert
Construction Quality Manager
Bison Pipeline Project
Tel: 713 354 6292
Cell: 832 588 0112

From: Ron Curle
Sent: Thursday, April 22, 2010 6:06 PM
To: Claude Albert; Veronique Cantin; Gerard Lalonde; Gary Babich; Joanne Unger
Subject: FW: Counter-bore and taper versus back-bevel
Importance: High

Veronique

What field welds (of different WTs) do we currently allow back-bevel?

Then let's make an estimate of qty, so that we can evaluate Claude's proposal

$first – decision second – it might be "Chicken S"

Please reply-all

Thanks!

Ron

From: Claude Albert
Sent: Thursday, April 22, 2010 4:34 PM
To: Ron Curle
Cc: Veronique Cantin; Shane Megoran; Gary Babich; Joanne Unger
Subject: FW:
Importance: High

Ron

The attached is the third bulletin received from PHMSA concerning welds of different wall thickness. As you know, today we had the visit from PHMSA at PG yard, to review out Welding Procedure Qualification process, of which they were very happy with, I will submit the meeting note tomorrow.

During the meeting with PHMSA, they express their concern on welds between pipes of different wall thickness, using a back bevel of transition.

I recommend we ONLY weld pipe of different wall thickness, all welds not only golden welds, using counter bore to ensure the welds will always be done on same wall thickness. It could be a counter bore done in the field using acceptable field equipment or a counter bore pup, which could be done in a shop.

This would eliminate PHMSA's concern on the subject, and would allow the project to adequately use AUT for the welds,

Cheers,

Claude Albert
Construction Quality Manager
Bison Pipeline Project
Tel: 713 354 6292
Cell: 832 588 0112

From: kenneth.lee@dot.gov [mailto:kenneth.lee@dot.gov]
Sent: Monday, April 19, 2010 10:00 AM
To: Claude Albert; Shane Megoran
Cc: stephen.bender@dot.gov; chris.hoidal@dot.gov
Subject:

Attached is a presentation I gave last month on PHMSA girth weld construction concerns your review. I welcome any comments or questions you may have. I'll see you Thursday in Houston.

Thanks,
Ken

Kenneth Y. Lee
Office of Pipeline Safety
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE, Room E22-205
Washington, DC 20590
Office: 202-366-2694
Cell: 202-573-1546
E-mail: kenneth.lee@dot.gov

From: Evan Vokes
Sent: Wednesday, May 25, 2011 3:31 PM
To: Gerard Lalonde; Ken Pigeau
Cc: Rick Ostrom; Robert Lazor; Chris Penniston
Subject: RE: 19.5 to 9.5mm transitions

A phone call from Ken occurred this afternoon
We cant shoot this weld with any certainty and it has a large LOF.

From: Gerard Lalonde
Sent: Wednesday, May 25, 2011 3:28 PM
To: Evan Vokes; Ken Pigeau
Cc: Rick Ostrom; Robert Lazor; Chris Penniston
Subject: RE: 19.5 to 9.5mm transitions

Do you have the background to this request?

From: Evan Vokes
Sent: Wednesday, May 25, 2011 3:03 PM
To: Ken Pigeau
Cc: Rick Ostrom; Robert Lazor; Gerard Lalonde; Chris Penniston
Subject: 19.5 to 9.5mm transitions

Hello Ken
I don't have time to make nice sentences with your rush request but the joint design you have reported is high risk of having a hydrotest failure.
The primary reason is large wall thickness changes are extremely hard to gain any resolution on film during radiography.

I will not delve into several technical problems that occur during this process but the result is low sensitivity which does not allow us to fully resolve planar defects, only volumetric.
The problem is compounded as the radiographer must shoot the weld from the thin side but the welder had to direct the heat from the consumable to the thick side with a high probability of a LOF on the thin side. These diagonal shots do not give enough defect thickness to the LOF or cracks to be detected. If your radiography has shown 5 inches of LOF in the root it is probable that you have much more that has not been detected. I don't understand how we would get acceptable film sensitivity with that joint design, DWSI shots and our RT spec but I have to trust the field inspection staff. I could do this with plate penetrameters but t wires are very hard to see.

An additional consideration is that we have seen light areas in the film next to failed cracks in these situations which were a result of the high low being ground off to mask a welding alignment problem and then the hydrotest head welds failed while the guys were standing there. When you weld very thick pipe to very thin pipe it is functionally difficult to align the pipe with an external clamp. This is why pipe should be similar wall thicknesses when welding if you cannot backweld. With the extreme pressures during hydrotesting this is very risky as the temporary welds are exposed to humans. The welds might be temporary but an accident is permanent and we can't turn the clock backwards.

When we back weld a pup on we can shoot the transition with SWSI as an internal shot which ups our probability of detection of injurious flaws.
The correct solution is always to counterbore a thick pup to line pipe size and backweld the thick pup to the head.
Even if you back bevel an 12or 13 mm pup to match the line pipe and back weld the heavy part to the 19mm it is much more reasonable than the current setup

Story on the attachment:

016358

There was a hydrotest failure but the inspector ground the root out before we laid our hands on the weld but the result of this one was obvious.
Notice the wall thickness difference and it passed RT.
Making new mistakes is progress but repeating old mistakes is silly.

If you cut it out, MT on the root will worry you.

Thank you
Evan

016359

From: Evan Vokes
Sent: Friday, October 22, 2010 6:27 PM
To: Veronique Cantin
Cc: Ron Curle; Gerard Lalonde; James Ferguson
Subject: RE: RT vs. AUT suspected crack on SPR 4

Don't mean to cause you grief Veronique
Regardless of what the procedure says, If any of the original taper from the counterbore and taper is left, in fracture mechanics it is a notch or the same as a back bevel.
I do not see why your procedure would leave any evidence of a taper behind.
You could never prove to me that this was not the same as a backbevel so this remains a stress riser and makes it hard to weld etc.
If this is within the calculated tolerances given in the transition specification, it is OK but I am not in favor of this procedure.
If it looks like a duck, it is

Hope this helps
Evan

From: Veronique Cantin
Sent: Friday, October 22, 2010 5:03 PM
To: Evan Vokes
Cc: Ron Curle; Gerard Lalonde
Subject: RE: RT vs. AUT suspected crack on SPR 4

Evan,

Maybe I can clarify this a bit. I worked with Gerard Lalonde, David Taylor and James Ferguson to provide a procedure for use in the field in the cases where counterbore and taper transitions made by fabricators at the ends of our MLV assemblies don't meet the TC mechanical spec.
Bison doesn't allow any backbevel transitions, be it at tie-in or other locations.

Please take a look at the technical clarification we came up with (see attached) and let me know if you have any further concerns.

Regards,

Veronique Cantin
Major Projects
Tel. : 403.920.5923
Cell: 403.585.3169

From: Evan Vokes
Sent: Friday, October 22, 2010 4:13 PM
To: Veronique Cantin
Cc: Ron Curle; 'Rembert.Gomez@universalpegasus.com'; Andre Auger; Gary Herd; Alan Goyne; Rick Ostrom; Salvatore Delisi
Subject: RE: RT vs. AUT suspected crack on SPR 4

Hello Veronique

016360

We need to avoid a weld where that contains the transitions for final transition and we need to avoid backbeveled transitions at all costs.
If I am understanding correctly, if the .650 wall pup with a counterbore is shortened to the back bevel and weld to .514 wall you will have set the conditions for a crack that the counter bore and taper transition is designed to mitigate. You will now have a real chance of a hydrotest failure as; backbevels are hard to weld, the inspection can miss a crack and the valve will apply a bending load to the girth weld. Additionally I don't have the details but I do not think backbevels are permissible for your PHMSA application.

The counterbore makes welding easier but the evidence is that workmanship is likely the problem and the AUT gives evidence that the back walls do not line up.
One likely possibility is that the counterbored end was used as a tie-in which is why the specification prohibits this. (should be a stab-on before welding the lap)
A less frequent possibility is that the counterbore is dramatically off side which would leave a very thin wall on one side.
Another occasional problem is that the fabricator has squashed the pipe when rolling the valve but this is measurable before welding.
If would make me happy if we leave enough material on the line pipe side that we can measure the true hi lo on this weld

Regardless the AUT gives evidence that the lineup was poor and likely did not meet API 1104 Section 7.2 on two counts and should have been caught with visual inspection.

I believe the instructions you need to give PG are as follows
Check with UT to ensure you have 3.5" counterbore left. If we are positive we have material, I would recommend that you put the pup in as minimum 3'6" linepipe and weld to the counterbored end first.(known as a stab on) This way you end up with a linepipe to linepipe joint for a lap type weld for the tie-in as per the specification. Please measure counterbore thickness to confirm it is within spec.

If you cut the counterbored pipe end off, you will have to have a pup matching the original heavy wall pup wall thickness with the counterbore to match the linepipe.
A 3'6" linepipe pup will then make the criteria for the tiein weld in the specification. Normally we do not allow pups together but if this is the situation send a RFI and we will give permission.

Thank you
Evan

From: Wise, Ronnie [mailto:RWise@pricegregory.com]
Sent: Friday, October 22, 2010 12:58 PM
To: Veronique Cantin; Gary Herd; Alan Goyne
Cc: Ron Curle; Evan Vokes; 'Rembert.Gomez@universalpegasus.com'; Andre Auger; Gregory, Doug; Roy, Chuck
Subject: Re: RT vs. AUT suspected crack on SPR 4

I believe the valve wall thickness is approximately .650". I believe the pup should be .617 wt with one end counterbored to match the line pipe?

From: Veronique Cantin <veronique_cantin@transcanada.com>
To: Gary Herd <gary_herd@transcanada.com>; Wise, Ronnie; Alan Goyne <alan_goyne@transcanada.com>
Cc: Ron Curle <ron_curle@transcanada.com>; Evan Vokes <evan_vokes@transcanada.com>; Rembert Gomez <Rembert.Gomez@universalpegasus.com>; Andre Auger <andre_auger@transcanada.com>
Sent: Fri Oct 22 13:42:46 2010
Subject: RE: RT vs. AUT suspected crack on SPR 4

Ronnie just pointed out that I didn't get this right. Here is a clarification:

1. For the counterbore and taper transitions at the end of MLV assemblies (when Company instructs Contractor to remove the counterbore due to out-of-spec counterbore thickness):
Follow Technical Clarification TC 044 (latest revision) and remove all counterbore. This should be very clear. Contractor cannot do a tie-in at the transition after the counterbore is removed; 3'6" of 0.514" pipe must be welded on before MLV assembly is installed and before tying in to the pipeline. The entire counterbore must be removed where TC 044 applies, only keeping the backbevel.

2. For any other counterbore and taper transitions (transitions made by Contractor):
Follow typical drawings for transitions and plan to have 4.5" of length for the counterbore. The minimum length to be left after installation into the pipeline is 3.5".

Regards,

Veronique Cantin
Major Projects
Tel. : 403.920.5923
Cell: 403.585.3169

From: Veronique Cantin
Sent: Friday, October 22, 2010 12:29 PM
To: Gary Herd; 'Wise, Ronnie'; Alan Goyne
Cc: Ron Curle; Evan Vokes; 'Rembert Gomez'; Andre Auger
Subject: RE: RT vs. AUT suspected crack on SPR 4

Minimum counterbore length required is 3.5" (although typicals indicate 4.5") – the extra 1" is meant for cut off after hydrotest, damaged ends, etc.

Regards,

Veronique Cantin
Major Projects
Tel. : 403.920.5923
Cell: 403.585.3169

From: Gary Herd
Sent: Friday, October 22, 2010 12:19 PM
To: Wise, Ronnie; Alan Goyne
Cc: Ron Curle; Evan Vokes; Rembert Gomez; Andre Auger; Veronique Cantin
Subject: FW: RT vs. AUT suspected crack on SPR 4

Ronnie,

There has been exhaustive effort to evaluate this circumstance of the RT vs AUT examination with the end result that the weld is classified as a cut-out.

Alan

Please instruct the field to cold cut ½" from the weld, on the valve side, and salvage the ring for further evaluation.

Regards,

Gary

From: Ron Curle
Sent: Thursday, October 21, 2010 12:19 PM

To: Gary Herd
Subject: Fw: RT vs. AUT suspected crack on SPR 4

Gary/ alan

Re: Spread 4 crack suspected on weld beside valve assembly.

Heads Up - we are checking with one more RT expert on the crack call but we are now at the 80% probability the we will be cutting it out.

The weld is back filled and on the side of an assembly (hard point) so a cut probably means digging back 80 feet to get flexibility, two cuts, and weld in a new pup.

Cautions:
1) The weld is on a counter bore and taper and (if we cut) we need to preserve as much of the length of the counter bore as possible <Veronique: please publish minimum length that needs to remain>. Before a cut we should get a hand UT to map the existing counter bore length.

2) This weld cut-out should be sent to the lab since it is a technical discrepancy

Therefore we should plan on using cold-cutters on the valve side if we make the cut.

If we are getting time critical to decide, and can't wait any longer, then cut is the only safe call.

Regards

This electronic message and any attached documents are intended only for the named addressee(s). This communication from TransCanada may contain information that is privileged, confidential or otherwise protected from disclosure and it must not be disclosed, copied, forwarded or distributed without authorization. If you have received this message in error, please notify the sender immediately and delete the original message. Thank you.

From: David Taylor
Sent: Monday, June 27, 2011 3:40 PM
To: Evan Vokes
Cc: Robert Lazor
Subject: RE: concrete proof for your meetings as per the NDE 5 Fabrication document.

Evan,
A couple of points I would like to make!!

1. You are on vacation! Please shut the computer and your phone off and take your vacation!!! I am stopping the practice of making up for vacation time worked while on vacation. The only exception will be if I pre approve the work.
2. Please stop the investigation you seem to be doing on your own. I requested you finish off the engineering assessment and validate it with Robert before you send it to me last week. Since this was not done and appears won't be completed until sometime in late July, it will be too late to be of any use.
3. Your second sentence does not help the position you have taken on this issue. "I can't definitely answer the question but **I know we are in violation**" is not supported by facts, therefore it adds no value to the argument. This discussion has been going on for over a month, you need to accept where we are and become aligned with where we are going as a company.
4. There have been many meetings with the project department regarding this and there is a path forward which is progressing and will be implemented before you return in July.

I do by the way disagree with your approach on the auditing, but we can discuss when you return from your vacation.

I appreciate your concerns and your commitment.

Thank you

Dave

From: Evan Vokes
Sent: Monday, June 27, 2011 8:30 AM
To: David Taylor
Cc: Robert Lazor
Subject: concrete proof for your meetings as per the NDE 5 Fabrication document.

I never had time to finish this up last week but there was a lot of internet searching for homework butI finally managed to learn basics of how to search the NEB website.
I collected as much as I could on section 54 but I cant definitively answer the question beyond I know we are in violation of anything that we weld under the authority of Z662 ie B31.3

The parts that stand out from the board letters are the rejection of construction contractor NDE audit application and the rejection of the 15% NDE audit procedure so it stands that the audit procedure is suitable for satisfaction of section 53 audit requirements exclusive..
It turns out that the Ekwan purchase that Encana built was one of the few pipelines that had the same section 54 problem. The attachment shows the proposal that Encana made to the board but does not show the acceptance therefore we don't know the percentage. I have searched for this the last two nights to no avail.

The direction the board has pointed us is to hire the NDE for Z662 activities regardless of how uncomfortable it is. This is the correct no risk response.
Having fittings coated is not the best situation but at this point in time it is practicable to sandblast and reshoot with our own contractor to comply with the specification but it is an economic penalty.
If we hire the NDE we have these companies available as professional service providers suitable for fabrication

Acuren
TEAM
RTD

I still do not agree with the audit approach but if we are going to audit and have it fly with the board, I cant see how we could utilize non CGSB technicians as competence is the question that will be asked. We have more certainty if we hire CGSB to audit 100% till we rectify this question. As part of an audit process I would anticipate that we can only ask for a reevaluation at this point and we should not absorb any risk on questionable welds. The big problem I have with the audit is the continual absence of support for construction contractor NDE hired under Z662.

Who is available for audit?
In my mind, it would be a company out of our database.

Acuren
DM Professionals
TEAM
RTD
NDE Engineering
UT Quality
Eclipse scientific

I worry about using Dave H for this as we have a lot of other work that should be our priority.
I talked briefly to Dave M at James" wedding and he can give details of the Ekwan audit

See you in a couple of weeks

From: Ross Ennion
Sent: Thursday, October 13, 2011 5:27 PM
To: Evan Vokes
Subject: email to moody

Hi Evan,

This is what I'm sending to moody et al let me know what you think?

Hi Mark,

Further to our conference call this afternoon, the purpose of which was to confirm the inspection process by Moody.

- **That the task is to inspect pressure vessels and must meet Code B51 ASME VIII with reference to mandatory codes ASME II, V, IX**
- **Is accountable for ensuring trained inspectors are sent out with current code and specifications**
- **Inspectors must be satisfied that code is complied to**
- **That there is no preset dollar value on the PO and that we are charged by time, distance and expenses**
- **It was noted that not all inspectors are conversant in – welding, NDE, materials and design, which you indicated we trained to the 2007 code.**

Deliverable

- **Advise scope of work for PO 267526**
- **Procedure for Pressure Vessel Inspection**
- **A competent inspector is available for inspection next week**
- **Documented proof of inspectors training**

Thanks,
Ross

016366

From: Harry Fenton
Sent: Monday, July 21, 2008 8:29 AM
To: Nicole Wershler
Cc: Evan Vokes; Trent Bertholet; Gerard Lalonde; Alan Anderson; Brian Gacek; Dave Pragnell; David Morgan; Harvey Motowylo; Gail Friesen; Garry Norton
Subject: FW: NCR TCPL 2007 63, 64, 65, 66, 67, 68, 69, 70
Attachments: NCR TCPL 2008 63,64,65,66,67,68,69,70.pdf; RE: NCR TCPL 2007 63, 64, 65, 66, 67, 68, 69, 70

Beyond the question of sign off on these NCR's is the strong indication of systemic problems for TransCanada fabrication in the U.S.

If we don't speak to the root cause we can expect to see these issues repeated.

Harry Fenton

TransCanada

Fabrication Program Manager
Facilities / Pipeline Projects
T: 780-962-7345
F: 780-962-7377
C: 780-232-7880

From: Nicole Wershler
Sent: Friday, July 18, 2008 3:26 PM
To: Evan Vokes; Trent Bertholet; Gerard Lalonde; Alan Anderson; Brian Gacek; Dave Pragnell; Harry Fenton; David Morgan
Cc: Harvey Motowylo
Subject: NCR TCPL 2007 63, 64, 65, 66, 67, 68, 69, 70

Hello Everyone,

The 2007 Sagebrush NCRS have been on hold since early 2008. I have been granted approval to proceed with closure on the attached NCRS. Can you please review the attached documents and provide me with direction on how you would like for me to proceed? Do these require a technical sign off? Or have these matters already been resolved outside of the NCR process when addressing the payment issues with Sagebrush?

Please let me know if you require any additional information. I look forward to receiving your response.

Thank you!

Nicole Wershler
Services Specialist
Supplier Management

450 1st Street SW
Calgary, Alberta T2P 5H1
Telephone: 403.920.6594
Fax: 403.920.5402
E-mail: nicole_wershler@transcanada.com

016367

Co A does design off our drawings & creates a Bill of Materials & David does the requisition

NONCONFORMANCE REPORT Rev 2 (08/

TransCanada
in business to deliver

SUPPLIER Sagebrush	**TC NCR NO.** 2007-63
COMPONENT / EQUIPMENT DESCRIPTION NPS 36 pipe r	
SUPPLIER REPRESENTATIVE (PERSON FORM ISSUED TO) Bryan Lunger	**PROJECT NO.** P2075405
TC SPECIFICATION/INDUSTRY STANDARD – CLAUSE NO.	**PURCHASE ORDER NO.** 157153

DESCRIPTION OF NONCONFORMANCE (INCLUDE P.O.ITEM NO. AND UNIQUE IDENTIFIER if applicable)

GTN supplied Sagebrush with 560-ft of NPS 36 x 0.643" wall thickness pipe to be used for the Ehrenberg Station fabrication. Instead of using the pipe for the Ehrenberg however Sagebrush used the pipe for SoCal fabrication which requires NPS 36 0.592" wall thickness pipe. The resulted in a shortage of the SoCal pipe and necessitated a last minute design change using 228-ft of 0.493" pipe south of the 14th Ave. crossing and 198-ft North of the fence inside SoCal. If these change had not been possible the project would have been delayed.

Reported By: Print Name	Signature	Company/Title	Expected Response Date YY	MM	DD
David Morgan		Buyer - GTN	07	11	29

SUPPLIER NONCONFORMANCE RESPONSE
(PLEASE PRINT YOUR RESPONSE, ADDRESSING THE THREE POINTS BELOW)
1. MATERIAL DISPOSITION (I.E. USE AS IS, REPAIR/REWORK, REJECT/SCRAP)
2. ADDRESS EXTENT OF NONCONFORMANCE (I.E. ISOLATED CONDITION, RECURRING PROBLEM, RE-INSPECTION REQUIRED)
3. CORRECTIVE ACTION TO PREVENT RECURRENCE

1. Material was used as stated in above GTN statement.

2. This was an isolated occurrence.

3. Better communication lines were developed between Sagebrush and GTN as to the use or non use of customer supplied material.

Proposed by: Print Name	Signature	Company/Title	YY	MM	DD
Doug Pruitt		QA/QC Manager	07	12	21

TC SUPPLIER RESPONSE REVIEW APPROVED ☐ NOT APPROVED ☐ CONDITIONALLY APPROVED ☐ OTHER ☐

Technical Review Required? Yes ☐ No ☐

TC Technical Authorization: Print Name	Signature	Company/Title	YY	MM	DD

Supplier Management Authorization: Print Name	Signature	Company/Title	YY	MM	DD

Distribution:	Signatories ☐	3PI ☐	SM File ☐	NCR Log ☐	Other ☐

If required please note additional sheets on form above. Attachments shall reference the P.O., project/NCR#, date and section title.

FileNet ID # 003753575

016368

NONCONFORMANCE REPORT Rev 2 (08/13/04)

TransCanada
In business to deliver

SUPPLIER Sagebrush	**TC NCR NO.** 2007-64
COMPONENT / EQUIPMENT DESCRIPTION: 36" valve assemblies (J-23) stem extensions installations: loose connections	
SUPPLIER REPRESENTATIVE (PERSON FORM ISSUED TO) Bryan Lunger	**PROJECT NO.**
TC SPECIFICATION/INDUSTRY STANDARD – CLAUSE NO. TCPL Technical agreement with Cameron valves, Copy provided to Sagebrush. August/07 TCPL spec: TES-VALV-LD-US	**PURCHASE ORDER NO.** J-23

DESCRIPTION OF NONCONFORMANCE (INCLUDE P.O.ITEM NO. AND UNIQUE IDENTIFIER if applicable)

1. stem extension ancillary piping (sealant risers, body bleed risers) was supplied by Cameron and attached to the valve by Sagebrush. As received, the connections were loose to an extent that they'd be unlikely to hold line pressure, some were approximately hand tight only. This is an issue with Sagebrush, as their responsibility is to assemble and test the extension and piping to the valve prior to shipment. The body bleed unions were hand tight and some of the threaded nipples on the sealant lines were not tight. The valve technician on site noticed this when grease was pumped in the sealant lines and grease was coming out at the unions and nipples. All the connections were then checked and not all connections were found to be tight.

2. two valves did not have spare nameplates attached

Expected Response Date

Reported By: Print Name	Signature	Company/Title	YY	MM	DD
Gerard Lalonde		TCPL project engineer	2007	12	01

SUPPLIER NONCONFORMANCE RESPONSE

(PLEASE PRINT YOUR RESPONSE, ADDRESSING THE THREE POINTS BELOW)

1. MATERIAL DISPOSITION (I.E. USE AS IS, REPAIR/REWORK, REJECT/SCRAP)
2. ADDRESS EXTENT OF NONCONFORMANCE (I.E. ISOLATED CONDITION, RECURRING PROBLEM, RE-INSPECTION REQUIRED)
3. CORRECTIVE ACTION TO PREVENT RECURRENCE

1. Assembly was repaired in the field by GTN.

2. This is an isolated condition and re-inspection would have been required in the field.

3. Sagebrush employees were made aware and re-trained on these items for current and future projects.

Proposed by: Print Name	Signature	Company/Title	YY	MM	DD
Doug Pruitt		**QA/QC Manager**	07	12	21

TC SUPPLIER RESPONSE REVIEW APPROVED ☐ NOT APPROVED ☐ CONDITIONALLY APPROVED ☐ OTHER ☐

Technical Review Required? Yes ☐ No ☐

TC Technical Authorization: Print Name	Signature	Company/Title	YY	MM	DD

Supplier Management Authorization: Print Name	Signature	Company/Title	YY	MM	DD

Distribution:	Signatories ☐	3PI ☐	SM File ☐	NCR Log ☐	Other ☐

If required please note additional sheets on form above. Attachments shall reference the P.O., project/NCR#, date and section title.

FileNet ID # 003753575

016369

From: Evan Vokes
Sent: Monday, June 27, 2011 8:32 AM
To: Robert Lazor; Salvatore Delisi
Cc: Chris Penniston; Rick Ostrom; Trent Bertholet
Subject: RE: Welding Reports for May 11 & 12, 2011 and the need for 3PI Training

Hello Everyone

My thoughts on welding inspection

While I was actively involved in the welding side these shortcoming were very apparent. APEGGA requires that design construction and inspection are under Engineering supervision and we do not do this Gail may organize a program but there is no training to prove competency as required by OPR. The real shame is what Enbridge does well where they do their audits as per section 53 on every type of inspection. The regulation does say shall not should.

Trent, Rick and Chris have seen different iterations of my show and tell presentation that I have put together. The logic is there as it relates to TES WELD PL and TES WELD AS etc. as welding is just physics.
We can go through those specifications afterwards and see how they relate to what they have learned. There should be a test and not that typical sham of a tops test either.

The part that concerns me is the welding inspectors come from many backgrounds non of which are suitable for inspecting transmission pipe.
CET, CWB W178 CWI NDE are all interesting points to start from but they do not tell you what you need to do and look for. The most important skill for a welding inspector is the one I am not strong at.
You must be able to write good notes in a short time. We can teach the techniques but we cant teach organization of how to get meaningful reports out..
You must let them know where the limits are as all the money Bison spent on inspectors and training was wasted and we constantly see inspectors make engineering decisions.

Realistically, we would give a presentation; go to the shop to show people how to measure parameters correctly.
We need them to have training in basic NDE techniques as they need to know that the radiography can be performed incorrectly

Now the big question. Does active control qualify for a welding, coating and NDE inspector for a few welds? I would not stake my PEng on this regardless of how few welds there are.
OPR is pretty specific on this subject and clearly we don't measure up. I think where Harry Fenton has gone is more appropriate and I had encouraged some PMs in meterstations to do the same. Proper solution, contract a couple of cross trained inspectors and be done with it.

See you in a couple of weeks
Evan

From: Robert Lazor
Sent: Friday, May 13, 2011 3:31 PM
To: Evan Vokes; Salvatore Delisi
Cc: Chris Penniston; Rick Ostrom; Trent Bertholet
Subject: FW: Welding Reports for May 11 & 12, 2011 and the need for 3PI Training

The attached documents are examples of what is received by Measurement Projects. You will note that welding parameters are not measured during welder qualfication, preheat and interpass temperature are not listed, and in general it would be difficult to prove that the WPDS was being followed.

Please work together to outline what we need to do in terms of revising/preparing Weld Inspection Forms. Also, prepare a course outline for Welding Inspectors. Could be classroom or distance teaching; I think that we should aim at Webex, possibly even several one-hour sessions.

There are many projects on the go this year and we should address Inspector training before we go to construction, so that we are in a great position at the start of the project.

Please remember to plan your vacation schedules before construction. If you don't, you might miss terrific opportunities such as visits close to Wood Buffalo National Park and the majestic Rockies of northern B.C.

Robert Lazor
Materials Engineering
Phone (403) 920-5679

From: Asa Gold [mailto:acegold@telus.net]
Sent: Thursday, May 12, 2011 9:07 PM
To: Matthew Tully
Cc: Bill Asher
Subject: Welding Reports for May 11 & 12, 2011

Matt,
Reports attached.

Asa Gold
Ace Consulting & Inpection Ltd.
Medicine Hat, AB
Cell: (403) 502 - 6859

memo

date June , 2011
attention David Taylor, Robert Lazor
location
cc

from Evan Vokes
subject Non Destructive Examination compliance with Onshore Pipeline Regulation, 1999

TransCanada PipeLines Limited

Evan Vokes
450 1st Street SW, Calgary, AB T2P5H1
tel (403) 920-7208
mobile (403) 836-1777
fax (403) 920-2319
email evan_vokes@transcanada.com
web www.transcanada.com

Internal examination of current company NDE practices raised the questions of inspection compliance with TransCanada. Recently, concerns were raised by a compression project and an external Engineering company about the adherence of TransCanada's specification. The scope of the problem of adherence to the regulations occurs in Section 17 of the Onshore Pipeline Regulations, 1999 (OPR 99). This analysis has shown that TransCanada does not adhere to the intent of Onshore Pipeline Regulations for construction inspection for all activities covered under the scope of the regulation although we have complied with Code requirements. The internal TransCanada assessment of the violation follows:

OPR 99 Section

17. When a company conducts joining on a pipeline, the company shall examine the entire circumference of each joint by radiographic or ultrasonic methods.

Discussion
The onshore pipeline regulation requires inspection of all welds as per OPR 99 Section 17. The rule applies to all piping unless this piping has an exemption in place from the Board. The scope of section 17 is applicable to construction activities under the Section 16 required joining program. The joining program covers all activities that are not part of the materials program Section 14 and materials quality assurance under Section 15. The joining program covers any item that has been welded under CSA Z662 and by extension ASME B31.3 construction activities are subject to this rule.

Deviation from OPR 99 requirement
The specification TES-DV23-0517 used for fabrication of compressor station piping using ASME B31.3 contains engineering guidance to use examination criteria other than that specified by the board. The scope of the deviation is low pressure piping other than that used for high pressure gas. The version history of TES-DV23-0517, as evolved from TES-DV15-120 rev 0, 2004 and other earlier shows the document subject matter has been in circulation for some time.

The board has accepted these documents on past projects and never questioned the submitted documents applicability to the requirement. The board issued industry variance MO-08-2000 does not contain any exception that is applicable to supporting a variance on this subject and the writer's knowledge, the board has never sent any queries on this subject to TransCanada.

016372

Recommendation
1) At this time, all welds performed by or for TransCanada under B31.3 shall be examined in accordance with the regulation.
2) A notice should be sent to the board noting the deviation from the rule on previously accepted documentation and corrective action on current construction projects would be to increase inspection to the regulation requirements.
3) TES DV23 0517 should be revised before another project submission to the board An alternate approach is a blanket variance to Section 17 should be applied from the NEB to bring TES-DV23-0517 into compliance.

Internal examination of current company NDE practices raised the questions of independent inspection compliance within TransCanada projects. Recently, additional concerns were raised by fabrication contractors about the adherence of TransCanada's specification to Section 54. The problems with adherence to the regulation occur in Section 54 of the Onshore Pipeline Regulations, 1999 (OPR 99). The internal TransCanada assessment of the violation follows:

OPR 99 Section
54. (1) When a company constructs a pipeline, the company or an agent independent of any construction contractor retained by the company shall inspect the construction to ensure that it meets the requirements of these Regulations and complies with the terms and conditions of any certificate or order issued by the Board.

(2) An inspection shall be performed by a person who has sufficient expertise, knowledge and training to competently carry out the inspection.

Discussion
The Board does offer some direction in the OPR 99 Section 54 (1) guidance notes that help develop the scope and clarify that the expectation of owner companies with the intention that the guidance notes are to be used as a guide for a submission of technical documentation to the board and an insight into the direction of the board. The insight into the direction of the Board is that the owner company typically are to directly hire and control NDE as part of the inspect process. As an alternative the Board does not preclude the construction contractor direct hiring of NDE as being permissible with an audit.

The assumption the board is making is that the Company is performing the typical inspection requirement. If the non-typical inspection is chosen, it would be reasonable of the Company to inform the board that the non typical inspection arrangement was chosen and comprises part of the joining program submission.

The stated goal in OPR 99 is to ensure: safety, environment and public interest are served. Fitness for service through technical inspections is a realistic expectation of public interest and with a descriptive regulation; the burden of proof is upon the owner company to ensure compliance. The nature of a technical inspection must include all construction inspection activities that can affect the performance of the pipeline. As such a request to prove independence from commercial/technical influence for all construction activities would include examinations of a technical nature such as laboratory testing and non destructive examination.

Current NDE practices at TransCanada have a wide variance in scope and practice. They range from directly hiring NDE on Pipeline and Integrity projects, to construction contractors hiring NDE with oversight from TransCanada direct hired welding inspection contractors. Many of these arguments for different areas of TransCanada projects are based in semantics as the regulations uses the word "examination" in section 17 and "inspection" in Section 54. The only correct answer is to contact the board and have an official ruling as we can support the semantics of whether or not the NDE is an inspection task either way.

There is an argument that since no pipeline contractor in Canada can inspect pipeline welds through the American Society of Non-Destructive Testing SNT-TC1A self certification program that all NDE is independent of the Contractor and that all fabricators hire subcontracted third party inspection companies for the NDE component of their work. The fact remains that many ASME fabrication shops in Alberta use a partial SNT-TC1A program for basic NDE methods with the blessing of the provincial pressure vessel regulator. This self certified SNT-TC1A program would never be acceptable to the Board under any circumstances. The most important shortcoming of the subcontracted NDE method is the construction contractor signs off acceptance of the welds which is contrary to the wording of the regulation. The Risk is the Board does not agree that independence of inspection is served as there are fewer checks and balances to ensure the outcome of the inspection is independent.

Projects deal with the question of independence for construction contractor hired NDE in different ways. For historical reasons, some projects have oversight with welding inspection contractors on a full time basis and others have oversight on a part time surveillance basis. There is no particular requirement for these contractors to have training in the quality control of NDE although some are technically competent in this field. There is no specific requirement for our inspectors to have a rigorous approach to the audit requirements of Section 53 although there has been an improvement in activities covered under the fabrication program in recent weeks specifically in areas of welding inspection and NDE audit.

To prove adherence with Section 54 there are two methods that can be pursued. To prove adherence beyond question under Section 54, the inspection of a weld to declare fitness for service would have to be performed by a trained independent non-destructive examination technician hired independent of the construction contractor that was paid for by TransCanada and signed off by a TransCanada representative. To prove adherence with the guidance notes audit component, a variance should have had to be in place before construction starts and it would require that we have a comprehensive audit program with an auditor competent in that type of inspection in place.

The first method is direct hiring of NDE where a project operation problem is the scheduling of NDE; as it is a problem to oversee the Company scheduled NDE on a site on a daily basis. Several competitors have successfully worked around this problem as it is not forbidden to have the construction contractor schedule work for our inspectors if there is proof of control of the process. To prove control, the inspector should be responsible to the company and should be paid independent of any process related to the construction contractor. Based on interviews with several of our competitors, the NDE Company in fabrication typically reports to the responsible welding inspector

016374

whom signs off acceptance of the welds. While the NDE contractor gives the construction contractor the disposition of welds, the construction contractor, does not have the authority to sign off acceptance of their own work.

The second method is to Audit after informing the Board of our intent. It is true that in the case of radiography, it is impractical to perform a real time audit. It is true in the case of methods such as magnetic particle inspection that you can only audit in real time. To audit, TransCanada would have to have an audit process that accounted for the method, schedule and skill/training of the auditor. In particular, for NDE audit, an engineering specification TEP-NDT-ADT exists that satisfies the Section 53 requirement of the board and gives direction for who may audit NDE.

Deviation from OPR 99 Section 54

Compliance with Section 54 designation of independence of inspection is required to include Non Destructive Examination. NDE on TransCanada projects some cases is performed by construction contractors in some internal groups within TransCanada without:

a) A variance from the Board to permit final acceptance of an inspection process
b) Adequate training for those currently charged with the duty of ensuring the inspection is carried out in accordance with the regulation.

Recommendation

a) To comply with the regulation verbatim, TransCanada must hire and control NDE activities as a recognized construction inspection activity covered under the joining program. There is no particular requirement for schedule but reporting and commercial and reporting structures must remain with TransCanada control.
b) There is a risk to the company if construction contractor hired NDE continues without defining if NDE is considered and inspection as defined by Section 54.
c) An n auditor that is qualified under our TEP-NDT-ADT should be contracted to audit film of current projects.
d) The NDE requirements should be officially written into the joining program directive as a distinct subsection and an appropriate NDE program should be developed from the direction indicated by the joining program.

From: David Taylor
Sent: Thursday, October 20, 2011 8:00 PM
To: Marc Charland; Evan Vokes; Cindy Guan; Bill Yang
Cc: Harvey Motowylo; James Ferguson; Guil Schotte; Darren McLean
Subject: RE: 3PI Checklist

Marc,
Thank you for your feedback!
I am in Houston today and couldn't send emails from the blackberry due to my mailbox being full.

I agree with you.

Bill,
As you are the chief inspector for TransCanada I would like to request that you consider revising the 3PI checklist and adding this requirement. This is the quickest and simplest way to communication our requirements to Moody Int'l. Cindy, can you please assist Bill.

As for the length of time to have this increased inspection – I would recommend that the wording in the checklist use something along the lines of " witness of NDE on cat D welds – unless waived by the Company Chief Inspector".

Thank you

Dave

From: Marc Charland
Sent: Thursday, October 20, 2011 7:46 PM
To: Evan Vokes; Cindy Guan; Bill Yang
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte
Subject: Re: 3PI Checklist

I appreciate the feedback but I do not agree this approach will work. Free form text to manage an issue like this is pretty risky. There are way too many buyers involved making it very difficult to manage. I do not want to put a buyer in a position where a project is impacted if they miss something engineering needs. I suggest we find a different solution and manage this either through vendor pre-qual, technical agreements, spec or 3PI checklist.

Marc Charland
Manager, CAN Supply Chain Operations, Materials
TransCanada
Ph: 403.920.5916
marc_charland@transcanada.com
Please consider the environment before printing this mail note.

From: Evan Vokes
Sent: Thursday, October 20, 2011 04:41 PM
To: Marc Charland; Cindy Guan
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte
Subject: RE: 3PI Checklist

Hi Marc
The best solution is to short term this witness requirement in every vessel procurement contract in "free form" as described below till we can put some requirements in PV1.

I cannot think of any other way to deal with this short term.
I have seen several approaches to this inspection in the last couple of day and lots of reasons why some of the methods wouldn't work and our 3PI needs to understand why and stop these practices.
Ultimately, the only way we can solve this is we need to get some verbage into the PV1 specification as how to conduct and witness a Cat D inspection as an engineering requirement. I want to see ABSAs inspection list before we commit to anything that is manufactured in AB. Its tough to make a blanket statement as in AB ABSA performs some tasks that Moody must perform alone in other jurisdictions.

Motivating our 3PI to follow the code should not require any additional documentation, rather some motivational speaking and checking performance measures for the near future should communicate our expectations till we get to the basic level of performance. I really don't want to pay a moody inspector to stand there all day for every nozzle on every vessel but we must get a measure of performance from our vessel manufacturer before we can reduce to a surveillance basis.

Hope this helps.

From: Marc Charland
Sent: Thursday, October 20, 2011 1:32 PM
To: Cindy Guan
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte; Evan Vokes
Subject: Re: 3PI Checklist

How do we ensure this is captured in every PO? Human error happens all the time. Expecting a buyer to add this through free form text does not work.

Marc Charland
Manager, CAN Supply Chain Operations, Materials
TransCanada
Ph: 403.920.5916
marc_charland@transcanada.com
Please consider the environment before printing this mail note.

From: Cindy Guan
Sent: Thursday, October 20, 2011 01:28 PM
To: Marc Charland
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte; Evan Vokes
Subject: RE: 3PI Checklist

Marc,

I don't have anything change for the 3PI checklist.

Based on Evan's e-mail below, we will not ask UT Cat D nozzles for witness forever. Then UT Cat D nozzle witness can be requested by PO.

3PI checklists are good to go as before.

Evan, please tell SCM how long/how many vessels you want to have UT Cat D nozzle be witnessed.

Thanks,

Cindy

From: Marc Charland
Sent: Thursday, October 20, 2011 1:18 PM
To: Evan Vokes; Cindy Guan
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte
Subject: Re: 3PI Checklist

Is the check list good to go or not?

Marc Charland
Manager, CAN Supply Chain Operations, Materials
TransCanada
Ph: 403.920.5916
marc_charland@transcanada.com
Please consider the environment before printing this mail note.

From: Evan Vokes
Sent: Thursday, October 20, 2011 12:29 PM
To: Marc Charland; Cindy Guan
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte
Subject: RE: 3PI Checklist

Hi Marc
I had a lot of soul searching yesterday on what was written in the code, the physics behind it which was all followed up with a discussion with the Materials and Design group at ABASA as well as the head of their inspection department. The closer we look; the SCL is a band aid that we have allowed Moody to use for the wrong purpose. The SCL in my mind is to confirm that the inspection met code but the way it was used was not in compliance with our expectations or Moody's own programs. The look at our internal practices shows that we need enforcement of existing code and specifications more than anything we are doing on the current check list. Cat D nozzles are already on the checklist with only real unknown is frequency and depth of witnessing activities being the real questions. The problem I have is to sure that inspection is carried out in accordance with the code and one of the revealing points is that our current inspection is incapable of seeing some of the expected defects. . The question of code compliance shows we need some engineering judgment to define the minimum level of acceptable inspection is carried out in the PV1 specification to ensure code compliance. I drew out some beam profiles on Tuesday and Wednesday and it really showed how inadequate the inspection was.

Looking at the wording of the code and the current inspection reports raises more questions about how if we conduct our oversight.
a) Should we approve NDE procedures (trust me, I don't want to go here on materials) or should Moody ensure NDE procedures meet code
b) Should we have 3PI witness of every cat D forever (cant see this happening in perpetuity but we need to do it for a while)
c) Do we directly supply oversight and make Moody conform to there own specification. (they seemed anxious to conform on Tuesday)
d) When will we audit Moody and our materials vendor and to what depth shall we audit as the demonstration of the UT technique raised more questions that further substantiated the suspected deviation from code that any other activity.

With the pressing inspection schedule, I think we will have to go make some mistakes when we are ready to send out the response to Moody but at least we will have started.
We have learned a lot with the B31.3 fabrication program by just going ahead and making mistakes with a less than perfect program as opposed to no plan at all.

From: Marc Charland
Sent: Thursday, October 20, 2011 10:35 AM
To: Cindy Guan; Evan Vokes
Cc: David Taylor; Harvey Motowylo; James Ferguson; Guil Schotte
Subject: FW: 3PI Checklist

Cindy and Evan,
When do you anticipate having the 3PI checklist for pressure vessels reviewed and updated?

Marc Charland
Manager, CAN Supply Chain Operations, Materials
TransCanada
Ph: 403.920.5916
marc_charland@transcanada.com
Please consider the environment before printing this mail note.

From: James Ferguson
Sent: Wednesday, October 19, 2011 5:13 PM
To: Marc Charland
Subject: Re: 3PI Checklist

I'm no too sure where the 3PI checklist is. Cindy and Evan have been working on a plan for going forward with the inspection, especially the Category D nozzles.

I will check with Cindy tomorrow and get back to you.

Thanks,

James

From: Marc Charland
Sent: Wednesday, October 19, 2011 04:26 PM
To: James Ferguson
Cc: Guil Schotte
Subject: 3PI Checklist

James,
Can you confirm when the 3PI checklist for pressure vessels will be corrected?

Can you confirm if this is at the top of the queue to rectify the hold points specific to the cat-d nozzles.

Marc Charland
Manager, CAN Supply Chain Operations, Materials
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Please consider the environment before printing this mail note.

TES-WELD-AS-US Welding of Assemblies and Station Piping		Document Type: Specification
Effective Date: 2009/11/25	Revision: 01	Status: Issued
Classification Code: DE-16	Document Owner: Engineering and Asset Reliability	
Originator: Trent Bertholet, Technologist, Materials Engineering Governance and Quality Management		Signature/Date (signed copy on file)
Discipline Checker: Evan Vokes, P. Eng., Materials Engineering Governance and Quality Management		Signature/Date (signed copy on file)
Responsible Engineer: Robert Lazor, P. Eng., Materials Engineering Governance and Quality Management		Signature/Date (signed copy on file)

1 PURPOSE

This Specification describes the technical requirements for qualification of welding procedures and welders, production welding, visual and nondestructive inspection and repair welding for welds in sweet natural gas and hazardous liquid pipeline systems. This Specification shall be read in conjunction with and covers additional requirements to ASME B31.4, ASME B31.8, API 1104, 49 CFR 192 and 49 CFR 195.

2 SCOPE

This Specification applies to TransCanada (the Company) facilities within the United States of America.

This Specification applies to welds made using welding procedures qualified in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section IX or API 1104 which include those that are made:

(a) in Compressor stations;

(b) in meter stations;

(c) in pump stations;

(d) pipeline assemblies;

(e) at a manufacturing plant or fabrication shop remote from the final location of the weld; or

(f) joining pipe to components or components to components.

This Specification does not apply to pipe-to-pipe production and tie-in girth welds made on pipeline sites covered by the Company Specification TES-WELD-PL-US or to welds used in branch connections that are covered by Company Specification TES-WELD-BC-US.

3 BRIEF DESCRIPTION OF CHANGE

- Included 49 CFR 195 and ASME B31.4 as reference documents.
- Updated references to Company Operating Procedures and Specifications
- Added additional clarification where this Specification would be used.
- Included additional requirements for inspecting weld bevels and locating 'olet' fittings.
- Specification modified for conversion from Canadian to US standards.

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4 REFERENCES

4.1 Codes, Standards and Regulations

(a) 49 CFR 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards

(b) 49 CFR 195 Transportation of Hazardous Liquids by Pipeline

(c) API 1104 Welding of Pipeline and Related Facilities

(d) ASME Standard B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids

(e) ASME Standard B31.8 Gas Transmission & Distribution Piping Systems

(f) ASME Boiler and Pressure Vessel Code: Section V Nondestructive Examination, Section IX Welding and Brazing Qualifications and Section VIII, Division 1 Rules for Construction of Pressure Vessels

(g) ASTM A370 Standard Test Methods and Definitions for Mechanical Testing of Steel Products

(h) ASTM E18 Standard Test Methods for Rockwell Hardness of Metallic Materials

(i) ASTM E23 Test Methods for Notched Bar Impact Testing of Metallic Materials

(j) ASTM E92 Standard Test Method for Vickers Hardness of Metallic Materials

(k) ASTM E384 Standard Test Method for Microindentation Hardness of Materials

(l) AWS A5.1 Specification for Covered Carbon Steel Arc Welding Electrodes for Shielded Metal Arc Welding

(m) AWS A5.4 Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding

(n) AWS A5.5 Specification for Covered Low Alloy Steel Arc Welding Electrodes

(o) AWS A5.18 Specification for Carbon Steel Filler Metals for Gas Shielded Arc Welding

4.2 Company Specifications and Procedures

(a) Company Procedure TEP-MECH-TRAN-US Selection of Transition Pieces and Joining Methods (005695478)

(b) Company Specification TES-NDT-RT-US Radiographic Examination of Welds (004472888)

(c) Company Specification TES-NDT-UT2-US Manual Ultrasonic Examination of Welds (004497443

(d) Company Specification TES-WELD-ABR-US Removal of Arc Burns (004472941)

(e) Company Procedure TEP-VALV-FAB Procedure for Supplemental Protection During Valve Fabrication (Cdn-US-Mex) (005741242)

(f) Company Procedure TEP-WELD-CLOS Closure Weld Procedure (003670675)

5 GENERAL

Welding shall be performed in accordance with;

(a) The applicable requirements of 49 CFR 192, 49 CFR 195, ASME B31.4, ASME B31.8 and API 1104, and any amendment, supplement, or errata issued by DOT, ASME, or API;

(b) The additional requirements of this Specification; and

(c) The Company requirements for Environment, Occupational Health and Safety.

5.1 Design Temperature

Welding procedures shall specify, and be qualified at or below, the minimum design temperature. Unless specified otherwise, minimum design temperatures are 23°F for welds in buried pipelines (2 feet or more of cover) and -49°F for any other welds.

5.2 Welding Process

(a) Fillet welds shall be made using a low hydrogen welding process, except that it shall be permissible to apply the first pass with a different process.

(b) The fills and cap passes on butt welds shall be made using a low hydrogen welding process in:

(i) pipe to component or component to component welds;

(ii) pipe to pipe welds; and

(iii) repair welds.

(c) Except where the piping is internally cleaned after welding, the root pass of butt welds in lube oil piping shall be made using gas tungsten arc welding and bare consumables.

5.3 Joint Design

5.3.1 Butt Welds

(a) Butt welds between items of unequal wall thickness shall be made using a transition designed in accordance with the requirements of Company procedure specified in Clause 4.

(b) Bevels angles shall be either 30° -0/+5° or 37.5° ±2.5°, unless otherwise specified, and all field cuts shall be normal to the pipe axis.

(c) Mitre welds are prohibited. Deflections up to 3° caused by misalignment are not considered to be mitre bends.

(d) The use of backing rings shall not be permitted.

5.3.2 Fillet Welds

Except where specified by the design, fillet welds shall not be permitted for joining pipe larger than NPS 1½.

5.3.3 Tack Welds

(a) Tack welds shall only be permitted within the weld bevel area and shall be full penetration welds or bridge tacks completed using a qualified, low hydrogen welding procedure.

(b) A minimum of four (4) tack welds shall be placed equidistantly around the circumference.

(c) For piping larger than NPS 16, the minimum length of a tack weld shall be 1½ to 2½ in.

5.4 Materials

5.4.1 Pipe and Components

(a) Materials shall be welded according to their P-Number and group number, or S-Number and group number, as given in the ASME Boiler and Pressure Vessel Code, Section IX.

(b) Carbon steel materials manufactured in accordance with standards or specifications, for which P-Numbers or S-Numbers are not given in the ASME Boiler and Pressure Vessel Code, Section IX, shall be considered to be equivalent to S-1 materials with group numbers as given below, provided that the maximum carbon equivalent (CE) does not exceed that given in the following table.

Grade	Maximum Carbon Equivalent (wt %)	S-1 Group Number
Up to Grade X52	Not Applicable	1
Up to Grade X65	0.45	2
Up to Grade X70	0.50	3
Higher than Grade X70	0.50	4

Note: When using the table, the first two columns are intended to be the input, and the value in column 3 is intended to be the output. The Carbon Equivalent (CE) is calculated using the P_{cm} formula in API 5L. The following examples illustrate the intent:

- Pipe with SMYS 52 ksi and less is S-1 group 1, regardless of its carbon equivalent value.
- Grade X56, X60, or X65 material is S-1 group 2 if its carbon equivalent value is 0.45% or less, and S-1 group 3 if its carbon equivalent value is over 0.45% but not over 0.50%.
- Grade X70 material is S-1 group 3 provided its carbon equivalent value is not over 0.50%.
- Grade X80, X90, or X100 material is S-1 group 4 provided its carbon equivalent value is not over 0.50%.
- Material for a grade higher than X52 with a carbon equivalent value over 0.50% is not covered by this table; it should be considered as a special material.

(c) Materials that do not conform to the groups specified in (a) or (b) shall be considered "Special" materials and shall require individual qualification of welding procedures.

5.4.2 Filler Metals

(a) Filler metals for welding carbon steel materials shall be selected from the following list:

Process	AWS A5.1/A5.5/A5.18) Classification or Trade Name
SMAW	E6010, E8010-G/E8010-P1, E7018-1, E8018-C2, E8018-G, E6918 (BVD85), E10018 (BVD 90)
GMAW	ER70-S2, ER70-S3, ER70S-6, ER70-S7
FCAW	E80C-Ni2 Corex 2N, SELECT ARC Select 80C-Ni2
SAW	F8A4-ECNi2-Ni2 Lincoln LAC-Ni2 wire & 882 flux F9A6-EM2-M2-H8 Lincoln LA100 wire & 880M flux

(b) Except as permitted below, electrodes for shielded metal arc welding of carbon steels higher than Grade X56 shall be E8010-G/E8010-P1 for cellulosic root/hot pass and E8018-C2 or E8018-C3 for fill, cap and repairs. On materials less than NPS 4 and less than 0.25 in. WT and where 3/32 in. diameter E8010-G/E8010-P1 electrodes are not available, it shall be permissible to use 3/32 in. 6010 electrodes for the root pass

(c) Filler metals for welding stainless steel materials shall be selected from the following list for SMAW (and GTAW) where -xx means -15 or -16:

Materials Used	**304**	**304L**	**316**	**316L**
Carbon Steel	E309-xx, E312 (ER309, ER312)			
316L	E316L-xx, E308-xx (ER316L, ER308)	E316L-xx, E308L-xx (ER316L, ER308L)	E316L-xx, E316-xx (ER316L, ER316)	E316L-xx (ER316L)
316	E308-xx, E316-xx (ER308, ER316)	E308L-xx, E316-xx (ER308L, ER316)	E316-xx (ER316)	
304L	E308L-xx, E308-xx (ER308L, ER308)	E308L-xx (ER308L)		
304	E308-xx (ER308)			

Note: Material grades are across the top and down the side and bolded. Recommended welding consumables are within the remaining boxes.

5.5 Shielding Gases

Shielding gas components shall have a purity of at least 99.5% and a dew point of -34°C or lower.

5.6 Closure Welds

Welds that will not be hydrotested shall be subject to the conditions outlined in Company Procedure TEP-WELD-CLOS.

6 QUALIFICATION OF WELDING PROCEDURES

6.1 General

Welding procedure specifications (WPS), other than the pre-qualified welding procedure specification data sheets provided by the Company, shall be qualified in accordance with the requirements of API 1104 or ASME Boiler and Pressure Vessel Code Section IX and the additional requirements of this section. Contractors/fabricators shall have qualified welding procedures reviewed and approved by Company welding engineering personnel for carbon steel materials less than NPS 16 and for all sizes of stainless steel materials.

6.2 Acceptable Weld Parameters

(a) Preheat: The minimum preheat shall be recorded at the start of welding, and shall be checked after each pass. Temperatures are to be measured at several locations along the weld and shall be at least 200°F (See also Clause 8.11)

(b) Interpass temperature: The maximum interpass temperature shall not exceed 390°F.

(c) Heat Input: The heat input shall range between 16 and 56 kJ/in.

(d) Carbon Equivalent: The carbon equivalent shall be calculated using the P_{cm} formula.

6.3 Materials for Qualification

Welding procedure qualification tests shall be made using a material of the same type as the material to be used in production welding. When joints are to be made between two materials with different base metal characteristics, a procedure qualification shall be made for the applicable combination, even though procedure qualification tests have been made for each of the two base metals welded to each other. Whenever available, materials for qualification shall also have an equivalent API 5L or ASME certification.

For materials having specified minimum yield strength higher than Grade X56, the carbon equivalent shall be reported on the WPS and the manufacturer's material test report attached to the PQR.

All materials should have impact toughness verified at or below the minimum design temperature to ensure suitability for the application.

6.4 Additional Essential Changes

Welding procedure specifications shall be limited by the following additional essential variables:

(a) Base Materials: A change in grade or grouping as defined in Clause 5.4.1.

(b) Carbon Equivalent: For steels Grade X70 and greater, an increase in carbon equivalent exceeding 0.05% for piping having a specified minimum yield strength higher than Grade X56.

(c) Shielding Gas Composition: A change of more than 1% in the nominal content of any gas comprising more than 5% of the shielding gas.

6.5 Change in Minimum Design Temperature

A change to a minimum design temperature colder than that used for impact toughness testing or fracture toughness testing during procedure qualification shall necessitate retesting for impact toughness testing as specified in Clause 6.7.

6.6 Test Weld Acceptability for Destructive Testing

(a) Test welds shall meet the following requirements:

  (i) Visual inspection requirements given in Clause 10; and

  (ii) The standards of acceptability for nondestructive inspection given in Clause 10.

(b) Test welds failing to meet the visual inspection requirements shall not be submitted to nondestructive examination.

(c) Test welds failing to meet the standards of acceptability for nondestructive inspection shall not be submitted to destructive testing. Inspection reports shall be attached to the Procedure Qualification record

6.7 Impact Toughness Testing

(a) Except for stainless steel materials, three (3) Charpy-V notch specimens from each of the weld metal and heat-affected zone(s) shall be tested in accordance with the requirements of ASTM A370 at or below the minimum design temperature.

(b) The average value of the Charpy V-notch energy for the three (3) specimens shall be a minimum of 20 ft-lbs. The minimum value is 15 ft-lbs and only one value may be less than the average 20 ft-lbs.

(c) All test values shall be recorded on the Procedure Qualification Record (PQR).

6.8 Hardness Testing

Welding procedure qualification records shall include microhardness or macrohardness traverses (see Figure 1 for recommended spacing) across the weld, heat-affected zones and parent metal as listed below;

(a) Microhardness tests: These tests shall be performed in accordance with the requirements of ASTM E384. The maximum hardness reading shall be 350 HV using a load of one (1) kg or less.

(b) Macrohardness tests: Either Rockwell B or C, or Vickers shall be used.

(i) Rockwell B or C hardness tests shall be performed in accordance with the requirements of ASTM E18. The maximum hardness shall be 100 if the Rockwell B scale is used or 22 if the Rockwell C scale is used.

(ii) Vickers hardness tests shall be performed in accordance with the requirements of ASTM E92 using a load of ten (10) kg. The maximum hardness shall be 248 HV10.

It shall not be permissible to convert hardness readings from one hardness scale to another hardness scale.

6.9 Records of Welding Procedures

Details of the welding procedure qualification tests and the qualified welding procedure specification shall be recorded. Copies of such records shall be available for review by the Company.

7 QUALIFICATION OF WELDERS

7.1 General

Each welder producing welds shall be entitled to work in the jurisdiction where the Work is performed. Welders shall be qualified in accordance with the requirements of 49 CFR 192 Subpart E, 49 CFR 195 Subpart D, and ASME Boiler and Pressure Vessel Code Section IX.

7.2 Test Weld Acceptability for Welder Qualification

Welders shall be qualified for the Work when they produce a test weld witnessed by the Company that:

(a) Has been made in accordance with the requirements of the welding procedure specification

(b) the visual inspection requirements given in Clause 10; and

(c) Meets the standards of acceptability for nondestructive inspection given in Clause 10.

A welder's first production weld shall not be used for welder qualification; welders must qualify on a coupon prior to production welding.

Test welds failing to meet the visual inspection requirements shall not be submitted to nondestructive inspection.

7.3 Records of Qualified Welders

Records shall be made of the tests given to welders and of the detailed results of each test. A list of qualified welders and the procedure specifications in accordance with which they are qualified to weld shall be maintained for review by the Company.

8 PRODUCTION WELDING

8.1 Compliance with Specifications

Production welding shall be performed by qualified welders in accordance with qualified welding procedure specifications. Records of welding parameters used for production welding, and of the resolution of any non-conformance, shall be maintained to demonstrate compliance with the requirements of this Specification and the welding procedure specifications. Records shall be available to the Company.

(a) The Company reserves the right to measure welding parameters on any production weld. When the parameters measured on a weld do not comply with the specified values, the Company reserves the right to reject such weld and any weld made after the last compliant record, unless the party responsible for the Work can demonstrate such welds are in compliance.

(b) Non-compliance with the requirements of this Specification and of the welding procedure specification shall be cause for weld rejection.

8.2 Cleaning of Pipe Ends

(a) Oxides or other extraneous matter shall be removed from the joint prior to commencement of welding.

(b) Flame cut bevels shall be ground to clean metal prior to welding. The bevel surfaces shall be smooth and free of irregularities that could adversely affect the welder's ability to produce high quality welds as required by the appropriate section of this Specification.

(c) Areas to be cleaned shall include the weld bevel and both internal and external pipe surfaces in the vicinity of the weld for a distance of at least 1 in. from the edge of the weld.

8.3 Pipe Identification

Where a pipe is cut, pipe identification such as pipe number, grade, heat number, Company purchase order and manufacturer shall be transferred to both ends of the pipe. Die stamping of the pipe or weld shall not be permitted for that purpose.

8.4 Laminations

(a) When tie-ins are made to existing pipe or facilities, the pipe shall be checked for laminations for the entire 360 degree circumference and 6 in. back from the weld bevel.

(b) Should any lamination or split end be discovered at the bevelled end of a pipe joint, either before or during welding, the joint shall be cut back until the lamination has been completely removed and the end re-bevelled.

(c) Consideration shall be given to using ultrasonic, liquid penetrant or magnetic particle inspection methods to confirm the new cut end is free of laminations or split ends.

8.5 Grinding of Seam Welds

For welds that will later be nondestructively examined using radiography, the pipe seam welds shall be ground flush (-0, +1/64 in.) with a gradual transition to the weld reinforcement for a minimum distance of 1 in. from the bevel edge.

For welds that will later be nondestructively examined using ultrasonic examination, the pipe seam welds shall be ground flush (-0, +1/64 in.) with a gradual transition to the weld reinforcement for a minimum distance of 6 in. from the bevel edge.

8.6 Alignment and Fit-up

(a) External forces required to move the mismatched pipes in alignment shall be kept to a minimum. If the pipes to be joined were in place below grade, a sufficient length of each pipe shall be exposed so that they can be moved without imposing detrimental external stresses at the joint. If the pipes were in place below or above grade and there is not sufficient length to allow free movement, the pipe(s) shall be cut and reinstalled to bring the misalignment within the allowable tolerance, or the pipe shall be cut and a new length of field bent pipe will be installed.

(b) Longitudinal seam welds shall be located such that they will be in the top half of the assembly, but not at the 12 o'clock position, when the assembly is ready for tie-in. Except for electric resistance welded pipe, longitudinal, spiral and skelp end welds in adjacent lengths of welded pipe shall be offset by a minimum distance of two (2) inches.

(c) Hammering of the pipe shall not be permitted.

(d) Line-up clamps, full penetration tacks or bridge tacks shall be used at all times.

(e) For pipe of the same nominal wall thickness, the maximum offset or misalignment of the abutting pipe ends shall not exceed 1/16 in.

(f) For pipe to fitting joints of equal nominal diameter and wall thickness, the external offset shall not exceed 1/8 in. Internal offsets exceeding 3/32 in. shall conform to the conditions specified in Clause 8.19.

(g) Pipe ends damaged or dented beyond these acceptance limits, external or internal offsets specified above, shall be cut and re-bevelled.

(h) The welding of alignment lugs shall only be permitted in the joint bevel and only with the approval of the Company. Alignment lugs shall be made of material that is similar to that being welded and shall be welded with a qualified, low-hydrogen, welding procedure.

(i) Pipe shall be fully inserted into sockolet fittings, utilizing the manufacturer's recommended gap. Gapolets are an acceptable means of maintaining the gap requirements.

(j) All O'let fittings shall be installed a minimum of two (2) inches (toe to toe of welds) from any long or spiral seam weld and any girth weld.

(k) Where transition weld preparations are part of the assembly, the lengths of the counterbores and their surface finish shall be adequate for ultrasonic inspection, if this technique is used.

8.7 Pipe Support

(a) The welding of supports, bracing bars or counter balance weights to pressure piping and components shall not be permitted.

(b) Pipe shall be supported in accordance with standard industry practice. Any occurrence of a pipe or component falling from its support shall be reported to the Company, together with any tests, inspections and remedial work performed as a result of the fall.

8.8 Weather Conditions

Portable enclosures are permitted to make conditions satisfactory for welding.

8.9 Grounding and Cables

(a) Grounding devices shall be designed to prevent arcing and shall be placed on a clean surface.

(b) Devices grounding in the bevel area shall be made of steel; copper or bronze tips shall not be used for such purpose.

(c) Welding shall be insulated to prevent arcing to the pipe surface.

8.10 Protection of Coatings

Consideration shall be given to the protection of the existing coatings on piping to minimize damage that may result from the welding operations.

8.11 Preheating and Controlled Cooling

(a) Preheating temperatures shall be as given in Table 1.

Table 1 – Preheating Temperatures

Application - Process – Grade	Minimum	Maximum
Bridge tacks and alignment lugs SMAW, GMAW and FCAW Up to NPS 12 and Grade X42 inclusive	70°F	400°F
Bridge tacks and alignment lugs SMAW, GMAW and FCAW Grades higher than X42 and assemblies larger than NPS 12	170°F	400°F
Pipe ALL processes ALL Grades	212°F	400°F
Components ALL processes ALL Grades	300°F	400°F
Repairs ALL processes ALL Grades	252°F	400°F
Pups to Weld-end Valves (NPS 16 & higher) ALL processes ALL Grades See special precautions below	212°F on pipe side 300°F on valve side	400°F in weld area 300°F at 4 in from weld area on valve body
General precautions for welding on weld-end valves: - The seat-ring gaps shall be protected from contamination by welding debris. - Consideration shall be given to the use of closures, seals, etc., post-weld cleaning and flushing out contaminated grease. - Preheating shall only be applied to the external surfaces while monitoring the temperatures given in Table 1. Precautions shall be taken to protect the valve seat seals, i.e., ensure that valves are fully opened. - For NPS 2 and larger valves, see additional guidelines for welding in Company Procedure TEP-VALV-FAB. - For valves < NPS 2, manufacturers' recommendations should be followed.		

(b) The minimum preheat temperature shall be maintained for a minimum distance of:

(i) 100 mm on each side of the weld for the full circumference in the case of girth welds; or

(ii) 150 mm from any point of the area to be repaired in the case of repairs.

(c) Preheat and interpass temperatures shall be checked using temperature-indicating crayons or pyrometers in an area ten (10) mm to thirty (30) mm from the edge of the bevel and shall be within the specified limits during the passage of the arc. When preheating with a flame, a minimum of fifteen (15) seconds shall elapse after the flame is removed from the surface before preheat temperatures are measured.

(d) No passes of a weld shall be cooled at a rate greater than that provided by natural air-cooling.

(e) Preheat shall be maintained until weld is at least two-thirds (⅔) full. For unequal WT across the weld, the minimum two-thirds (⅔) full shall be measured on the thinner wall thickness.

8.12 Number of Welders

A minimum of two (2) welders shall be required for welds on piping larger than NPS 16 and for the root pass and hot pass of NPS 16 welds, except that only one welder is required for rolled welds.

8.13 Start of Welding

Welding shall not commence until all parts to be joined are secured against relative movement.

8.14 Removal of Bridge Tacks and Alignment Lugs

Bridge tacks and alignment lugs shall be completely removed after they have served their purpose. For material grades greater than X80, tacking/lug attachment areas shall be inspected by magnetic particle inspection for cracking after removal and prior to completion of the root pass.

8.15 Cleaning between Passes

Weld bead starts, high points and starting porosity shall be removed by grinding prior to depositing weld metal over them.

8.16 Maximum Bead Width

(a) Except as permitted below, the maximum width of any weld bead shall be 3/4 in.

(b) It shall be permissible to use a full weave technique with a bead width exceeding 3/4 in. when welding in the fixed position using SMAW electrodes of 5/32 in. diameter or less and at least one of the items being welded does not exceed 0.688 in. nominal wall thickness.

8.17 Weld Capping

(a) For pipe to fitting or valve joint with unequal wall thickness, if the end preparation is a single bevel (30° or 37.5° nominal) the cap shall reach the breaking point between the bevel angle and the external diameter of the fitting or the taper angle, if any.

(b) If the fitting has a compound bevel (37.5° nominal) and then 10°, the cap shall reach the edge between the weld bevel and the secondary bevel (taper angle).

(c) In any case, the maximum cap overlap shall be three (3) mm beyond the edge of the weld bevel. The slope of the cap shall not exceed 30° and the weld thickness on the fitting side shall not exceed 1.5 times the nominal pipe wall thickness.

8.18 Interruptions in Welding

(a) Except as permitted below, production welding shall continue without interruption and the weld temperature shall be maintained above the minimum interpass (preheat) temperature until at least two (2) passes have been completed and two-thirds (⅔) of the weld thickness is filled.

(b) For GMAW/SAW or GMAW/SMAW/SAW combined rolled welds, it shall be permissible to let the weld cool down following the completion of the root and hot passes and the first SAW pass, provided that the assembly is not moved. The weld shall be wrapped in an insulating blanket if the weld is allowed to cool after the hot pass.

8.19 Backwelding

Backwelding is permitted on pipe to fitting welds to account for inherent misalignment from manufacturing.

When attaching fittings/valves to pipe, any area where the internal misalignment exceeds 3/32 in. shall be backwelded using low hydrogen electrodes so as to produce a gradual transition in material thickness between the fitting/valve and the pipe. The root pass metal reinforcement shall be removed by grinding before backwelding.

8.20 Transition Welds

Transition welds shall be designed as specified in Clause 5.3.1. The preferred type of transition joint is the combination 'counterbore and taper'.

Welding of transition joints shall be completed as described below;

(a) Final tie-in welds shall not be permitted at taper transition joints, except as allowed in Table 2;

(b) For limitations on component to pipe welds (fabrication welds) refer to Clause 8.19 and Table 2.

(c) Field tie-in welds at transition joints are acceptable utilizing the limitations stated in Table 2.

Table 2 – Transitions in a Station

Weld Type	Welds Involving Components in the Field	Pipe to Pipe	Notes
Final Tie-ins	**Not Acceptable**	**Acceptable** [1]	▪ Counterbored and taper transitions, no restrictions.
		Not Acceptable	▪ Taper transitions on pipe wall thickness greater than 0.100 in. in difference.
Tie-in Welds	**Not Acceptable**	**Acceptable** [1, 2]	▪ Counterbored and taper transitions, no restriction

[1] Taper transitions on pipe wall thickness up to and including 0.100 in. difference, NDE for both wall thicknesses is required.
[2] Taper transitions on pipe wall thickness difference greater than 0.100 in. requires an engineering assessment and approval. NDE for both wall thicknesses is required.

8.21 Identification of Welders

(a) Welders shall be responsible for marking their unique welder number/letter on the top quadrant of the pipe adjacent to each weld they have worked on using a permanent marker (low stress stamps are not acceptable for pressure piping). Welder markings shall be at least four (4) inches from the edge of the coating cutback (approximately 8 to 10 in. from the weld centerline). The welder identification number/letter shall also be recorded on the NDE inspection record and on the relevant drawing/spool sheet.

(b) Stainless steel welds shall be identified using an indelible (chloride-free) ink marker.

8.22 Clean-up of the Weld

Weld spatter shall be completely removed from the surface of the joint for a minimum distance of four (4) inches on each side of the weld.

8.23 Clean-up of the Work Area

The work area shall be kept free of waste. Pipe pups, bevel shavings, unused welding rods and other surplus materials shall be collected continuously.

9 INSPECTION AND TESTING OF PRODUCTION WELDS

9.1 Visual Inspection

Completed welds shall be visually inspected and any imperfection shall be assessed using the applicable Standard of Acceptability given in Clause 10.

It shall be permissible to repair defects in the cap or root pass detected by visual inspection before nondestructive testing, provided that:

(a) All repair work is approved by the Company;

(b) Any welding is done in accordance with the requirements of an approved welding procedure;

(c) A visual inspection of the weld is performed after the repair work; and

(d) Inspectors shall be trained and their qualifications approved by the Company.

9.2 Mandatory Nondestructive Examination

(a) All production welds shall be nondestructively examined for 100% of their lengths, in accordance with the requirements of Chapter VI of ASME B31.3; and

  (i) Where such welds are butt welds, using radiographic or ultrasonic methods, or a combination of such methods;

  (ii) Where such welds are fillet welds or combination groove/fillet welds, using wet magnetic particle inspection (black on white or fluorescent) on ferrous materials or liquid penetrant inspection on non-ferrous materials.

(b) Any imperfection shall be assessed using the applicable Standard of Acceptability given in Clause 10. The Company may, at its option, require additional inspection with other nondestructive examination methods listed within this Specification.

9.3 Nondestructive Examination Methods

(a) Radiographic inspection shall be performed in accordance with the requirements of Company Specification TES-NDT-RT-US.

(b) Ultrasonic inspection shall be performed in accordance with the requirements of Company Specification TES-NDT-UT2-US.

(c) Magnetic particle inspection shall be performed in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section V, Article 7. The direct current method of magnetization shall not be used.

(d) Liquid penetrant inspection shall be performed in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section V, Article 6.

(e) With permission of Company engineering personnel and an approved procedure and operators Phased Array Ultrasonics may be implemented for pipe to pipe butt welds.

(f) If field hardness testing is required, testing shall conform to ASTM E 384 using Equotip or similar portable hardness tester. The instrument shall be calibrated using Vickers hardness blocks and linearity shall be verified at two points outside the expected hardness range.

10 STANDARDS OF ACCEPTABILITY

The standards of acceptability for weld inspection shall meet the requirements of Section 9 of API 1104 and the additional requirements shown in this section.

The standards of acceptability for visual inspection shall meet the following additional criteria for the maximum height of weld reinforcement:

Height of reinforcement, in	Pipe Nominal Thickness, in.
Less than 0.100	Less than 0.512
Less than 0.138	Greater than 0.512 inclusive

10.1 Visual, Magnetic Particle, Liquid Penetrant and Radiographic Inspections

The standards of acceptability for visual inspection, magnetic particle inspection, liquid penetrant inspection and radiographic inspection shall be the applicable criteria given in Table 3.

10.2 Ultrasonic Inspection

(a) Indications of discontinuities characterized as cracks are unacceptable regardless of length or location.

(b) A linear-type discontinuity is unacceptable if the amplitude of the indication exceeds the reference level and its length exceeds:

(i) ¼ in. for $T_w \leq$ ¾ in.;

(ii) $T_w/3$ for $T_w >$ ¾ in. and ≤ 1-1/2 in.; or

(iii) 0.5 in. for $T_w >$ 1-1/2 in..

(c) No indication will exceed a vertical height of 25% Tw for oil service and 50% Tw for gas service.

Table 3 – Acceptance Criteria for Assemblies and Station Piping Welds

Imperfection Type See Note (1)	Visual Method	Radiography	Acceptance Criteria See Note (2)
Groove and Fillet Welds Requirements			
Crack	Y	Y	Zero (no evident imperfection)
Lack of fusion	Y	Y	Zero (no evident imperfection)
Surface porosity or exposed slag inclusion	Y	NA	Zero (no evident imperfection)
Groove Welds Only (In addition to Groove and Fillet Welds Requirements Above)			
Incomplete penetration (IP)	Y	Y See Note (4)	Depth of IP < 0.04 in. and < 0.2 T_w Cumulative length of IP < 1-1/2 in. in any 6 in. weld length
Internal porosity	NA	Y	For T_w > ¼ in., 1.5 x dimensions listed in ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Appendix 4
Slag inclusion, tungsten inclusion, or elongated indication	NA	Y	Individual length < 2 T_w and < 2 in. Individual width < 0.12 in. and < T_w 2 Cumulative length < 4 T_w in any 6 in. weld length
Undercutting	Y	See Note (5)	Depth of undercut < 1 mm and < T_w /4
Concave root surface	Y	Y	Total joint thickness, including weld reinforcement, > T_w
Reinforcement or internal protrusion See Note (3)	Y	NA	Height of reinforcement: < 0.1 in. for T_w < ½ in. < 0.14 in. for T_w > ½ in.
Fillet Welds Only (In addition to Groove and Fillet Welds Requirements Above)			
Undercutting	Y	NA	Depth of undercut < 1 mm and < T_w /4
Height of Reinforcement See Note (4)	Y	NA	< 0.1 in. for T_w < ½ in. < 0.14 in. for T_w > ½ in.
Y Examination method generally used for evaluating this kind of weld imperfection NA Examination method not generally used for evaluating this kind of weld imperfection			

Notes:

1. Accumulation of Different Imperfections: The cumulative length of all imperfections shall not exceed three (3) in. in any 12 in. length of weld, or 25% of the weld length in welds less than 12 in. long.
2. Where two limiting values are separated by "and", the lesser of the values determines acceptance. Where two sets of values are separated by "or", the larger value is acceptable. T_w is the nominal wall thickness of the thinner of two components joined by a butt weld.
3. Height is the lesser of the measurements made from the surfaces of the adjacent components; both reinforcement and internal protrusion are permitted in a weld. Weld metal shall merge smoothly into the component surfaces.
4. Height measured from the theoretical throat. Internal protrusion does not apply. Weld metal shall merge smoothly into the component surfaces.
5. If radiography is used to assess depths of incomplete penetration and undercut, a comparator shim shall be used. Depths are estimated by comparing the density of the film image of the undercut or incomplete penetration with the density of film images of known groove depths in the comparator shims. Shims shall be made of a material that is radiographically similar to the material being inspected and the image of at least one shall appear on each radiograph.

11 REPAIR OF WELDS CONTAINING DEFECTS

11.1 Cracks

Cracks shall not be repaired and shall be removed by cutting out cylinders containing such cracks. Replacement pups, if required, shall be three (3) feet long or one diameter in length, whichever is the longest.

11.2 Approval for Repair and Procedure

Repair of defects in production welds shall:

(a) Require approval of the Company;

(b) Be performed by qualified welders using welding procedure specifications approved by the Company; and

(c) Be recorded on the inspection reports.

11.3 Removal of Defects

(a) Except as permitted below, defects in welds shall be removed by grinding.

(b) It shall be permissible to remove defects in welds by air carbon arc gouging provided that:

(i) The wall thickness exceeds 0.375 in.;

(ii) A one (1) foot wide area centered around the defective weld metal is preheated to a minimum of 150°F and a maximum 300°F before the gouging process begins;

(iii) After gouging and prior to commencement of welding, gouged surfaces are made smooth and free of irregularities by grinding a minimum of 3/32 in. of material from the bottom and edges of the groove;

(iv) The groove preparation is visually examined to ensure that all traces of carburized metal, copper deposits, or other extraneous matter have been removed from the groove; and

(v) Approval is obtained from the Company prior to commencing repair welding.

(c) Any section of pipe that has arc burns that cannot be repaired in accordance with Company Specification TES-WELD-ABR-US shall be cut out and replaced. Replacement pups, if required, shall be three (3) feet long or one diameter in length, whichever is the longest.

11.4 Welding Process and Consumables

The repair welding process shall be designed and consumables selected in accordance with the requirements of Clause 5.2.

11.5 Preheat for Repair Welding

The repair area shall be preheated in accordance with the requirements given in Clause 8.11.

11.6 Start and Stop of Repair Welds

The start and stop of repair welds shall be ground to conform to the contour of the original weld.

11.7 Inspection of Repairs

(a) Repairs shall be inspected using the methods and procedures specified for production welds in Clause 9.

(b) Proper removal of defects shall be confirmed using the same method used to find the original defects.

(c) Any imperfection shall be assessed using the applicable Standard of Acceptability given in Clause 10.

11.8 Further Repair Attempts

Further attempts at repairing a given defective area of a given weld beyond the first repair shall not be permitted without prior approval of the Company.

12 HEAT TREATMENT AND MECHANICAL TESTING

12.1 Heat Treatment

Assembly welds governed by ASME B31.4 or ASME B31.8, where the nominal wall thickness exceeds 1.250 in. shall be stress relieved.

Assembly welds that require stress relief shall be heat-treated between 1100°F and 1200°F for a minimum holding time of 1 hour/1 inch of bevel thickness. Assembly welds that must be stress relieved shall use a qualified welding procedure designed for and qualified with post weld heat-treatment.

12.2 Mechanical Testing

When using previously tempered piping/fitting materials (normalized and tempered, or quenched and tempered, prior to welding) and the stress relieving temperature is less than or equal to the materials' tempering temperature, no mechanical testing in addition to that required by the applicable material standard is required.

When the stress relieving temperature is greater than the materials tempering temperature, the following additional tests shall be conducted:

(a) For materials less than (<) Grade X42, Charpy tests in accordance with the requirements of the applicable material standard shall be conducted after stress relieving. The Charpy toughness requirements of the applicable material standard shall be met. Additional tensile tests are not required. Charpy tests are required on each heat of parent metal.

(b) For materials greater than or equal to (≥) Grade X42, all mechanical tests in accordance with the requirements of the applicable material standard shall be conducted after stress relieving. The requirements of the applicable material standard shall be met. Mechanical tests are required on each heat of parent metal.

When stress relieving is used on untempered piping/fitting materials (those that were not normalized and tempered, or quenched and tempered) the following additional tests shall be conducted:

(c) For materials less than (<) Grade X42, Charpy tests in accordance with the requirements of the applicable material standard shall be conducted after stress relieving. The Charpy toughness requirements of the applicable material standard shall be met. Additional tensile tests are not required. Charpy tests are required on each heat of parent metal.

(d) For materials greater than or equal to (≥) Grade X42, all mechanical tests in accordance with the requirements of the applicable material standard shall be conducted after stress relieving. The requirements of the applicable material standard shall be met. Mechanical tests are required on each heat of parent metal.

13 RECORDS

13.1 Drawings for Manufactured Items

Drawings for items purchased as a manufactured component (ie. meter run, header) shall be prepared by and submitted by the manufacturer for written acceptance. In addition to the information specified in the applicable Company material specification, the drawings shall contain the following:

(a) Welding procedure numbers and revision numbers for the assembly welds.

(b) Maximum qualified CE for each assembly weld procedure, when required.

(c) Specified NDE requirements.

(d) Applicable material specification, revision number, and revision date.

(e) Applicable material number.

(f) When specified the equipment data sheet number(s) and revision(s).

(g) Purchase order number.

(h) The minimum design temperature.

(i) Material traceability numbers.

(j) Project name and number.

(k) Bill of Materials showing the material specification and heat number for each material used in the assembly.

(l) Other applicable information.

13.2 Drawings for Fabricated Assemblies

Drawings for fabricated assemblies will be provided by the Company. The fabricator can chose to work from these drawings or to create spool drawings. In either case the following information shall be included on the as-built drawing or spool sheet:

(a) Bill of Materials showing the material specification and heat number for each material used in the assembly.

(b) Weld procedure numbers (including revision number).

(c) Project name and number.

(d) Contract number and/or purchase order number.

(e) Weld map (drawing showing the weld locations and numbers).

(f) NDE procedure number.

(g) Spool sheet number identified on original drawing.

13.3 Reports and Certificates

The manufacturer shall supply a document package prior to shipping the manufactured component to the Company or its designated delivery point, unless alternate arrangements are agreed upon with the Company. The document package shall include:

(a) The information specified within the Company material specification.

(b) The purchase order number.

(c) A copy of the Company accepted drawing.

(d) Material test reports (MTR), including CE values.

(e) Pressure testing records.

(f) Heat treatment records.

(g) Weld map (drawing showing the weld location and number).

(h) Nondestructive inspection reports; such reports shall identify the procedure number and revision number used for the inspection.

(i) Correlation between the bill of material item number on the accepted drawing, and the piping material manufacturer and heat number.

(j) Project name and number.

(k) Summary of measured welding parameters (amps, volts, travel speed, heat input).

The fabricator shall supply a document package prior to shipping the fabricated assembly to the Company. The field installation contractor shall ensure a document package is supplied to the company at completion of the project. The document package shall include but not be limited to the following:

(a) An approved inspection and test plan.

(b) Completed as-built drawings.

(c) Fabrication spool sheets (with checkers signatures).

(d) Material test records (MTR), including CE values.

(e) Pressure test logs and charts.

(f) Heat treatment report and related charts.

(g) Weld map (drawing showing the weld location and number).

(h) Nondestructive inspection reports; such reports shall identify the procedure number and revision number used for the inspection.

(i) Correlation between the bill of material item number on the accepted drawing, and the piping material manufacturer and heat number.

(j) Project name and number.

(k) Summary of measured welding parameters (amps, volts, travel speed, heat input).

The document package shall be in a format acceptable to the Company, electronic format is acceptable.

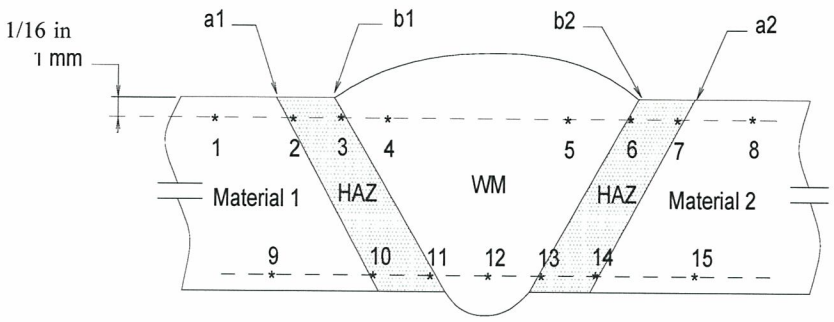

Figure 1 - Hardness Traverse Locations

Lines a1, a2	Boundary visible after etching between heat-affected zone (HAZ) and unaffected parent metal
Lines b1, b2	Boundary visible after etching between weld metal and HAZ. Hardness impressions 3, 6, 11 and 13 should be entirely within the HAZ, as close as possible to the fusion boundary. Impression 2 should coincide with the HAZ of the final run, and impression 6 with the change in profile of the fusion line associated with the final run.

- END OF DOCUMENT -

From: Meera Kothari
Sent: Tuesday, January 18, 2011 2:12 PM
To: Russell Wong; Matt Cetiner
Cc: Evan Vokes; Suman Basak; 'dhodgkinson@telus.net'; David Taylor; Darryl Sandquist; David Penning
Subject: Re: NDE Contractors - Phase 3 and Phase 4

we are going to proceed with weldsonix on the list for phase 4 and they will continue as the nde contractor for michels phase 3.

We are not going to qualify oceaneering for any keystone related work.

Please stop these emails. This is a project engineering decision.

Thanks
Meera

From: Russell Wong
Sent: Tuesday, January 18, 2011 02:08 PM
To: Matt Cetiner
Cc: Evan Vokes; Suman Basak; 'dhodgkinson@telus.net' <dhodgkinson@telus.net>; David Taylor; Darryl Sandquist; David Penning; Meera Kothari
Subject: FW: NDE Contractors - Phase 3 and Phase 4

Matt

I spoke with Dave Hodgkinson today to get background information on Weldsonix. The start of using Weldsonix for TransCanada projects was back in 2004 for Peerless I project and the conclusion of their performance was poor. Since then TransCanada Keystone signed a contract with Weldsonix on March 1, 2008. Weldsonix was later disqualified probably around spring 2009 by Dave. H. I suspect a letter was never issued to Weldsonix notifying them of their disqualification. The reasons for disqualification of Weldsonix can be found in the Supplier Management System and according to Dave H. the reasons are still valid today.

Dave H. who has had experience working with Weldsonix is advising TransCanada and Keystone never to use them again with the following reasons:

1. Lack of management support for the project
2. Lack of technical support for the project
3. High turnover of employees
4. Lack of proper maintenance on equipment
5. Lack of QA/QC competency / commitment
6. Operates the project at the least cost
7. Broken promises that they will perform better next time

Based on the following points it is my opinion that Weldsonix poses high risk to the project from a supplier performance and pipeline integrity perspective. Due to shortages of AUT suppliers, we should proceed with pre-qualification of Oceaneering as recommended by Eng. Gov.

Russell

016403

From: David Taylor
Sent: Saturday, January 08, 2011 03:53 PM
To: Matt Cetiner; Evan Vokes
Subject: RE: NDE Contractors - Phase 3 and Phase 4

What are the issues with we had with Weldsonics? What experience has Oceaneering have with AUT systems on land, that would lead us to qualify them?

From: David Penning
Sent: Thursday, January 06, 2011 6:23 AM
To: Darryl Sandquist; Alan Lietz
Cc: Stephen Marr; Evan Vokes; Meera Kothari; Jesse Bajnok; Matt Cetiner
Subject: RE: NDE Contractors - Phase 3 and Phase 4

I thought we had discussed this to death already and decided that Weldsonics was a contractor that we were sufficiently experienced with after phase 1 and that we could manage them via Michels to get the performance we desired.

As for Oceaneering, what is the cost to qualify them versus the alternatives? Did the other contractor supply alternate prices for previously approved vendors? With all the schedules being compressed, regardless of the permit date, do we need another NDE vendor in the southern US to cover the volume of work on Keystone (phases 3 and 4 going simultaneously)? My guess is yes, we should qualify them. I have no experience with UT Quality, but haven't had great luck with TEAM and last time I checked on RTD their prices were so high and performance so slow that I would struggle going down that path.

Thanks,
David L. Penning, PMP
Keystone Pipeline Phase III
O: 713.693.6411
F: 713.693.6498

From: Darryl Sandquist
Sent: Wednesday, January 05, 2011 5:02 PM
To: David Penning; Alan Lietz
Cc: Stephen Marr; Evan Vokes; Meera Kothari; Jesse Bajnok; Matt Cetiner
Subject: NDE Contractors - Phase 3 and Phase 4

In discussion with Matt Cetiner and Evan Vokes with regards to the NDE Contractors for the Phase 4 RFP, it came to light that Engineering Governance has delisted Weldsonics as approved Supplier. Even though we generally do not rely on Engineering Governance/Supplier Management approval for subcontractors, NDE plays a large role in the quality of the project so we should consider the issues.

Evan is recommending that Weldsonics not be included in the Phase 4 RFP as an approved Supplier (limit to the 4 approved – TEAM, Shaw, UT Quality, Applus/RTD) and that Phase 3 request Michels to propose an alternate subcontractor for Spread 1-4 from one of the approved Suppliers. In the Michels contract, Meera did write a specific scope item to address previous issues that we had with Weldsonics.

We also discussed Oceaneering for Spread 5 & 6, and Evan is willing to qualify them in early February or March and will also provide some support in contesting the increase in costs that Sunland is quoting for AUT vs RT.

Alan – I believe we came to this agreement yesterday, with the exception of Weldsonics – we had planned to leave them on for Michels to propose.

David – what are your thoughts on Michels using Weldsonics as a subcontractor?

Darryl Sandquist
Commercial Lead – Keystone XL Pipeline
TransCanada
P: 403.920.6941
C: 403.831.4101
www.transcanada.com

From: David Taylor
Sent: Thursday, October 20, 2011 8:12 PM
To: Evan Vokes; Jim Platt; Cindy Guan
Cc: Grant Kowpak; Darren McLean
Subject: RE: Peerless vessel

Evan,
Did you include our Facilities Integrity department personnel (Bill Yang and John Haley) in this conversation with ABSA?
Did you contact the Company Regulatory department for guidance on this matter?

Please let me know.

Thank you

Dave

From: Evan Vokes
Sent: Thursday, October 20, 2011 10:03 AM
To: Jim Platt; David Taylor; Cindy Guan
Cc: Grant Kowpak
Subject: Peerless vessel

Hi Everyone
Yesterday Jim and myself had agreed that I should phone Material and Design at ABSA yesterday and this meeting with ABSA was very productive
I talked with Bruce McWhirter and Mick Poelhman and it made it much easier to clear up a memo that I have been working on and I need to finish writing

The short news is, if we specify our inspection, it is mandatory under the code and that means I must meet the code in my response
.
If we want to write a variance to our specification for method or other special requirements that are included in the code that is up to us.
The foreword in the code is the part that is the stumbling block as almost all of our vessels are simple but we operate at a much higher pressure than most owner users.
I did ask that famous question if ABSA cares and both Bruce and Mike were adamant that they do care about inspections of Cat D nozzles. There are some issues with how ABAS handles inspections of Cat D but the Materials and Design group care.

No matter what we do, if we cannot make a code inspection for the nozzles and want to accept the vessels we have to variance to one of two choices

a) delete the requirement for Cat Ds. This was forbidden by management already as they stated that they did not want a repeat of Edson. It is stil an option but if there is a failure, we will be back justifying our engineering practice with the regulator.
b) Radiography. We can write a variance to the specification and still be within the limits of the code and ABSA's concerns.

This means if our NDE provider can prove film sensitivity. We are good. Jim had Acuren doing some prework yesterday. The problem is the source must be held vey steady to meet sensitivity requirements we will know soon if this is practicable.

Mike Poelman will be talking to their Authorized inspectors (AI) about NDE requirements. There is no specific promise of what will happen but he is very open to the inspection needs of users that are not related to process fluid engineering concerns. Mike and Bruce did tell me about the detail the AI looks at vessels I will be asking Mike to give me a bit more in depth so we understand if Moody process is replicating the inspection that ABSA has done. In other jurisdictions, Moody

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will always be responsible for the full inspection. to understand the context of the AI duties, there are areas that AI will never look at as they only look at the RT record, never the film so this becomes our 3PI problem.

Thank you
Evan

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 01/30/2013 Hours Worked : 9
Weather: Sunny Temp. Low 45 High 65
Owner/Operator: Transcanada/Keystone XL Spread 2
Contractor Michels
Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: **Traveled to Jacksonville, Texas and met with Kelly White (PHMSA Escort) at Michels construction yard. Reviewed welding procedures with Grant Bourgeon (Chief Welding Inspector). Reviewed rejected weld repair records with Darrren Durda and HDD procedures with Kabir Elegba (site engineer) and Bernado Abrams . A Mr. Bob Campbell is the developer of the HDD procedures utilized by TransCanada. Traveled to M.P. 321 to observe lowering in and discovered activity was stopped due to earlier rain and were only pumping water out of ditch. Traveled to M.P. 328 and observed field automated coating. Observed heating, blasting and spraying of 20 to 25 mils of 2888 epoxy onto field joints. Expressed a concern that it appeared adequate inspection of the field joint to assure clean and bare metal was free of debris and blasting sand before spraying of field joint.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Additional Comments:

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_01/31/2013___ Hours Worked :__9_____
Weather: Sunny____Temp. Low_45___High_65__
Owner/Operator: TransCanada/Keystone XL___ Spread__ 2____
Contractor___Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_ **Traveled to M.P. 262 and observed hydro activities of a 21 mile segment of main line. All activities seemed to be following T/C's procedures. Questioned lead inspector about process of a 1 hour pre test of heavy wall bore pipe prior to lowering in and subjecting same pipe to a minimum of 8 hr test at a lower pressure. Was advised that this was their policy to determine any minor pin hole leaks in long seam and body of pipe joint before mainline test. Traveled to M.P. 239 to observe excavation and sitting activities for Winnsboro pump station.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :_____

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 02/06/13____ Hours Worked :_12_____
Weather:_Rainy___Temp. Low_50___High_60__
Owner/Operator:_TransCanada/Keystone XL__ Spread__2____
Contractor_Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_ **Escorted Mr. Tim Butters (PHMSA associate Administrator) to observe New Construction Activities on Spread 2 (two) of the Keystone XL pipeline project. Stopped at M.P. 335 and 336. Most activities were being shut down due to rain. Walked along pipeline ROW to observe pre constructed main line pipe. Interviewed with lead welding inspector on site. Talked with AUT level 2 (two) technician about integrity of ultrasonic examination of field joint welds. Traveled to M.P. 369 to observe HDD of Neches River. Talked with drilling technician in drill control room about process. Traveled to Lufkin pump station and found activities were also stopped due to rain. Escorted Mr. Butters back to Dallas.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :___**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : February 26, 2013 Hours Worked :9
Weather:Sunny Temp.50s Low50s High60s
Owner/Operator:Transcanada SpreadSpread 2
ContractorMichel Construction

Observed Activity : Safety Training

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Winnsboro Office	Winnsboro Pump Station	n/a

Comments: **Took mandaotory Safety Training**

Observed Activity :Hydrotest

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Beginning of Spread 2	n/a	195

Comments**Observed end of hydrostatic testing of section from MP 195 to Winnsboro Pump Station site.Testing was completed during the night time so didn't observe acutal test. Pipe was still filled with water and under a lowered pressure. Examined pipe for expansion of joints. Coating had no indications of cracking.**

Observed Activity:Pump station construction activities

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Winnsboro Pump Station	n/a	235

Comments: **Crews were working on concrete pouring, conduit work and some welding. Both section 1 and 2 of the hydrotests were examined. Both headers were still exposed and showed no signs of expansion. Welding crews were welding per procedures.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : February 27, 2013 Hours Worked :9
Weather:Sunny Temp.50s Low50s High60s
Owner/Operator:Transcanada SpreadSpread 2
ContractorMichel Construction

Observed Activity :Welding

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Angelina River Xing	N/A	310

Comments:_**Welding was observed on pipe being used to cross under the Angelina River. The Pipe was concrete coated. Verified procedures were on hand. Procedure KXL-SMAW-ML2 was being utilized and verified during the welding. Jerry Davis and John Smith were the welding inspectors.**

Observed Activity :Angrlina River Crossing

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Angelina RiverXing	n/a	310

Comments**Examined pipe being utilized for the river crossing. All pipe going under the river and wetland area was concrete coated. The river is approximately about 40 ft from bank to bank. Area had a lot of standing water due to recent rain. The contractor called it a wetland but not sure if it is an official wetland area.**

Observed Activity:Visited complaint area

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
CR 890 xing	n/a	318

Comments:_**Visited area in which Mr. Tucker complained about the mud/water runoff caused by the pile of dirt left by Transcanada and exposed ditch. Pipeline was already covered at location. There were no open ditches but there was still a lot of dirt piled next to ROW. There did seem to be some dirt runoff into Mr. Tucker's property, which is across CR 890. Talked to Mr. Tracy Hilburn and Mr. Dan Cerkoney and suggested that they place silt fencing or clean up ROW to prevent runoff of water and dirt into Mr. Tucker's property.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : February 28, 2013 Hours Worked :9
Weather:Sunny Temp.50s Low50s High60s
Owner/Operator:Transcanada SpreadSpread 2
ContractorMichel Construction

Observed Activity :Site Specific Safety Training

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Lufkin Pump Station	N/A	338

Comments:_**Completed site specific safety training**

Observed Activity :Pipe examination and NDT records

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Lufkin Pump Station	n/a	338

Comments**Examined pipe, flanges, and valves for rating and coating conditions.Reviewed several xrays and repair records. Had about 20 xrays so far on station piping. Verified Mr. Hudgens Level II training/qualification record.**

Observed Activity:Automatic welding

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
MP 355	n/a	355

Comments:_**Observed automatic welding process at approximately mp 355. There were 3 hoods(bead passes, filler passes, and cap) utilized to complete each weld. Verified procedure being utilized at location and that were being followed. Inspector was checking pre heat, speed, and settings. Welding procedure being utilized was WPS APO153 rev.2**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 08/14/2013____ Hours Worked : _9_____
Weather:____Temp. Low____High___
Owner:_TransCanada/ Keystone XL_____
Contractor: _____
Observed Activity :_ _Pump stations hydro records.

_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

(SPREAD 2)

Comments_**Traveled to MP 195.0 to PS #36 and observed three valve assembly off mainline for future station. No expansion issues observed. Traveled to Winnsboro PS #37 at MP 239. Reviewed both low and high pressure piping hydro test documentation. Suggested more information on actual chart recordings. i.e. MFG #, Serial #, etc. etc. Operator had documentation sheets for this information but did not transfer to the actual test recording charts. Pump Station piping about 99% complete. Insulation being installed on above ground piping. No evidence of pipe expansion. Traveled to Tyler PS #38. Reviewed hydro test packet. No documentation to prove instruments used to record activity was actual instrument used. Certification sheets instruments were in packet, but not recorded on charts. Advised to use better documentation in the future.**

_____
_____
_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____
_____
_____
_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____
_____
_____
_____

Additional Comments:_____

_____

_____

_____

_____

OPS Inspector's Signature :__**Jim Arnold**

_____

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 08/15/2013____ Hours Worked :__9_____
Weather:____Temp. Low____High___
Owner:_TransCanada/Keystone XL_____
Contractor: _____
Observed Activity :_ _Pump stations hydro records.

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments__**Reviewed Hydro test of both high pressure and low pressure above ground piping subjected to hydro test at Lufkin PS # 39. Records were adequate and observed no evidence of expanded pipe. Reviewed hydro packet for Corrigan PS #40 . Records were adequate. Station consisted of three valve cluster off mainline for future PS. Observed MLV setting off highway 190. No evidence of pipe expansion and was being equipped for automation of valve actuators.** (SPREAD 2) (SPREAD 3)

Observed Activity : _____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: _____

Observed Activity : _____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: _____

Additional Comments: _____

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 10/30/2013____ Hours Worked :__9_____
Weather:____Temp. Low____High___
Owner:__TransCanada/Keystone XL_____
Contractor: __Michels_____
Observed Activity :_Anomaly and DCVG digs _

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

(SPREAD 2)

Comments__**Interviewed Cathodic Protection Crew about overall program. I was advised the plan had been submitted to PHMSA. The line is currently being protected by temporary anodes until project has been commissioned and then will protected by impressed current. Observed anomaly dig #GC-1-1400000058 @ MP 133.72. This anomaly did not require a cut out. Observed DCVG dig #235 @ MP 153.8. Discovered lots of rock damage spots on upper half of pipe. After further examination it was determined to excavate pipe back in both directions until clean pipe was discovered. Pipe was lightly blasted and recoated. Jeeping procedures showed no more anomalies and line was backfillede.**_____

Observed Activity : _____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: _____

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Additional Comments:

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 02/19/2013 Hours Worked : 10

Weather: Clear Temp. Low 45 High 65

Owner/Operator: TransCanada/Keystone Pipeline Spread 3

Contractor Sunland/RWCI

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: **Traveled to Sour Lake, Texas field office and met with Ken Perque (PHMSA Escort). Traveled to End of Keystone Pipeline At Nederland, Texas. The line will enter the property of Sunoco Logistics for delivery to them. Reviewed Sunoco and Mersac safety films for future access to job site. Met with Tim Dowd (site construction lead) for T/C and received a copy of contacts for the station construction which will use Ron Williams Construction. Traveled to station 25004+90 to observe HDD activities of Hildebrant Bayou area. This is an approximate 4700' drill. Traveled to South side of drill site to observe ARO coated pipe to be used for the pull back under the bayou. The pipe had been previously welded and field coated. Don't know if hydro had been performed yet.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Additional Comments:

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_02/20/13___ Hours Worked :__9_____
Weather:_Cloudy___Temp. Low_40___High_55__
Owner/Operator: Trans/Canada/Keystone Pipeline___ Spread_3_ ____
Contractor_Sunland_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Traveled to Construction site for Liberty Pump station (PS41) to observe activities related to pump station . M.P 435.52. All pillings had been driven, dirt work complete. Pump sumps were excavated and electrical supplier was building construction power station for project. Traveled to Goodrich, TX area to observe pipe gang activities, welding, coating, tie-ins and lowering in. Traveled to Sunland/TC construction yard to review welding procedures with Mr. LeBlanche. Seems contractor is still experiencing high weld reject issues. Reviewed coating procedures with coating inspector.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :_**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : March 18, 2013 Hours Worked :9
Weather:Sunny Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Bending

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
24905+25	Terrel Park Rd	n/a

Comments:_**Crew was setting up for bending activities. The site is the end of a HDD. Inspector was on site and observing handling of pipe.**

Observed Activity :HDD

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Port Author HDD	———	———

Comments**Crew was filling HDD pipe for pre-drill hydrotest. Water was being pumped in from a creek and would take approximately 24 to fill. Inspected pipe for any coating damage. All pipe had ARO coating. The HDD is going under Hwy 93, and RR tracks. Its approximately 3500 ft long.**

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
———	———	———

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : March 19, 2013 Hours Worked :9
Weather:Sunny Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Safety Training

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Nederland Station	_____	n/a

Comments:_**Watched safety videos at the Sunoco Plant tie in.**

Observed Activity :Concrete pouring

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Nederland Station	_____	_____

Comments**The contractor inside the Sunocoe Plant is Ron Williams. Tim Dowd is Transcanada site lead. Crew was preparing concrete support boxes with rebar for concrete pouring. Crew has not started on pipeline activities. The pipe will tie into two break out tanks that are owned by Sunoco. Sunoco personnel are working on tanks and preparing for operation. They are being taken out of service for an internal inspection.**

Observed Activity:HDD Pipe examination

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Brad Miller Park	_____	_____

Comments:_**HDD pipe is in place and ready for hydrotest and pull. Examined pipe for any coating damage. All pipe has ARO coating. The HDD will be going under pipelines and RR tracks next to Dow, Air Liquide and Sunoco Plants**

Observed Activity :Welding

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Farnett Rd Xing	_____	n/a

Comments:_**Crew was repairing welds on HDD pipe. The welder was Willie Ledet. Qualification record was verified. Procedure being used was KXL-SMAW-PRP. Welding inspector on site was Jason Moore. Readings were being taken to assure welder was within limits.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature **:**_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : March 20, 2013 Hours Worked :9
Weather:Sunny Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Review Welding Records

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Livingston Office	_____	n/a

Comments:_**Reviewed welding records due to concern on high repair rates. Alan Leblanc is the Senior Welding Inspector. I reviewed welding procedures: New and Old procedure, Repair Procedure and Partial Repair Procedures. Reviewed AUT and RT records. Verified welder qualifications. There is a concern with the high reject rate on repairs. The current rate is at 22% which is very high. Some welders have been let go due to high repair rates and some have left for other jobs. There is no pattern as why there is a high repair rate. PQR's weren't available at the Livingston Office. I was told that they are kept by Transcanada.**

Observed Activity :Jeeping/ pipe lowering

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hwy 190 Xing	_____	_____

Comments**The crew was jeeping the pipe that was going to be lowered into the ditch for a tie in weld. Jeeping was being performed per procedure. Inspector was on site verifying jeeper settings. Crew was waiting for coating to dry to lower pipe.**

Observed Activity:Jeeping

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
HWY 146 2nd xing	_____	_____

Comments:_**Crew was jeeping pipe before backfilling ditch. Jeep settings were verified. Crew was using epoxy gun to make coating/holiday repairs an applied with a brush. Areas were being preheated before epoxy was applied.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
_____	_____	n/a

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : April 01, 2013 Hours Worked :9
Weather:Rainy Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Coating

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Terrel Park	Terrel Park Rd	n/a

Comments:_**Observed girth weld coating. Spoke with foreman on coating application. They coat to 20-40 mils and do two coats on HDD pipe. The y apply coating with brushes. Do not use spray on application. Checked thickness of coating with gauge to assure correct thickness. Go back 2" from weld exposure to assure good application of coating.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
———	———	———

Comments**Conditions were very muddy and wet. Could not get around some areas due to getting stuck.**

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
———	———	———

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : April 02, 2013 Hours Worked :9
Weather:overcast Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Drilling HDD

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Dupont Plant	_____	n/a

Comments:_**Observed drilling activities close to the Dupont Plant. The HDD is about 1400 ft going under some RR tracks and Plant property. Spoke with drilling foreman and inspector. Are drilling about 25 joints a day. They are reaming with a 36" bit. Drilling foreman was very knowledgeable on HDD procedures and methods.**

Observed Activity :Tie in weld

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Meeker Rd. Xing	_____	_____

Comments**Tie in crew was setting up to perform tie in welds. Girth welds were also being coated. Crew had trouble setting up do to condition of ROW. Very muddy and wet.**

Observed Activity:Welding

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hilldebrandt Rd. Xing	_____	_____

Comments:_**Observed welding of pipe. Welder had certifications and procedure. Crew had welds covered with tarp due to rain in accordance with procedures. During welding the welders had a canopy over them to protect from rain.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : April 03, 2013 Hours Worked :9
Weather:Overcast/rainy Temp.60s Low60s High60s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Review welding records

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Livingston Office	____	n/a

Comments: **Reviewed welding records at the Livingston office. Repair rate has decreased. There is no pattern or an obvious welder with higher repair rates. Welders with high repair rates have been let go or have quit the job.**

Observed Activity :Hydrotest records

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Livingston Office	____	____

Comments**Asked for hydrotest records but records are kept by Transcanada in Houston. TC has to review hydrotest records before making them official.**

Observed Activity:Caliper pig set up

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
MP371	____	____

Comments: **Visited location where caliper pig is going to be run. The headers were in place and crew was setting up to run pig. Conditions were very muddy so pig run was being delayed.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : June 17, 2013 Hours Worked :9
Weather:Sunny Temp.90s Low70s High90s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Girth Weld Inspection Digs

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Spread 3	____	Section 3-1

Comments: **Sunland is exposing approximately 100 girth weld that may have some coating damage due to welding spatter. During welding, there was no burlap cover used to protect pipe from weld spatter damage. During construction the inspector noticed the damage areas but nothing was ever done to repair the damage.**

Observed Activity :Girth weld inspection dig

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
19808+24	____	____

Comments**Dig #3EMI-0040C this was a previous repaired area that was exposed on an earlier date to verify inspectors claims of the damage.**

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
____	____	____

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : June 18, 2013 Hours Worked :9
Weather:Sunny Temp.90s Low70s High90s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Girth Weld Inspection Digs

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
19852+97	____	Section 3-1

Comments: **Dig # 3AMS065C- Girth weld was exposed and repairs were made to the coating due to welding spatter.**

Observed Activity :Girth weld inspection dig

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
19828+13	____	____

Comments**Dig #3AMS-0015C observed coating inspector examine/evaluate pipe for coating damage. Damage to coating was found on the top half of pipe due to welding spatter. Inspector outlined areas that need repair.**

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
____	____	____

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : June 19, 2013 Hours Worked :9
Weather:Sunny Temp.90s Low70s High90s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Bending

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hwy 3513 Xing	____	____

Comments:_**Pipe was strung out ready for bending. Bending machine broke down so was getting repaired. Examined pipe for any coating damage.**

Observed Activity :Lowering pipe

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hwy 347 Xing	____	____

Comments**Pipe was being lowered into the ditch. Examined ditch for condition of soil. Soil looked clean with no rocks, boulders, wood chunkcs or any trash. Pipe was being supported by booms to minimize stress on pipe.**

Observed Activity:Coating

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hilldebrant Road Xing	____	____

Comments:_**Crew was coating girth welds. Observed activities to assure proper application of coating.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : June 20, 2013 Hours Worked :9
Weather:Sunny Temp.90s Low70s High90s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :HDD

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Brooks Road Xing	____	469

Comments: **HDD activities were being performed. The head was being attached in preparation for pulling the pipe. There were about 11 pipelines that were being crossed. Kinder Morgan representative was present as there line was being crossed. Soil/mud had no signs of rocky substance. The entire pull was approximately about 400 ft of pipe.**

Observed Activity :Pipe examination

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Hwy 347 Xing-east side	____	____

Comments**Pipe was strung out. Examined pipe for coating damage and condition of pipe. Girth welds were coated with spray on application. Coating looked in good condition.**

Observed Activity:Bending

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
HWY 3514 Xing	____	____

Comments: **Bending machine was finally fixed and bending activities resumed. Engineer was on site to oversee bending activities.**

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : June 21, 2013 Hours Worked :9
Weather:Sunny Temp.90s Low70s High90s
Owner/Operator:Transcanada SpreadSpread 3
ContractorSunland Construction

Observed Activity :Running Scrubbing pigs

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Sec 3-2 &3	____	424.2

Comments: **Launcher has been welding on pipe for pigging activities. Two sections were being run at one time so approximately 40 mile section. Extrs compressors were brought in due to the first pig getting stuck. Pig may have been trapped due to dirty conditions inside the pipe. The plan was to run extra scrubbing pigs until line was clean enough to run deformation/caliper tool.**

Observed Activity :Anamoly Dig

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Section 3-1	____	____

Comments**Two anomaly digs were still under water. Crew was waiting for water to reside in order to resume digging operations.**

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
____	____	____

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : _08/16/2013___ Hours Worked :___9____
Weather:____Temp. Low____High___
Owner:_TransCanada/Keystone XL_____
Contractor: _____
Observed Activity :_ _Pump stations hydro records.

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments__**traveled too and observed Liberty PS #41 above ground piping that will be subjected to hydro test. This station is moth balled for approximately 30 days due to contractor was sent to Cushing station #32 to complete work for displaced contractor at PS #32. Will review hydro packet for station #41 at a later date. No evidence of pipe expansion observed. Station is about 90% complete. Observed EOL delivery station construction. Inspected meter station piping and surge relief line. Station is 60-705 complete. Station has not been hydro tested.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :__**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_03/05-06/13___ Hours Worked :__9_____
Weather:_Clear___Temp. Low_25___High_50__
Owner/Operator:_TransCanda/Keystone__ Spread__1 ____
Contractor___Wanzek/Matrix_____
Observed Activity :_Breakout Tank Construction

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Traveled to Cushing, OK and met with Harold Anderson (PHMSA Escort) and Lance Johnson, site construction manager for T/C. Tried to review procedures used for construction of Breakout tanks with very little success. The procedures were extreamly vague and was met with strong resistance to revel documents. The documents requested and was told could not be reviewed were as follows:** Copies of the following documents/information was requested but not provided to PHMSA during the recent construction inspection of the Keystone Gulf Coast Pipeline in Cushing, OK:

- Geotechnical report prepared by Terracon (API 650, Appendix B, B.2.1, IBR)
- Written specifications for construction of breakout tanks and associated piping (§195.202 Compliance with specifications or standards.).
- Soil compaction testing records (API 650, Appendix B, B.2.4, IBR)
- Tank design calculations showing the determination of shell course thicknesses, wind loading design, seismic design, etc. Matrix has developed a design package that has been provided to PHMSA for other breakout tank construction inspections and a similar set of calculations is what was requested (API 650, Section 5, etc., IBR).
- Construction drawings for Cushing, OK breakout tanks and associated piping (§195.202 Compliance with specifications or standards.).
- Concrete compressive strength tests for ringwall (§195.202 Compliance with specifications or standards.).

- Testing and inspection records for materials placed under breakout tank bottom including pH, chloride levels, etc. (API 650, Appendix B, etc., API 651, 5.3.2, IBR).
- Design provisions to ensure expected breakout tank settlement of tanks does not introduce attached piping stress to tanks or piping.
- Need copies Worley Parsons API 650 Oil Storage Data Sheet for each tank (§195.202 Compliance with specifications or standards.).
- Matrix welding procedure FC-014-1, 10/10/1996, Revision 21, 0718/2012 and PQR MS-03-127, semi-automatic welding, filler metal Kobelco Frontiarc 711 (API 650, Section 7.2, IBR).
- Matrix Weld Repair Procedure, Bechtel document 25472-175-V1G-G00z-00819, Revision 1, WRP-01 (Matrix Number) (API 650, Section 7, IBR).
- Concrete ringwall design calculations including design loading, bearing stresses vs. soil bearing capacity, uplift, bending, torsion, hoop stresses, reinforcing steel, etc., (API 650, Appendix B, IBR).
- Concrete ringwall design calculations showing adequacy due to eccentric loading, why shell was not centered on ringwall (API 650, Appendix B, B.4.2.2, IBR).
- Concrete ringwall design calculations showing justification for width of design without a footing (API 650, Appendix B, B.4.2.3 f, IBR).
- Calculations showing verification of sliding friction resistance (API 650, 5.3.1.2, IBR).
- Calculations showing seismic design considerations and justification (API 650, Appendix E, E.3.1, IBR).
- Calculations showing adequacy of floating roof design (API 650, Appendix C, IBR).
- Tabulation of weld failures, tabulation of weld failures by welder (API 650, Section 8, IBR).
- Radiographs taken in the first 10' of weld for each completed vertical joint butt weld for each welder for each type and thickness (API 650, 8.1.2.2, IBR).
- Radiographs taken in the first 10' of weld for each completed horizontal joint butt weld for each welder for each type and thickness (API 650, 8.1.2.3, IBR).
- Vacuum box test procedure and testing records (API 650, 8.6.2, IBR).

- Material certifications for all materials, including fittings, flanges, valves, piping, shell plates, floor plates, etc. (API 650, IBR, §195.202 Compliance with specifications or standards.).
- Cathodic protection design documents (specifications, drawings, etc.) for breakout tanks (§195.565 How do I install cathodic protection on breakout tanks?, API 651, IBR).
- Specifications and manufacturer's information on internal linings that will be used in the breakout tanks (§195.579 What must I do to mitigate internal corrosion?, API 652, IBR).
- Design documents for leak detection and subgrade protection (API 650, Appendix I, IBR).
- Hydrostatic test procedure (API 650, IBR).

These documents were officially requested by PHMSA.

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Additional Comments:

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_03/07/13___ Hours Worked :_9_____
Weather:_Clear___Temp. Low_29___High_55__
Owner/Operator: TransCanada/Keyestone XL___ Spread_1_ ____
Contractor__Wanzek/Matrix_____
Observed Activity :__ASME Code IX welder qualification

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Observed 4 welder qualification test for procedure # W2-863-ASME-SM-02,03 & 04. They were trying to test 8 welders today by watching 4 this AM and 4 this PM It should be noted that two of the first 4 busted out while I observed them. I didn't see the results of the other two or the other four in the afternoon. I left to travel back to Headquarters.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature : **Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :03-18-2013____ Hours Worked :_10_____
Weather:_Clear___Temp. Low_25___High_50__
Owner/Operator: TransCanada/Keystone XL___ Spread__ 1____
Contractor__Matrix and Wanzek_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Traveled to Cushing, OK and met with Harold Anderson PHMSA Escort, Erik Hughes Compliance Specialist with Keystone, and Kelly White, PHMSA Escort. Requested to see documents for project #08E4490 which satisfied request for written specifications for construction of beak-out tanks and associated piping per 192-202. These documents were allowed to be reviewed on site, but refused to allow them to leave the site. Reviewed RT/weld quality reports for tanks 1-7. Reviewed Worley-Parsons (engineering firm of records), Oil Storage Tanks Specs document #25472-100-3PS-MTFS-10-0001. Reviewed Matrix shell radiograph DWG 100-10G for job # 22w11-3792 reflecting radiograph of all vertical and horizontal shots. Requested Cathodic Protection design documents and was informed they had been sent to PHMSA on 03-16-2013. Reviewed Worley-Parsons TransCanada piping stress analysis design criteria document # 2547L-100-p6y-pp01-w001 and 25350-100-p6y-pp01-w001.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:

OPS Inspector's Signature :_**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :03-19-13____ Hours Worked :__1_____
Weather:_Clear___Temp. Low_45___High_55__
Owner/Operator:Transcanada/Keystone XL___ Spread__1 ____
Contractor_Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Traveled to Praque, OK and met with Harold Anderson, PHMSA Escort. Erick Hughes, compliance specialist, traveled with us to observe field activities of pipeline construction. Traveled to MP 74.70 to observe HDD operations of the Canadian River drilling activities on South side of river. Traveled to MP 77.50 and observed slick/wet bore of public road south of highway 1.**_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :__**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :03-20-13____ Hours Worked :__9_____
Weather:_Clear___Temp. Low_40___High_55__
Owner/Operator:TransCanada/KeystoneXL___ Spread__ 1____
Contractor__Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Enviromental protesters were due to arrive at Cushing on this day and was advised to not visit site. Traveled back to Headquarters.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :___**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :03-21-13____ Hours Worked :__9_____
Weather:_Clear___Temp. Low_40___High_55__
Owner/Operator:TransCanada/KeystoneXL___ Spread__ 1____
Contractor__Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_**Enviromental protesters were due to arrive at Cushing on this day and was advised to not visit site. Traveled back to Headquarters.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :___**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_04/17/2013___ Hours Worked :___9____
Weather:_Clear___Temp. Low 55____High_70__
Owner/Operator: Transcanada/Keystone XL___ Spread__1 ____
Contractor__Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_ _**Met Harold Anderson at Atoka, OK and traveled to MP 148.7 to observe mini-gang operations. Tie-in welding, end facing. Inspected pump station excavation activities for station number 35. (Bryan). Obtained copy of plot plan #4420-01-00 03-002 at MP 149.0. Interviewed with John Emerson, site lead. Station in early stages of development. Traveled to MP 128.5 and observed field coating crew. Blasting, heating and spray painting epoxy 2888 product. Blasting with Black Beauty sand. Traveled to Lehigh, OK to observe cement coating application to outside of pipe for use in wet land areas.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

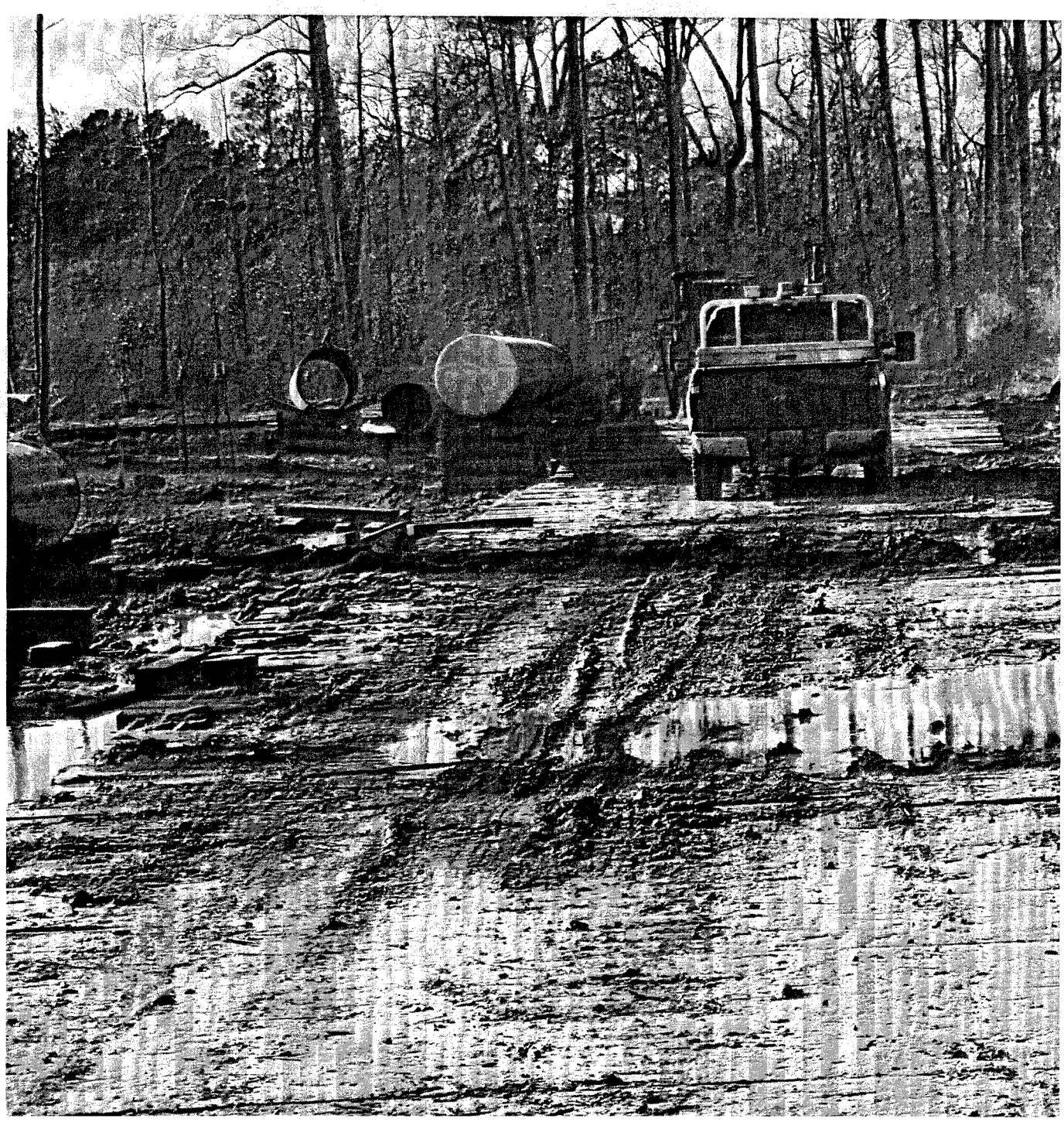
Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____



Field Coating crew at MP 128.5, spread1 1

OPS Field Agent

EXHIBIT ONE(1)

OPS Inspector's Signature :__**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 04/22/2013 Hours Worked : 9
Weather: Clear Temp. Low 55 High 75
Owner/Operator: TransCanada/Keystone XL Spread 1
Contractor Michels
Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments: **Traveled to Atoka, OK and met with Harold Anderson and MP 106 to observe pipe lowering in and jeeping operations. Watched contractor do a calibration of jeeping equipment.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:

Additional Comments:

OPS Inspector's Signature :_**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date :_04/23/2013___ Hours Worked :_10_____
Weather:_Cloudy___Temp. Low_33___High_45__
Owner/Operator: TransCanada/Keystone XL Spread_1/Cushing Terminal
Contractor__Wanzek/Matrix_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_ _**Traveled to TransCanada's Tankage terminal in Cushing, OK to observe and discuss percentage of completion of tank farm. Talked with Tom Fletcher, tank construction project manager. Discussed % of completion of tanks. No welding was being performed due to cold, wet conditions. Tank completion is as follows:**

1. **6th ring complete and tank is standing alone.**
2. **6th ring complete**
3. **5th ring complete and final ring to be complete this week**
4. **2nd ring complete and 3rd ring will be completed this week**
5. **2nd ring SR2 installed and being welded**
6. **SR3 being welded and be completed this week**
7. **SR3 complete and 4th to be completed this week. Made a general tour of facility to observe overall appearance of activities. Talked with Kelly Plummer, QAQC coordinator for welding with Wanzek and was advised that a new welding procedure was being developed for plant piping due to operator could not get original material ordered. This qualification was for X65 to X70 and X70 to X70. Had planned on using X65 for plant piping but had to change to X70X.715 wall and must qualify a new procedure.**

_____
_____
_____
_____
_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____
_____
_____
_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :___**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 04/25/2013____ Hours Worked : _9_____
Weather:Cloudy____Temp. Low_45___High_70__
Owner/Operator: TransCanada/Keystone XL___ Spread__1 ____
Contractor__Michels_____
Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_ _**Traveled to Atoka, OK to observe main line tie-in welding crew activities. Observed field joint automated coating process.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :_____**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE(1)

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : May 22, 2013 Hours Worked :9
Weather:Sunny Temp.80s Low70s High80s
Owner/Operator:Transcanada SpreadSpread 1
ContractorMichels Construction

Observed Activity :Hydrostatic testing

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
Cushing Terminal	____	0.2 to 1.33

Comments: **Michels was hydrotesting about a mile of pipe coming out of the Cushing Terminal. This section is tested separate from the rest of pipeline due to it being close to the pump station. MOP is 1600psi. Minimum Hydrotest pressure was 2266psi, actual test pressure was being held at about 2300 psi. Reviewed dead weight, pressure chart, and temperature chart calibration certs. Bob Campbell with Transcanada was at test location. Readings were being taken at 5 min increments, then raised to 15 min. A section of pipe was being tested along with mainline to use as a tie in pup. Electronic gauge was connected to pipe as backup for deadweights.**

Observed Activity :

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
____	____	____

Comments

Observed Activity:

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.
____	____	____

Comments:_

Additional Comments:
OPS Inspector:**Agustin Lopez**
OPS Inspector's Signature :_____

Distribution : OPS Engineer

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 10/28/2013___ Hours Worked :__9_____
Weather:____Temp. Low____High___
Owner:_TransCanada/Keystone XL_____
Contractor: _Michales_____
Observed Activity :_ _ _____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments__**Traveled to Atoka, OK and met with Harold Anderson, PHMSA Escort to address relevent questions from PHMSA. Answered questions will be furnished to PHMSA . Found out there were numerous DCVG identified digs that need to be observed. These range from M.P. 1.97 to 166.83.**

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :__**Jim Arnold**

Distribution : OPS Engineer
OPS Field Agent

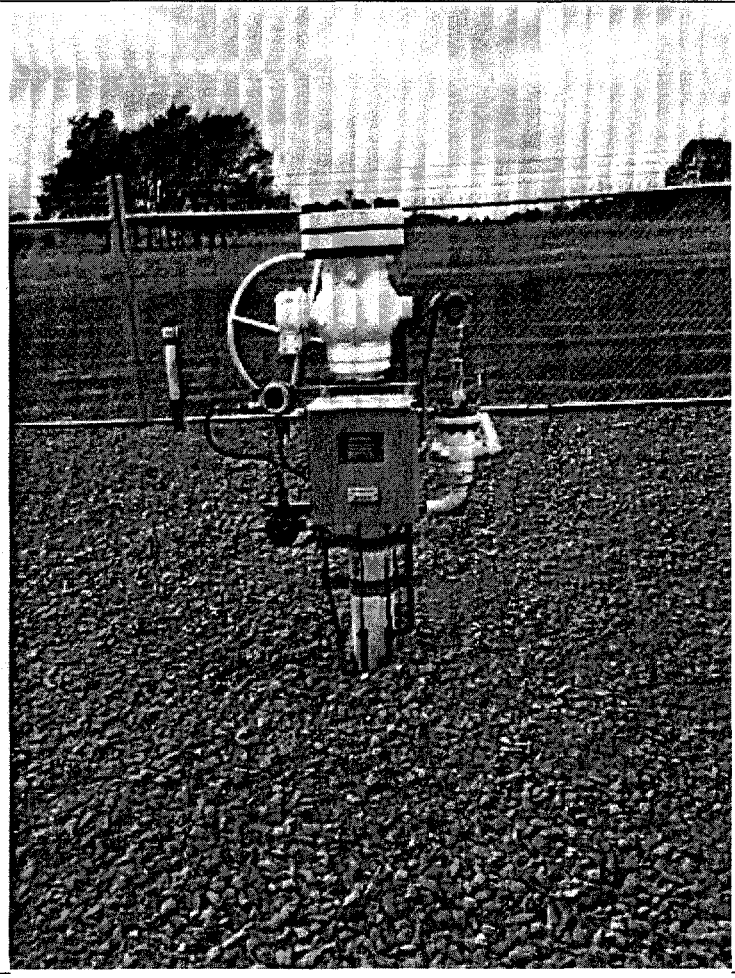
EXHIBIT ONE

U.S. Department of Transportation
Office of Pipeline Safety
Daily Construction Inspection Report

Date : 10/29/2013____ Hours Worked :_14_____
Weather:____Temp. Low____High___
Owner:_TransCanada/Keystone XL_____
Contractor: _Michels_____
Observed Activity :_ Mainline valve placement and final tie in of ML at Cushing, OK_

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

All MLVComments_**Observed MLV CRM WL-03A # 239 @ MP 77.65 on South Side of Canadian River. Valve was equipped for automation. See Pictures 1-4. (All MLV on Keystone Pipeline did not have a position indicator as required by 195.116(c)) Observed MLV CRM WL-02A #240 @** MP **73.14 on North Side of Canadian river. Valve is equipped for automation. See pictures 5-10. Observed MLV CSHSP-04A #273 @ South Side of North Canadian River. This valve is a manual valve not equipped for automation. I check valve is installed on upstream side of MLV. See pictures 11-13. Observed MLV CSHSP-03A #280 on North Side of North Canadian River. Valve is equipped with automation. See pictures 14-17. Observed MLV CSHSP-02A- 287 on South Side of Deep Fork River. Valve is not equipped for automation. See picture 18. Observed MLV CSHSP-01A- #295 on North Side of Deep Fork River. Valve is equipped for automation. See pictures 19-22. Observed final line tie in at pump station #32. Tie in consisted of transition at road crossing from .618 WT to .564 and reversed at pump station tie in.**



Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Observed Activity :_____

Station # Start/Stop	GPS Lat. / GPS Long.	Appx. M.P.

Comments:_____

Additional Comments:_____

OPS Inspector's Signature :__**Jim Arnold** _____

Distribution : OPS Engineer
OPS Field Agent

EXHIBIT ONE

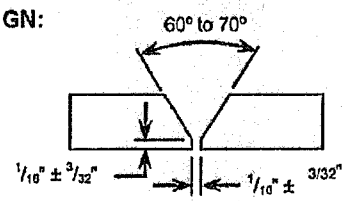
OLD

WELDING PROCEDURE DATA SHEET KXL-SMAW-ML

Revised 10 Feb 2011

TransCanada
In business to deliver

PROJECT: Keystone Pipeline Project Phase 3 & 4 **SERVICE TEMPERATURE:** 23 °F
APPLICATION: Below Ground Pipe to Pipe Girth Welds & Tie Ins
MATERIAL SPECIFICATION(S): TES-PIPE-EW-US, TES-PIPE-SAW-US, API 5L X70M
DIAMETER GROUP: ☐ < 2 ⅜ in. ☐ 2 ⅜ in. through 12¾ in. ☒ > 12¾ in.
WALL THICKNESS GROUP: ☐ < 3/16 in. ☒ 3/16 in. through ¾ in. ☐ > ¾ in.
JOINT DESIGN:



Number of beads will vary with pipe wall thickness.

WELDING PROCESS(ES): SMAW (i.e. SMAW, GTAW, SAW, FCAW) **TYPE(S):** Manual (i.e. Manual, Machine, Automatic, Semi-Auto.)
FILLER METAL GROUP(S): 1,2 **ELECTRODES:** E6010, E8010 (G or P1)
ELECTRICAL CHARACTERISTICS: DCRP **POSITION:** 5G
WELDING DIRECTION: Vertical Down **SPEED OF TRAVEL:** 5-19 in./min.
SHIELDING GAS (Type, Mixture): Not Applicable **FLOW RATE:** Not Applicable
FLAME CHARACTERISTICS: Not Applicable **SHIELDING FLUX:** Not Applicable
LINE-UP CLAMP: External – Tie-in **REMOVAL OF CLAMP:** After 50% of root completed
PREHEAT TEMP.: 254°F min. **INTERPASS TEMP.:** 275°F min. /425°F max. **PWHT:** None
TIME BETWEEN PASSES: Max. 15 min. between Root/Hot Pass, complete weld within 72 hrs
CLEANING and/or GRINDING: Wire brush and/or grinding as required.

Bead	Electrode		Welding Direction	Amperage Range	Voltage Range	Travel Speed Range, in./min.	Time Between Passes	Heat Input kJ/in.
	Size	Class						
Root	5/32	E6010	Down	108-171	19-27	10.8-16.5	15 min	9.0-19.1
Hot Pass	5/32	E8010G/P1	Down	149-216	20.7-32	14.5-18.7	30 min	12.0-23.2
Fill/Strip	3/16	E8010G/P1	Down	140-220	20.7-32	5.1-12.4	72 Hours	20.0-64.4
Cap	3-16	E8010G/P1	Down	126-198	22.5-34	8.6-16.2	72 Hours	12.8-44.7

REMARKS:
1. NDT - 100% radiography in accordance with the requirements of the current edition of API 1104.
2. Minimum preheat shall be maintained at all times, unless welding is interrupted in which case the joint must be preheated before welding re-commences.
3. If necessary due to WT changes or variation in joint spacing within the tolerance limits, it is permissible to change the electrode size to one nominal size smaller or larger, but the same range of welding parameters must be used.
4. Refer to Keystone Pipeline Specification TES-WELD-PL-US

DECLARATION: The information in this data sheet is correct and based on welding procedure specifications that meet the qualification requirements of the latest edition of API 1104.
PQR RECORDS: KPL-RMS-SMAW-ML-Rev2

Proposed by: Trent Bertholet Checked by: Jesse Bajnok 18-FEB-2011
Signature and Date
Contractor: Sunland Construction, Inc. Accepted by: Brent Aton 7-JUN-2012
Signature and Date

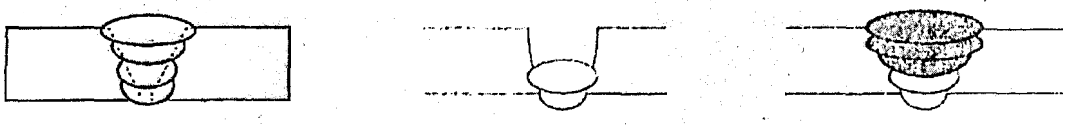
016473

WELDING PROCEDURE DATA SHEET KXL-SMAW-PRP

Revised 10 Feb 2011

TransCanada
In business to deliver

PROJECT: Keystone Pipeline Project Phase 3 & 4 **SERVICE TEMPERATURE:** 23 °F
APPLICATION: Partial Thru-Wall Repairs on Pipe to Pipe Girth Welds
MATERIAL SPECIFICATION(S): TES-PIPE-EW-US, TES-PIPE-SAW-US, API 5L X70M
DIAMETER GROUP: ☐ < 2 ⅜ in. ☐ 2 ⅜ in. through 12¾ in. ☒ > 12¾ in.
WALL THICKNESS GROUP: ☐ < 3/16 in. ☒ 3/16 in. through ¾ in. ☐ > ¾ in.
JOINT DESIGN:



Original Weld Detail | Area Ground out to Remove Defects | Completed Repair

WELDING PROCESS(ES): SMAW (i.e. SMAW, GTAW, SAW, FCAW) **TYPE(S):** Manual (i.e. Manual, Machine, Automatic, Semi-Auto.)
FILLER METAL GROUP(S): 3 **ELECTRODES:** E8018-C3
ELECTRICAL CHARACTERISTICS: DCRP **POSITION:** 5G
WELDING DIRECTION: Vertical Up **SPEED OF TRAVEL:** 2.1 – 5.6 in./min.
SHIELDING GAS (Type, Mixture): Not Applicable **FLOW RATE:** Not Applicable
FLAME CHARACTERISTICS: Not Applicable **SHIELDING FLUX:** Not Applicable
LINE-UP CLAMP: Not Applicable **REMOVAL OF CLAMP:** Not applicable
PREHEAT TEMP.: 254°F min. **INTERPASS TEMP.:** 275°F min. /425°F max. **PWHT:** None
TIME BETWEEN PASSES: Max. 15 min. between passes until completed
CLEANING and/or GRINDING: Wire brush and/or grinding as required.

Bead	Electrode		Welding Direction	Amperage Range	Voltage Range	Travel Speed Range, in./min.	Time Between Passes	Heat Input kJ/in.
	Size	Class						
Fill	3/32	E8018-C3	Up	80-135	19-27	2.1-3.2	15 min	28.5-68.5
Fill / Cap	1/8	E8018-C3	Up	110-160	19-26	3.1-5.6	15 min	22.4-80.5

REMARKS:
1. NDT - 100% radiography in accordance with the requirements of the current edition of API 1104.
2. Minimum preheat shall be maintained at all times, unless welding is interrupted in which case the joint must be preheated before welding re-commences.
3. Refer to Keystone Pipeline Specification TES-WELD-PL-US

DECLARATION: The information in this data sheet is correct and based on welding procedure specifications that meet the qualification requirements of the latest edition of API 1104.
PQR RECORDS: 916-AI

Proposed by: Trent Bertholet Checked by: Jesse Bajnok
Contractor: Sunland Construction, Inc. Accepted by: Ben Arnold

28-FEB-2011
Signature and Date
7-JUN-2011
Signature and Date

016474

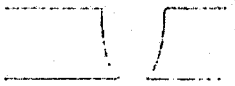
WELDING PROCEDURE DATA SHEET KXL-SMAW-RP

Revised May 9 2011 REVISION 1

TransCanada
In business to deliver

PROJECT: Keystone Pipeline Project Phase 3 & 4 **SERVICE TEMPERATURE:** 23 °F
APPLICATION: Multiple Thru-Wall Repairs on Pipe to Pipe Girth Welds
MATERIAL SPECIFICATION(S): TES-PIPE-EW-US, TES-PIPE-SAW-US, API 5L X70M
DIAMETER GROUP: ☐ < 2 ⅜ in. ☐ 2 ⅜ in. through 12¾ in. ☒ > 12¾ in.
WALL THICKNESS GROUP: ☐ < $^{3}/_{16}$ in. ☒ $^{3}/_{16}$ in. through ¾ in. ☐ > ¾ in.
JOINT DESIGN:

Original Weld Detail



Area Ground out to Remove Defects

Completed Repair

WELDING PROCESS(ES): SMAW (i.e. SMAW, GTAW, SAW, FCAW) **TYPE(S):** Manual (i.e. Manual, Machine, Automatic, Semi-Auto.)
FILLER METAL GROUP(S): 1,3 **ELECTRODES:** E6010, E8018-C3
ELECTRICAL CHARACTERISTICS: DCRP **POSITION:** 5G
WELDING DIRECTION: See Table Below **SPEED OF TRAVEL:** 2 – 8 in./min.
SHIELDING GAS (Type, Mixture): Not Applicable **FLOW RATE:** Not Applicable
FLAME CHARACTERISTICS: Not Applicable **SHIELDING FLUX:** Not Applicable
LINE-UP CLAMP: Not Applicable **REMOVAL OF CLAMP:** Not applicable
PREHEAT TEMP.: 254°F min. **INTERPASS TEMP.:** 275°F min. / 425°F max. **PWHT:** None
TIME BETWEEN PASSES: Max. 15 min. between passes until completed
CLEANING and/or GRINDING: Wire brush and/or grinding as required.

Bead	Electrode		Welding Direction	Amperage Range	Voltage Range	Travel Speed Range, in./min.	Time Between Passes	Heat Input kJ/in.
	Size	Class						
Root	1/8	E6010	Down	60-120	21-35	3 - 7	15 min	11.8-90.0
Hot Pass	3/32	E8018-C3	Up	70-110	20-27	2 - 6	15 min	22.7-68.5
Fill/Strip	1/8	E8018-C3	Up	110-160	19-26	3 - 8	15 min	44.7-92.4
Cap	1/8	E8018-C3	Up	100-160	19-26	3 - 8	15 min	23.7-92.4

REMARKS:
1. NDT - 100% radiography in accordance with the requirements of the current edition of API 1104.
2. Minimum preheat shall be maintained at all times, unless welding is interrupted in which case the joint must be preheated before welding re-commences.
3. If necessary due to WT changes or variation in joint spacing within the tolerance limits, it is permissible to change the electrode size to one nominal size smaller or larger, but the same range of welding parameters must be used.
4. Refer to Keystone Pipeline Specification TES-WELD-PL-US

DECLARATION: The information in this data sheet is correct and based on welding procedure specifications that meet the qualification requirements of the latest edition of API 1104.
PQR RECORDS: 916-AI, 916-N

Proposed by: Trent Bertholet Checked by: Jesse Bajnok 9-MAY-2011
Signature and Date
Contractor: Sunland Construction Inc. Accepted by: Brent Atoe 7 JUL - 2011
Signature and Date

016475

Keystone - API-1104 Welder Qualification Form

Form W8 Rev 0

TransCanada
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Welder's Name (print)	Welder's ID Stamp	Test Location, Project and/or Spread No.
Mathew K. Linehan (DL#082143627 Ok.)	3177	Livingston West Pipe Yard Gulf Coast - Spread 3

TEST CONDITIONS

	Test 1	Test 2	
	Single Qual	Multiple Qualification	
Weld Type	Butt	Butt	Branch
Pipe Specification & Grade	API 5L X70		
Diameter of Test Pipe	36"		
Wall Thickness	.465"		
Centerline of Pipe Axis 2G, 5G, 6G	5G		
AWS Filler Metal Identification	A.5.1/A.5.5		
Welding Procedure Specification No.	KXL-SMAW-RP		

WELDER QUALIFICATION BASED ON DESTRUCTIVE TEST AND RESULTS

Number of Test Completed Per Test	Nick	N/A		
	Face	N/A		
	Root	N/A		
	Side	N/A		

Visual Acceptable ☐ Visual Not Acceptable ☐ Welder Qualified ☐ Welder Disqualified ☐

WELDER QUALIFICATION BASED ON NDE OF TEST BUTT WELD

NDT Method	☒ Radiographic Testing	Weld ID No. 3177	Radiographic Report No. Shaw D/67	X-Ray Film No.'s. 1
	☐ Ultrasonic Testing	Weld ID No.	Ultrasonic Report No.	Ultrasonic Data file name or No. (if applicable)

Visual Acceptable ☒ NDE Acceptable ☒ Welder Qualified ☒ Welder Disqualified ☐

ESSENTIAL VARIABLES FOR WELDER QUALIFICATION
(Mark With an 'X')

WELDING								API Filler Metal Group No. (1,2,3)	Welding Electrode Direction of Travel		Qualification	
Welding Process					Welding Equipment							
SMAW	GMAW	SAW	GTAW	FCAW	Manual	Semi-Automatic	Automatic		Up	Down	Multi-Qual (All diameters, wall thickness, and positions)	Single (See Additional Limitations Below)
X					X			1,3	F/C	R	N/A	X

ADDITIONAL LIMITATIONS (Mark with an 'X')
ONLY COMPLETE THIS SECTION FOR SINGLE QUALIFICATION

Pipe											Butt Weld		Fillet Weld	
Outside Diameter Inches			Wall Thickness Inches			Centerline of Pipe (Axis)			Position					
<2.375	≥2.375 ≤12.75	>12.75	<.188	≥.188 ≤.750	>.750	Vertical 2G	Horizontal 5G	All Pipe Axis Positions	Fixed	Rolled	60-70 Deg. Bevel	Mech. GMAW Welding Bevel	Branch Fillet	Lap Fillet
		X		X			X		X		X			

Welding Inspector's Name (Please Print)	Welding Inspector's Signature	Date Of Test	Date of Qualification Expiry
Allen Le Blanc	Allen J. Le Blanc CWI 97080951 QC1 Exp. 4/1/2015	Nov. 10,2012	6 mts of Last Accepted weld

016476

Keystone - API-1104 Welder Qualification Form Form W8 Rev 0	TransCanada In business to deliver

WELD PARAMETER DETAILS

Welding Consumables:							
Welding Position:	5 G		**Welding Direction:**	Root Down /Fill and Cap UP			
Welding Procedure:	KXL-SMAW-RP						
Weld pass # :	Root	Hot Pass	Fill/Strip	Cap			
Electrode Size:	1/8" E6010	3/32" E8018-C3	1/8" E8018-C3	1/8" E8018-C3			
Weld current:	DCRP	DCRP	DCRP	DCRP			
Weld voltage:	A=60-120 V=21-35	A=70-110 V=20-27	A=110-160 V=19-26	A=110-160 V=19-26			
Travel Speed:	3"-7" IPM 11.8-90.0 KJ/IN	2"-6" IPM 22.7-68.5 KJ/IN	3"-8" IPM 44.7-92.4 KJ/IN	3"-8" IPM 23.7-92.4 KJ/IN			
Welding Consumables:							
Welding Position:			**Welding Direction:**				
Welding Procedure:							
Weld pass # :							
Electrode Size:							
Weld current:							
Weld voltage:							
Travel Speed:							

Welding Inspector's Name (Please Print)	Welding Inspector's Signature	
Allen Le Blanc	Allen Le Blanc CWI 97040951 EXP. 4/1/2015	Nov. 10,2012

016477

Keystone - API-1104 Welder Qualification Form

Form W8 Rev 1

TransCanada
In business to deliver

Welder's Name (print)	Welder's ID Stamp	Test Location, Project and/or Spread No.
Larry J. Guilbeaux (DL#009297642 La.)	3224	Livingston West Pipe Yard Gulf Coast Spread 3

TEST CONDITIONS

	Test 1	Test 2	
	Single Qual	Multiple Qualification	
Weld Type	Butt	Butt	Branch
Pipe Specification & Grade	API 5L X70		
Diameter of Test Pipe	36"		
Wall Thickness	.465"		
Centerline of Pipe Axis 2G, 5G, 6G	5G		
AWS Filler Metal Identification	A.5.1/A.5.5		
Welding Procedure Specification No.	KXL-SMAW-ML		

WELDER QUALIFICATION BASED ON DESTRUCTIVE TEST AND RESULTS

Number of Test Completed Per Test	Nick 8	Accept		
	Face 2	Accept		
	Root 2	Accept		
	Side N/A			

Visual Acceptable ☒ Visual Not Acceptable ☐ Welder Qualified ☒ Welder Disqualified ☐

WELDER QUALIFICATION BASED ON NDE OF TEST BUTT WELD

NDT Method	☐ Radiographic Testing	Weld ID No.	Radiographic Report No.	X-Ray Film No.'s.
	☐ Ultrasonic Testing	Weld ID No.	Ultrasonic Report No.	Ultrasonic Data file name or No. (if applicable)

Visual Acceptable ☐ NDE Acceptable ☐ Welder Qualified ☐ Welder Disqualified ☐

ESSENTIAL VARIABLES FOR WELDER QUALIFICATION
(Mark With an 'X')

WELDING												
Welding Process					Welding Equipment			API Filler Metal Group No. (1,2,3)	Welding Electrode Direction of Travel		Qualification	
SMAW	GMAW	SAW	GTAW	FCAW	Manual	Semi-Automatic	Automatic		Up	Down	Multi-Qual (All diameters, wall thickness, and positions)	Single (See Additional Limitations Below)
X					X			1,2		X	N/A	X

ADDITIONAL LIMITATIONS (Mark with an 'X')
ONLY COMPLETE THIS SECTION FOR SINGLE QUALIFICATION

Pipe											Butt Weld		Fillet Weld	
Outside Diameter Inches			Wall Thickness Inches			Centerline of Pipe (Axis)			Position					
<2.375	≥2.375 ≤12.75	>12.75	<.188	≥.188 ≤.750	>.750	Vertical 2G	Horizontal 5G	All Pipe Axis Positions	Fixed	Rolled	60-70 Deg. Bevel	Mech. GMAW Welding Bevel	Branch Fillet	Lap Fillet
		X		X			X		X		X			

Welding Inspector's Name (Please Print)	Welding Inspector's Signature	Date Of Test	Date of Qualification Expiry
Allen Le Blanc	Allen J. LeBlanc	Jan. 30,2013	6 Months of Last Accepted Weld

016478

Keystone - API-1104 Welder Qualification Form
Form W8 Rev 1

TransCanada
In business to deliver

WELD PARAMETER DETAILS

Welding Consumables:							
Welding Position:	5G		**Welding Direction:**	Down			
Welding Procedure:	KXL-SMAW-ML						
Weld pass # :	Root	Hot Pass	Fill	Cap			
Electrode Size:	5/32" E6010	5/32" E8010G/P1	3/16" E8010G/P1	3/16" E8010G/P1			
Weld current:	DCRP	DCRP	DCRP	DCRP			
Weld voltage:	A=108-171 V=19-27	A=149-216 V=20.7-32.0	A-140-220 VV=20.7-32	A=126-198 V=22.5-34			
Travel Speed:	10.8"-16.5" Kj 9-19.1	14.5"-18.7" kj 12.0-23.2	5.1"-12.4" kj 20.0-64.4	8.6"-16.2" kj 12.8-44.7			
WFS (GMAW only):	N/A	N/A	N/A	N/A			
Welding Consumables:							
Welding Position:			**Welding Direction:**				
Welding Procedure:							
Weld pass # :							
Electrode Size:							
Weld current:							
Weld voltage:							
Travel Speed:							
WFS (GMAW only):							

Remarks:

Allen J Le Blanc CWI 07040951 QC1 EXP 4/1/2014

Welding Inspector's Name (Please Print)	Welding Inspector's Signature
Allen J. Le Blanc	A Allen J Le Blanc 1-30-13

016479

New

WELDING PROCEDURE DATA SHEET KXL-SMAW-ML

Revised January 31, 2013

TransCanada
In business to deliver

PROJECT: Keystone Pipeline Project Phase 3 & 4 **SERVICE TEMPERATURE:** 23 °F

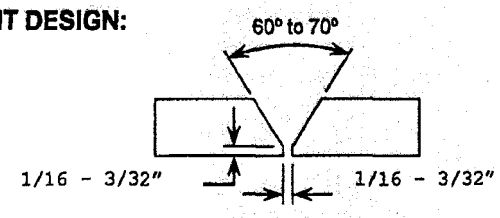
APPLICATION: Below Ground Pipe to Pipe Girth Welds & Tie Ins

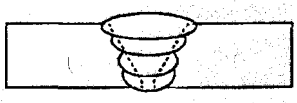
MATERIAL SPECIFICATION(S): TES-PIPE-EW-US, TES-PIPE-SAW-US, API 5L X70M

DIAMETER GROUP: ☐ < 2 ⅜ in. ☐ 2 ⅜ in. through 12¾ in. ☒ > 12¾ in.

WALL THICKNESS GROUP: ☐ < 3/16 in. ☒ 3/16 in. through ¾ in. ☐ > ¾ in.

JOINT DESIGN:





Number of beads will vary with pipe wall thickness.

WELDING PROCESS(ES): SMAW (i.e. SMAW, GTAW, SAW, FCAW) **TYPE(S):** Manual (i.e. Manual, Machine, Automatic, Semi-Auto.)

FILLER METAL GROUP(S): 1,2 **ELECTRODES:** E6010, E8010 (G or P1)

ELECTRICAL CHARACTERISTICS: DCRP **POSITION:** 5G

WELDING DIRECTION: Vertical Down **SPEED OF TRAVEL:** 5-19 in./min.

SHIELDING GAS (Type, Mixture): Not Applicable **FLOW RATE:** Not Applicable

FLAME CHARACTERISTICS: Not Applicable **SHIELDING FLUX:** Not Applicable

LINE-UP CLAMP: External – Tie-in, Internal - Mainline **REMOVAL OF CLAMP:** External After 50% of root completed, Internal After 100% of root completed

PREHEAT TEMP.: 254°F min. **INTERPASS TEMP.:** 275°F min. /425°F max. **PWHT:** None

TIME BETWEEN PASSES: Maximum 15 min. between Root/Hot Pass, complete weld within 72 hrs

CLEANING and/or GRINDING: Initial Bevel Preparation: Mechanical End Face or Grinding and wire wheel on the ID. Cleaning Between Passes: Wire brush and/or grinding as required.

Bead	Electrode		Welding Direction	Amperage Range	Voltage Range	Travel Speed Range, in./min.	Time Between Passes	Heat Input kJ/in.
	Size	Class						
Root	5/32	E6010	Down	110-165	20-26	10.8-16.5	15 min.	9.0-19.0
Hot Pass	5/32	E8010G/P1	Down	149-216	20.7-32	14.5-18.7	30 min.	12.0-28.0
Fill/Strip	3/16	E8010G/P1	Down	140-220	20.7-32	5.1-12.4	72 Hours	20.0-64.4
Cap	3/16	E8010G/P1	Down	126-198	22.5-34	8.6-16.2	72 Hours	14.8-44.7

REMARKS:

1. NDT : 100% in accordance with the TransCanada Specification TES-WELD-PL-US
2. Minimum preheat shall be maintained at all times, unless welding is interrupted in which case the joint must be preheated before welding re-commences.
3. If necessary due to WT changes or variation in joint spacing within the tolerance limits, it is permissible to change the electrode size to one nominal size smaller or larger, but the same range of welding parameters must be used.
4. Refer to Keystone Pipeline Specification TES-WELD-PL-US

DECLARATION: The information in this data sheet is correct and based on welding procedure specifications that meet the qualification requirements of the latest edition of API 1104.

PQR RECORDS: KPL-RMS-SMAW-ML-Rev2

Proposed by: Trent Bertholet Checked by: Meera Kothari

1/31/2013

Signature and Date

016480

TransCanada	NDE Progress Report	Form W12	Rev. 1	KEYSTONE PIPELINE

Date of Inspection:	March 13, 2013	Spread	3	Page	1	of	1
Welding Contractor:	Sunland	NDE Contractor:	SHAW				

	Date of Inspection: March 13, 2013		To Date: March 13, 2013	
AUT SMAW Maingang total:	27		4996	
Reject:	6		520	
Cutouts:	3		85	
Reject Rate:	33.3		12.1	
AUT SMAW Minigang total:	0		0	
Reject:	0		0	
Cutouts:	0		0	
Reject Rate:				
AUT (All Tie-Ins, Fab., Road Bores) total:	0		176	
Reject:	0		24	
Cutouts:	0		5	
Reject Rate:			16.5	
RT (All Tie-Ins, Fab., Road Bores) total:	14		626	
Reject:	1		86	
Cutouts:	0		3	
Reject Rate:	7.1		14.2	
AUT and RT Repairs total:	0		766	
Reject:	0		64	
Cutouts:	0		110	
Reject Rate:			22.7	
GRAND TOTALS				
Totals (temporary welds not included):	41		5798	
Total Rejected:	7		630	
Total Cutouts:	3		93	
Total Reject Rate:	24.4		12.5	

Remarks

NOTE: This document has been adjusted to reflect the cut-outs. From now on when a repair is rejected it will be placed in the cut-out section as only one repair attempt is allowed unless approval for a second repair is granted by TCPL.

Any reject that is over 30% of the OD circumference will be recorded in the cut-out area.

NDE Supervisor:	Robert Lake		
Keystone NDE Engineer:	Gary Rolland	Signature:	
NDE Technicians:	Carol Dean Anderson, Jason Miller, Daniel Bailey, Jack Mendivil, Chad Ashley		

195.234 , S.C 18 , 20

3/14/13

TransCanada	NDE Progress Report	Form W12	Rev. 1	KEYSTONE PIPELINE

Date of Inspection:	March 14, 2013	Spread	3	Page	1	of	1
Welding Contractor:	Sunland	NDE Contractor:	SHAW				

	Date of inspection: March 14, 2013		To Date: March 14, 2013
AUT SMAW Maingang total:	41		5037
Reject:	0		520
Cutouts:	1		86
Reject Rate:	2.4		12.0
AUT SMAW Minigang total:	0		0
Reject:	0		0
Cutouts:	0		0
Reject Rate:			
AUT (All Tie-Ins, Fab., Road Bores) total:	0		176
Reject:	0		24
Cutouts:	0		5
Reject Rate:			16.5
RT (All Tie-Ins, Fab., Road Bores) total:	16		642
Reject:	0		86
Cutouts:	0		3
Reject Rate:	0.0		13.9
AUT and RT Repairs total:	10		776
Reject:	0		64
Cutouts:	0		110
Reject Rate:	0.0		22.4

GRAND TOTALS			
Totals (temporary welds not included):	57		5855
Total Rejected:	0		630
Total Cutouts:	1		94
Total Reject Rate:	1.8		12.4

Remarks

NOTE: This document has been adjusted to reflect the cut-outs. From now on when a repair is rejected it will be placed in the cut-out section as only one repair attempt is allowed unless approval for a second repair is granted by TCPL.

Any reject that is over 30% of the OD circumference will be recorded in the cut-out area.

Supervisor:	Robert Lake		
Keystone NDE Engineer:	Gary Rolland	Signature:	
NDE Technicians:	Carol Dean Anderson, Jason Miller, Daniel Bailey, Jack Mendivil, Chad Ashley		

195.234 , S.C 18 , 20

3/16/13

016482

TransCanada	NDE Progress Report	Form W12	Rev. 1	KEYSTONE PIPELINE

Date of Inspection:	March 15, 2013	Spread	3	Page	1	of	1
Welding Contractor:	Sunland	NDE Contractor:	SHAW				

	Date of inspection: March 15, 2013	To Date: March 15, 2013
AUT SMAW Maingang total:	34	5071
Reject:	0	520
Cutouts:	0	86
Reject Rate:	0.0	12.0
AUT SMAW Minigang total:	0	0
Reject:	0	0
Cutouts:	0	0
Reject Rate:		
AUT (All Tie-Ins, Fab., Road Bores) total:	0	176
Reject:	0	24
Cutouts:	0	5
Reject Rate:		16.5
RT (All Tie-Ins, Fab., Road Bores) total:	16	658
Reject:	1	87
Cutouts:	0	3
Reject Rate:	6.3	13.7
AUT and RT Repairs total:	5	781
Reject:	0	64
Cutouts:	0	110
Reject Rate:	0.0	22.3
GRAND TOTALS		
Totals (temporary welds not included):	50	5905
Total Rejected:	1	631
Total Cutouts:	0	94
Total Reject Rate:	2.0	12.3

Remarks

NOTE: This document has been adjusted to reflect the cut-outs. From now on when a repair is rejected it will be placed in the cut-out section as only one repair attempt is allowed unless approval for a second repair is granted by TCPL.

Any reject that is over 30% of the OD circumference will be recorded in the cut-out area.

...DE Supervisor:	Robert Lake		
Keystone NDE Engineer:	Gary Rolland	Signature:	
NDE Technicians:	Carol Dean Anderson, Jason Miller, Daniel Bailey, Jack Mendivil, Chad Ashley		

195.234 , S.C 18 , 20

3/19/13

016483

TransCanada	NDE Progress Report	Form W12	Rev. 1	KEYSTONE PIPELINE

Date of Inspection:	March 18, 2013	Spread	3	Page	1	of	1
Welding Contractor:	Sunland	NDE Contractor:	SHAW				

	Date of inspection: March 18, 2013	To Date: March 18, 2013
AUT SMAW Maingang total:	44	5148
Reject:	3	529
Cutouts:	0	86
Reject Rate:	6.8	11.9
AUT SMAW Minigang total:	0	0
Reject:	0	0
Cutouts:	0	0
Reject Rate:		
AUT (All Tie-Ins, Fab., Road Bores) total:	3	179
Reject:	0	24
Cutouts:	0	5
Reject Rate:	0.0	16.2
RT (All Tie-Ins, Fab., Road Bores) total:	12	676
Reject:	1	88
Cutouts:	0	3
Reject Rate:	8.3	13.5
AUT and RT Repairs total:	8	792
Reject:	0	64
Cutouts:	0	110
Reject Rate:	0.0	22.0

GRAND TOTALS		
Totals (temporary welds not included):	59	6003
Total Rejected:	4	641
Total Cutouts:	0	94
Total Reject Rate:	6.8	12.2

Remarks

NOTE: This document has been adjusted to reflect the cut-outs. From now on when a repair is rejected it will be placed in the cut-out section as only one repair attempt is allowed unless approval for a second repair is granted by TCPL.
Any reject that is over 30% of the OD circumference will be recorded in the cut-out area.

1 TW weld on test header inspected by RT, not included in above numbers.
3 TW welds on pull heads inspected by RT, not included in above numbers.

NDE Supervisor:	Robert Lake		
Keystone NDE Engineer:	Gary Rolland	Signature:	G R Rolland
NDE Technicians:	Carol Dean Anderson, Jason Miller, Daniel Bailey, Jack Mendivil, Chad Ashley		

195.234 , S.C 18 , 20

SUNLAND CONSTRUCTION, INC.

TRANSCANADA KEYSTONE GCP3
WELDER REPAIR SUMMARY
"SOUR LAKE / MINI-SPREAD"

WELDER ID	WELDER NAME (last, first)	DATE 3/18/2013 # of WELDS	# of REPAIRS	DAILY REPAIR RATE (%)	WELDER POSITION / Comments	TOTAL # of WELDS	TOTAL # of REPAIRS	PROJECT REPAIR RATE (%)
3003	Ledet, Willie **(FOREMAN)**	2		0.00%	Fill & Cap	79	3	3.80%
3004	Martin, Brian					233	9	3.86%
3007	Louverie, Ronnie					145	11	7.59%
3008	Rung, Jeremy	5		0.00%	Fill & Cap	289	11	3.81%
3014	Pego, Joseph W					213	14	6.57%
3053	Stansbury, Nick					402	16	3.98%
3088	White, Brandon					114	8	7.02%
3089	Conrad, Daryl G.					118	8	6.78%
3104	Wright, Jesse Lloyd	5		0.00%	Fill & Cap	317	17	5.36%
3113	Gayneaux, Zeek Joshua	6		0.00%	Fill & Cap	195	12	6.15%
3114	Richard, Joseph Matthew	6		0.00%	Fill & Cap	199	5	2.51%
3139	Evan, Virgal	11		0.00%	Bead & Hot Pass	421	22	5.23%
3140	Richard, Joe					179	9	5.03%
3168	ellender, Edwin Carroll Jr.	11	1	9.09%	Bead & Hot Pass	411	23	5.60%
3197	Blanchard, Jerome M.	8	1	12.50%	Weld Out	170	2	1.18%
3198	Matherne, Stanley J.	12		0.00%	Fill	82	6	7.32%
3200	Jolly, Billi D.					8	1	12.50%
3201	LeJeune, Damian J.					11	2	18.18%
3223	Presley, John S.					0	0	
3224	Guilbeaux, Larry J.					0	0	
3234	East, Edward	9		0.00%	Fill	110	2	1.82%
						0	0	
						0	0	
						0	0	
						0	0	
						0	0	
						0	0	
						0	0	
						0	0	

SUNLAND CONSTRUCTION, INC.	TRANSCANADA KEYSTONE GCP3 WELDER REPAIR SUMMARY "LIVINGSTON / MAIN CREW WELDING"	DATE 3/18/2013						
WELDER ID	WELDER NAME (last, first)	# of WELDS	# of REPAIRS	DAILY REPAIR RATE (%)	WELDER POSITION / Comments	TOTAL # of WELDS	TOTAL # of REPAIRS	PROJECT REPAIR RATE (%)
3001	Hogan, Roy **(FOREMAN)**	3		0.00%	Repair Welds	268	16	5.97%
3002	White, David **(FOREMAN)**	6		0.00%	Hot Pass & Cap	116	0	0.00%
3005	Harrell, Joshua	1		0.00%	Weld Out	799	5	0.63%
3011	Hinson, Randy	2		0.00%	Weld Out	102	2	1.96%
3012	Perkinson, Steve					175	4	2.29%
3016	Hinklin, Verne	40		0.00%	Fill	2060	3	0.15%
3017	Melancon, Craig	40		0.00%	Fill	2161	6	0.28%
3019	Morehead, Pat	3		0.00%	Weld Out	106	5	4.72%
3022	Martin, Ty	35	1	2.86%	Hot Pass	4056	43	1.06%
3025	Noyola, Michael	6		0.00%	Cap	416	1	0.24%
3026	Moorhead, Chris	3		0.00%	Weld Out	96	3	3.13%
3028	Moore, Darrel	3		0.00%	Cap	475	6	1.26%
3032	Morehead, Zachary	6		0.00%	Hot Pass & Cap	1024	6	0.59%
3033	Leonard, Avery					512	7	1.37%
3037	Harvey, Taylor	4		0.00%	Cap	523	6	1.15%
3039	McGuire, Nathan					2444	94	3.85%
3040	Harman, Teddy					2389	31	1.30%
3041	Ganske, William					103	3	2.91%
3042	Hungerford, Matt	2		0.00%	Weld Out	274	7	2.55%
3043	Arceneaux, Jared					49	12	24.49%
3044	Lanclos, Matthew	6		0.00%	Cap	487	1	0.21%
3045	Leleux, Brian	3		0.00%	Weld Out	289	11	3.81%
3049	Warren, Dennis					7	2	28.57%
3051	Fenton, Brian					1021	0	0.00%
3052	Plake, Donald Lee					124	3	2.42%
3053	Stansbury, Nick					273	9	3.30%
3054	Davis, Justin					190	8	4.21%
3064	Brisioe, James Kyle					84	1	1.19%
3065	Cooley, Jordan Ryan	6		0.00%	Cap	467	2	0.43%
3068	Knight, Brandon					175	11	6.29%
3074	Law, Preston					8	2	25.00%
3075	Pinner, Casey	1		0.00%	Fill & Cap	288	2	0.69%

SUNLAND CONSTRUCTION, INC.

TRANSCANADA KEYSTONE GCP3
WELDER REPAIR SUMMARY
"LIVINGSTON / MAIN CREW WELDING"

WELDER ID	WELDER NAME (last, first)	DATE 3/18/2013 # of WELDS	# of REPAIRS	DAILY REPAIR RATE (%)	WELDER POSITION / Comments	TOTAL # of WELDS	TOTAL # of REPAIRS	PROJECT REPAIR RATE (%)
3080	Tarkington, Waylon					222	9	4.05%
3081	Modisette, Robert Chad	6		0.00%	Cap	466	2	0.43%
3082	Tennison, William Mack					452	10	2.21%
3083	Christy, Jason					190	9	4.74%
3086	Berry, Mark	2		0.00%	Weld Out	177	13	7.34%
3096	Murphy, Joseph					157	9	5.73%
3101	Broussard, Ryan Keith	5		0.00%	Weld Out	4007	135	3.37%
3108	Sterling, Charles Michael	1		0.00%	Bead & Hot Pass	146	7	4.79%
3110	Swire, Justin Robert	6		0.00%	Cap	355	4	1.13%
3116	McCullough, Shawn T.	40	2	5.00%	Bead	2385	39	1.64%
3118	Leblanc, Jason S.					231	17	7.36%
3122	Lopez, Alberto	1		0.00%	Weld Out	137	3	2.19%
3123	Horton, Josh					203	5	2.46%
3128	Labaun, Jared	1		0.00%	Weld Out	113	3	2.65%
3129	Edgertan, Phillip A.	5		0.00%	Cap	371	1	0.27%
3130	Spivey, Michael					73	3	4.11%
3131	Bole, Tom H.					102	7	6.86%
3135	Willis, Kyle	1		0.00%	Weld Out	266	5	1.88%
3136	Wright Justin					281	4	1.42%
3143	Eaves, Bradey					70	1	1.43%
3144	Clark, James Cody					350	13	3.71%
3145	Cox, Phillip Blake	6		0.00%	Cap	438	1	0.23%
3146	Bertrand, Casey	6		0.00%	Cap	389	0	0.00%
3148	Crouch, Barry Layne					65	0	0.00%
3153	Morrison, Joe	1		0.00%	Weld Out	137	4	2.92%
3160	Clayton, Jason Dwayne					97	3	3.09%
3161	Murray, Trinity (Bubba)					37	7	18.92%
3162	Richmond, Justin T.					97	3	3.09%
3163	Gerardo, Jose Luis	20		0.00%	Hot Pass	405	1	0.25%
3166	Robinson, Worland Scott	4		0.00%	Cap	352	0	0.00%
3169	Wesley, Marshall Loftin					30	1	3.33%
3171	Tippett, Seth Allen	3		0.00%	Cap	362	2	0.55%

SUNLAND CONSTRUCTION, INC.

TRANSCANADA KEYSTONE GCP3
WELDER REPAIR SUMMARY
"LIVINGSTON / MAIN CREW WELDING"

WELDER ID	WELDER NAME (last, first)	DATE 3/18/2013 # of WELDS	# of REPAIRS	DAILY REPAIR RATE (%)	WELDER POSITION / Comments	TOTAL # of WELDS	TOTAL # of REPAIRS	PROJECT REPAIR RATE (%)
3172	Loggins, Tony Dwight	5		0.00%	Cap	378	7	1.85%
3175	Pyle, Christopher					25	1	4.00%
3177	Linehan, Matthew	4		0.00%	Repair Welds	312	23	7.37%
3178	Hearn, Rusty					925	32	3.46%
3179	Isom, Adrian Joseph					215	10	4.65%
3181	Jackson, Jeffrey Alan	6		0.00%	Cap	474	6	1.27%
3183	Carrier, David					803	7	0.87%
3184	Everrt, Scott					6	0	0.00%
3185	LeMaire, Casey Dean					69	1	1.45%
3186	Nunez Jr., Elry					48	3	6.25%
3187	Wagner, Jeff C.					54	3	5.56%
3188	Jones, Timond	1		0.00%	Weld Out	81	7	8.64%
3190	Ward, Jeremy					1438	17	1.18%
3191	Baily, Nathan R.					61	5	8.20%
3192	Gilbreath, Walter L.	17		0.00%	Hot Pass	583	3	0.51%
3193	McFaul, Jason M.	40		0.00%	Bead	878	27	3.08%
3194	Loftin, Gevin G.	1		0.00%	Fill & Cap	183	6	3.28%
3211	Wells, Marty L.					76	0	0.00%
3212	Louviere, Bryant A.					36	2	5.56%
3215	Pasket, Jeff I.	1		0.00%	Weld Out	49	2	4.08%
3217	Walton, Tommy M.	2		0.00%	Weld Out	44	1	2.27%
3218	Perez, David L.	1	1	100.00%	Weld Out	48	1	2.08%
3219	Istre, Randy H.	2		0.00%	Weld Out	45	1	2.22%
3220	Smith, Michael D.					67	6	8.96%
3221	Morre, Steve					27	1	3.70%
3223	Presley, John S.	1		0.00%	Weld Out	47	0	0.00%
3224	Guilbeaux, Larry J.	3		0.00%	Cap	47	5	10.64%
3232	English, Kevin	1		0.00%	Bead & Hot Pass	218	2	0.92%
3233	Stacy, Chad					7	1	14.29%
						0	0	
						0	0	
						0	0	

This Policy applies to all Personnel (including full-time and part-time employees, contract workers, contractors and consultants) of TransCanada Corporation and its wholly-owned subsidiaries, and operated entities in Canada, the United States and Mexico (the "Company"). When appropriate, the policy will be included as part of contractual agreements with third-party stakeholders, such as customers and suppliers, that may access or create Company information systems and technologies.

This policy applies to all information systems and technologies maintained by and under the control of the Company. For the purposes of this policy this includes, but is not limited to:

- Company-related information,
- Computers, related systems including all data and programs,
- E-mail, voice mail, and other voice and data communication systems managed by the Company or a third party,
- Industrial control systems (SCADA) including Distributed Control Systems (DCS),
- Hand-held devices and personal communication devices (e.g. cell phones, smart phones),
- Company and external information storage facilities, where information resources are stored or managed via electronic or digital media or devices.

POLICY STATEMENTS

1. All information systems and technologies must be developed and maintained in a secure manner at all times.

2. All information and data must be maintained and secured in a manner consistent with the "Information Management Policy.

3. All information systems and technologies developed or acquired by or for the Company are property of the Company and must be used for Company approved purposes.

4. It is the responsibility of all department personnel to manage and secure their information systems and technologies (using tools and protocols supplied by Information Services).

5. Senior Leadership will be accountable to ensure information systems and technologies within their functional area are identified and assigned an Information Asset Owner (i.e. leader, manager).

6. Use of the Company's information systems and technologies must comply with all applicable corporate governance documents and all applicable statutory, legislative, regulatory, contractual, industry and operational requirements.

7. Information systems and technologies must be appropriately protected, from unauthorized or inappropriate access, use and destruction or disclosure whether accidental or intentional, throughout the systems lifecycle.

8. Information must be transmitted in a secure manner (e.g. encrypted, etc.), appropriate for its sensitivity, regardless of the media or communication method used.

9. All sensitive and valuable information systems and technologies must be appropriately secured when left unattended.

10. Incidents related to information security must be reported to IS Governance and Security, Business Information, Internal Audit, Human Resources, Legal, Corporate Security, Privacy Officer or others as governed by their respective corporate policies.

COMPLIANCE / EXCEPTIONS

Personnel are expected to comply with all aspects of this policy and to support others in doing so. Personnel who fail to comply with a TransCanada Policy or its intent or who knowingly permit personnel under his or her supervision to not comply will be subject to disciplinary action up to and including termination of employment, termination of contract or removal from the Company's worksite. Please refer to the TransCanada Policies and Procedures Web Site for more information.

RESPONSIBILITIES

As owners of the Information Security Policy, Information Services mandate is to govern the security of the Company's information systems and technologies. The related responsibilities are as follows:

Information Services

- Provide training and awareness regarding the Information Security policy and standards.
- Track and resolve issues, concerns and incidents relating to the Information Security policy.
- Develop the IS security strategy, practices, standards and guidelines in support of this and other Company policies.
- Provide IT risk assessment and consultation services to support the Information Asset Owner, the Custodian and the personnel in the performance of their security of information responsibilities.
- The Vice President of Information Services is accountable to ensure that technology policies, standards, guidelines, tools, and processes exist to enable the protection of the Company's electronic information systems and technologies.
- The Vice President of Information Services is the Information Asset Owner of the IT Infrastructure.

Senior Management

- Ensure information systems and technology within their functional area are secured and personnel are held accountable for following this corporate policy.

Information Asset Owner

- Ensure all levels of access to information systems and technologies are aligned with business and regulatory requirements.
- Establish control over their information systems and technologies that meets all legal, regulatory and operational compliance requirements.

All Personnel

- Become informed about the Company's Information Security policy and maintain their information systems and technologies accordingly.

016490

REFERENCES AND LINKS

- Questions and Comments
- Code of Business Ethics
- Information Management Policy
- Information Management Program
- Protection of Personal Information Policy
- NERC-CIP Cyber Security Program
- Acceptable Usage of Electronic Information Resources
- Corporate Password Standard

Document Originator(s)	**Signature**
Terry Lamb IS Governance and Security	
Document Reviewer(s)	**Signature**
Darryl Williams Director, IS Governance and Security Rick Coutts VP, Information Services	
Approval(s) for Issuance	**Signature**
Sean McMaster Chair, Corporate Performance Committee Executive Vice President, Corporate and General Counsel On behalf of the Committee	

KEYSTONE PIPELINE PROJECT - U.S. PHASE IV (STEELE CITY SEGMENT)
PIPELINE ROUTE VARIATION FORM

0179-SD-P2-329.3-338.6-S

1 **VARIATION TYPE**: Pump Station: X

Does this change require Centerline variation? Yes: X No:

2 **LOCATION (Final PS Location):** Sketch: Attached Pictures: -

State:	SD	Township:	17N	Quad Map:	Attached		
County:	Harding	Range:	6E	Aerial Map:	Attached		
Section:	25	Legal (Initial PS loc.)	19-17N-7E	Initial PS MP	333.6	Final PS MP	- Mar 26th, 2010 C/L

3 **REASON FOR PUMP STATION RELOCATION** (Please include reason for move):

The Greater Sage Grouse has been now listed in the endangered species list by the US Fish and Wildlife Service. The proposed relocation of Buffalo Pump Station (PS-16) is to avoid having any above groud facilities (pump station and access roads) within a 0.6 mile radius (specified by US Fish and Wildlife Service) from the Greater Sage Grouse Leks.
The proposed reroute is to accomodate this relocation.

DETAILS OF NEW PUMP STATION LOCATION AND ROUTE VARIATION, IF APPLICABLE (Please describe in detail):

It is proposed that the Pump Station Buffalo (PS-16) site be increased in acreage to 11.3 Acres from the previous site (8.5 Acres). The pump station has been moved from the southeast corner of the southwest quarter of Sec 19 (T17N-R7E), just north of JB road to the southeast corner of the northwest quarter of Sec 25 (T17N-R6E). The dimensions of the Pump Station have been increased to 760' X 650' from earlier dimensions of 742' X 500'.
The proposed reroute starts at the PI near MP 329.3 and deviates towards the south. It continues in this direction for 12,500 ft until it avoids a pond and its sideslopes. Along its path it makes slight a slight deviation to cross a stream feature perpendicularly. The proposed centerline turns towards the southeast and then continues for another ~7,500 ft until it reaches JB road. It then turns towards the south and continues for 3,280 ft (crossing JB road ~5,580 ft west of its current crossing location). Along its path, it passes through the west edge of the proposed PS-16 site. From here, the proposed reroute deviates towards the southeast and continues for 27,470 ft to rejoin the current centerline at the PI near MP 338.6. Along its path, it makes some minor deviations to avoid/cross drainage features at preferred locations.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; routing to pump station, hydraulic impacts, etc.):

The size of the proposed Pump Station (PS-14) is increased to 11.3 acres from 8.5 acres. The proposed reroute is ~2,605 ft longer than the original route. The additional number of stream crossings are estimated on a desktop analysis. **The proposed reroute is based on Desktop analysis and may be tweaked in the field by engineers based on field reconnaissance.**

COST ANALYSIS (costs incurred or saved from the route variation)

Additional Acreage of the proposed Pump Station site	2.9	acres	$ 11,600.00	$4,000/ac
Additional length of route realignment:	2,605	ft.	$ 937,800.00	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional waterbody crossing (streams, ponds, etc.):				
20' - 35' +		EA	$ -	$ 185,000/EA
10' - 19'		EA	$ -	$ 77,250/EA
Less than 10'	2	EA	$ 65,000.00	$ 32,500/EA
Additional survey required:				
Civil:	9.86	mile	$ 49,300.00	$ 5,000/mile
Cultural:	9.86	mile	$ 24,650.00	$ 2,500/mile
Biological:	9.86	mile	$ 27,608.00	$ 2,800/mile
Additional length of power line construction:		ft.	$ -	$ 25/ft

Miscellaneous costs saved or added due to new pump station location from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the new pump station location: $ 1,115,958

4 **LAND / UNIVERSAL FIELD** *Doug Reichley*

a) Is a new landowner affected by proposed Pump Station relocation? Yes: X No:
b) Is the landowner agreeable to the proposed Pump Station location? Yes: X No:
c) Is relocation proposed to satisfy landowner concerns? Yes: No: X
-If yes, name of landowner(s)/track number(s):
d) Has all the evaluation criteria been examined/provided for this specific discipline? Yes: X No:
If no, please explain why:

5 **ENGINEERING/CONSTRUCTION** *David Guien*

a) Maximum deviation perpendicular to proposed alignment: 6,540 ft.
b) Is relocation proposed for engineering/construction reasons? Yes: No: X
c) Will site require noise mitigation measures? Yes: No: X

6 **ENVIRONMENTAL / TROW** *Jonathan Minton*

a) Has the previous pump station been environmentally surveyed? Yes: X No:
b) Has the proposed pump station been environmentally surveyed? Yes: X No:
c) Was new pump station location proposed to satisfy environmental issues? Yes: X No:
d) Was pump station relocation proposed to satisfy agency request? Yes: X No:
-If yes, name of agency(s): USFWS
e) Environmental features:

Added (+): None at PS-16 site, unknown on reroute.
Subtracted (-): Avoids 0.6-mile Sage Grouse NSO, avoids multiple intermittent and ephermial waterbody crossings.

7 **POWER INFRASTRUCTURE TECHNICAL** *Larry Sibbald*

a) Will the new pump station location involve a new utility provider? Yes: No:
b) Will the new pump station location result in a significant change to the power line routing to the station? If yes, by how many miles? Yes: No: miles
c) Are there any apparent obstacles to routing a power line to the new station? Yes: No:
If yes, please list:

8 **ENGINEERING / FACILITIES AND HYDRAULICS** *Sandra Gigovic*

a) Is the proposed Pump Station area acceptable for PS design? Yes: X No:
b) Will pump station relocation impact hydraulics? Yes: No: X
c) Will new pump station location affect valve placement around HCA areas? Yes: No:

9 **STAKEHOLDER RELATIONS / TCPL** *Bud Anderson*

a) Does the proposed pump station location result in any new stakeholders? Yes: No:
b) Does it require follow-up with specific stakeholder groups? Yes: No:
c) Was the new pump station location proposed to satisfy stakeholder request? Yes: No:
-If yes, please specify issue type (as it aligns to stakeholder database):

0179-SD-P2-329.3-338

10 Originator: Environmental
Date: 9/14/2010

11 Received by: *Centerline Coordinator*
Date: 9/14/2010
Fax to: ?

12 Assigned Tracking Number: 0179-SD-P2-329.3-338.6-S

13 Filed by: *Centerline Coordinator*
Date:
Fax to: ?

0179-SD-P2-329.3-338.6-S

KEYSTONE PIPELINE PROJECT - U.S. PHASE IV (STEELE CITY SEGMENT)
ROUTE VARIATION AUTHORIZATION FORM

Date: 9/14/2010

Tracking Number: 0179-SD-P2-329.3-338.6-S

Description: Relocation of Buffalo Pump Station (PS-16) and proposed reroute to complement pump station design.

Initial PS MP: 333.6 Final PS MP: -

Originated By: Environmental

Variation Form Attached: Yes X No

Universal Field Services - Land	Doug Reichley	Variation: Approved X Rejected	
Comments:		*Doug Reichley* Date: 9/15/2010	
		If Rejected Why?	
Construction / Engineering	David Guien	Variation: Approved X Rejected	
Comments:		*David Guien* Date: 9/18/2010	
		If Rejected Why?	
Trow - Environmental	Jonathan Minton	Variation: Approved X Rejected	
Comments:	The reroute to the new site still requires environmental survey.	*Jonathan Minton* Date: 9/15/2010	
		If Rejected Why?	
Power Infrastructure Technical	Larry Sibbald	Variation: Approved Rejected	
Comments:		*Name?* Date:	
		If Rejected Why?	
Project Management	Butch Wallace	Variation: Approved X Rejected	
Comments:		*R.E. Wallace* Date: 9/20/2010	
		If Rejected Why?	
Stakeholder Relations	Bud Anderson	Variation: Approved Rejected	
Comments:		*Name?* Date:	
		If Rejected Why?	
Facilities:	Sandra Gigovic	Variation: Approved X Rejected	
Comments:	Final hydraulic impact of the relocation will need to be reviewed once final pump station mileposts are available.	*Sandra Gigovic* Date: 9/30/2010	
		If Rejected Why?	
TransCanada:	Alan Lietz	Variation: Approved X Rejected	
Comments:		*Alan Lietz* Date: 10/25/2010	
		If Rejected Why?	

Forward to:

Butch Wallace	X	Jonathan Minton	X	Larry Sibbald	X
David Guien	X	Bud Andersen	X	Alan Lietz	X
Doug Reichley	X	Sandra Gigovic	X		

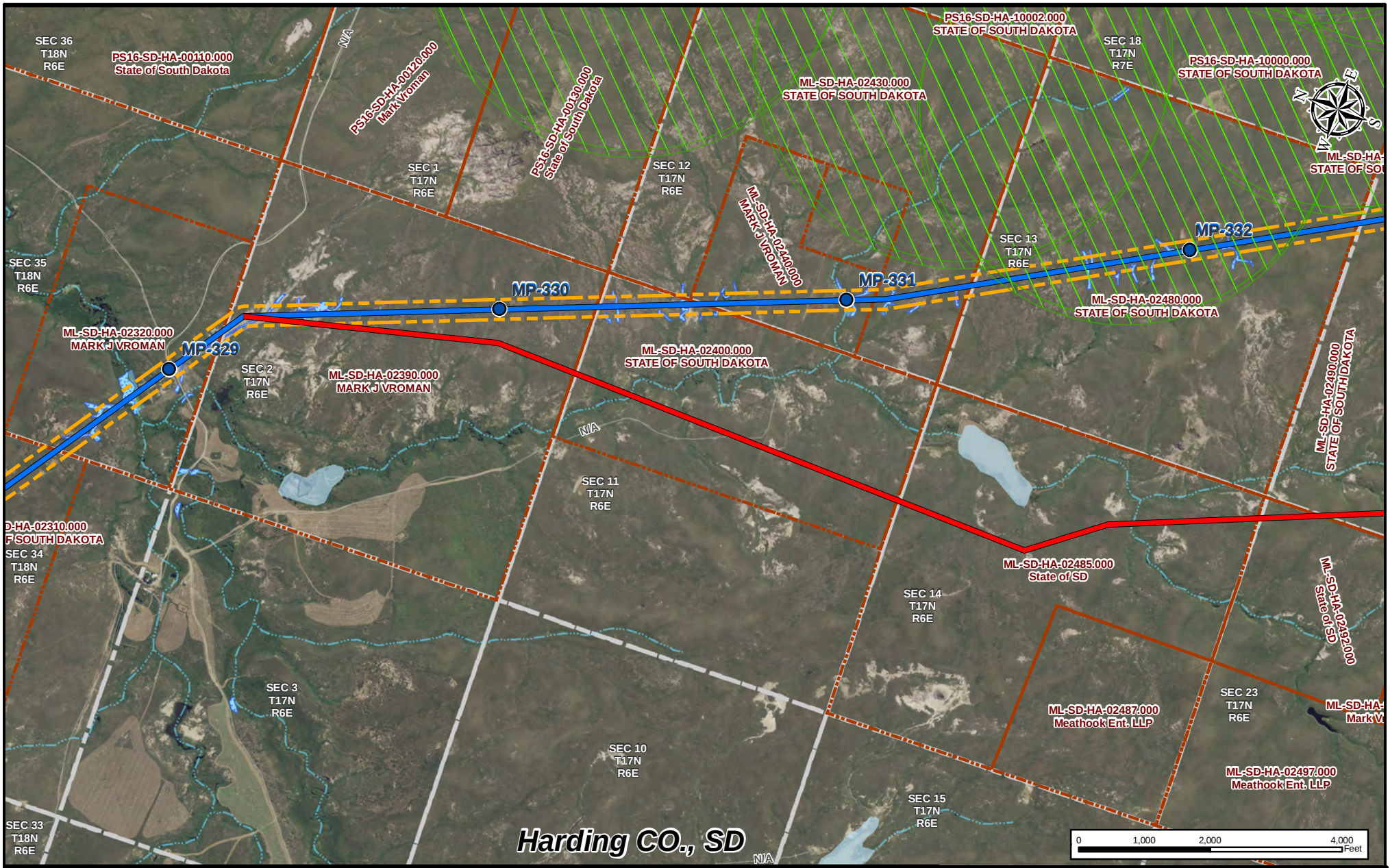
Dispute Resolution, if Required: Yes No

Comments:

Teleconference Required: Yes No

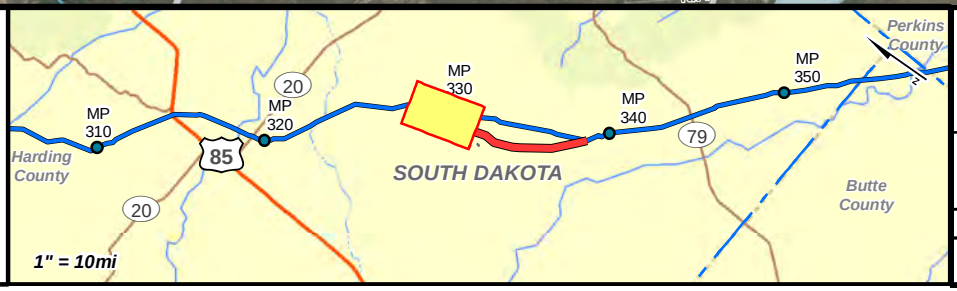
Decision:

Database - ?	**Database -** ?
Filed By:	Filed By:
Date:	Date:
Fax to: ?	*Fax to: ?*



Legend

- Milepost
- Centerline (2010-03-26)
- Prop. ReRoute
- Waterbody
- Wetland
- Sage Grouse 0.6 Mile Buffer
- Current Pump Station
- Proposed Pump Station
- 300ft Corridor
- Parcel Boundary
- Section Line
- Access Roads
- County Boundary
- State Boundary



KEYSTONE XL PROJECT - STEELE CITY SEGMENT
PROPOSED ROUTE VARIATION FOR PS-16
HARDING COUNTY, SD

Trow

DATE	PROJECT	MAP PARAMETERS
Sep 08, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 2000'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
ACB	NJA	ALS	0179-SD-P2-329.3-338.6-S	1	0

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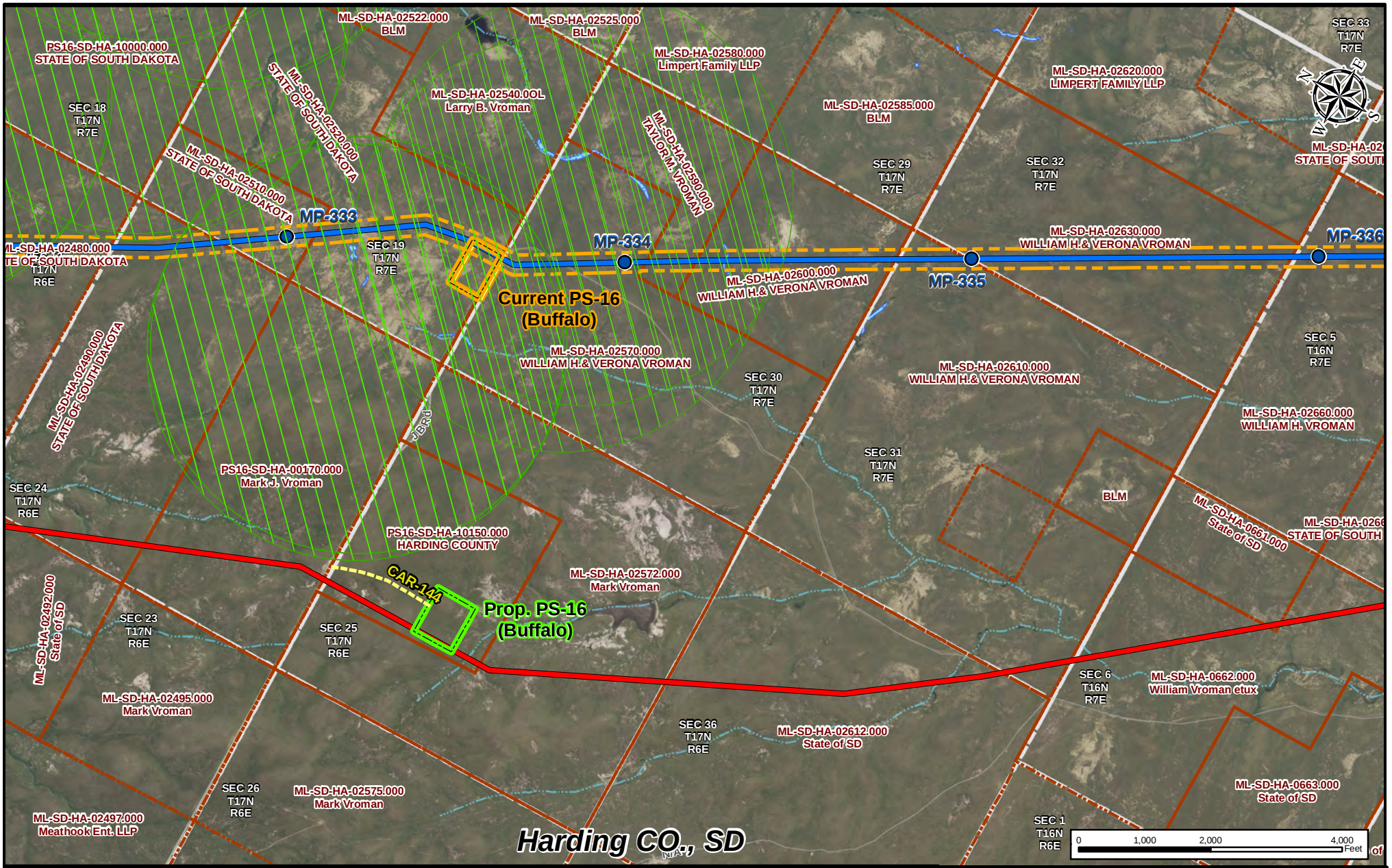
016494



Legend

- Milepost
- Centerline (2010-03-26)
- Prop. ReRoute
- Waterbody
- Wetland
- Sage Grouse 0.6 Mile Buffer
- Current Pump Station
- Proposed Pump Station
- 300ft Corridor
- Parcel Boundary
- Section Line
- Access Roads
- County Boundary
- State Boundary

KEYSTONE XL PROJECT - STEELE CITY SEGMENT
PROPOSED ROUTE VARIATION FOR PS-16
HARDING COUNTY, SD

Trow	DATE	PROJECT	MAP PARAMETERS
	Sep 08, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 2000'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
ACB	NJA	ALS	0179-SD-P2-329.3-338.6-S	2	0

Path: G:\2000DraftingandGIS\WorkingMaps\RouteVariations\PS16\PS16_STRIP_MAP.mxd

016495

Legend

- Milepost
- Centerline (2010-03-26)
- Prop. ReRoute
- Waterbody
- Wetland
- Sage Grouse 0.6 Mile Buffer
- Current Pump Station
- Proposed Pump Station
- 300ft Corridor
- Parcel Boundary
- Section Line
- Access Roads
- County Boundary
- State Boundary

KEYSTONE XL PROJECT - STEELE CITY SEGMENT
PROPOSED ROUTE VARIATION FOR PS-16
HARDING COUNTY, SD

Trow

DATE	PROJECT	MAP PARAMETERS
Sep 08, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 2000'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
ACB	NJA	ALS	0179-SD-P2-329.3-338.6-S	3	0

Path: G:\2000DraftingandGIS\WorkingMaps\RouteVariations\PS16\PS16_STRIP_MAP.mxd

016496

KEYSTONE PIPELINE PROJECT - U.S. PHASE IV (STEELE CITY SEGMENT)
PIPELINE ROUTE VARIATION FORM

0186-SD-P2-594.7-594.7-S

1

VARIATION TYPE: Pump Station [X]

Does this change require Centerline variation? Yes [ ] No [X]

2

LOCATION (Final PS Location): Sketch: Attached Pictures: -

State: SD Township: 95N Quad Map: -

County: Tripp Range: 74W Aerial Map: Attached

Section: 26 Legal (Initial PS loc.) 16-95N-74W Initial PS MP 591.9 Final PS MP 594.7 March 26th, 2010 CL

3

REASON FOR PUMP STATION RELOCATION (Please include reason for move):

The Colome Pump Station was previously located on Graesser Family TR (ML-SD-TR-11970.000) which was a denial for the Pump Station. Colome Pump Station is proposed to be relocated onto a willing landowner (Bernard & Betty Seegers, Trustees).

DETAILS OF NEW PUMP STATION LOCATION AND ROUTE VARIATION, IF APPLICABLE (Please describe in detail):

It is proposed to relocate Colome Pump Station ~2.8 miles downstream onto the northeast corner of section 26, T95N-R74W. A 1,910 ft. permanent access road (CAR-139) will be constructed from 331st Ave into the pump station area.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; routing to pump station, hydraulic impacts, etc.):

The size of the proposed Pump Station (PS-21) is increased to 8.4 acres from the previous site of 5.0 acres. The cost of construction of access road is not estimated in these costs.

COST ANALYSIS (costs incurred or saved from the route variation)

Additional Acreage of the proposed Pump Station site	3.4	acres	$ 13,600.00	$4,000/ac
Additional length of route realignment:		ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional waterbody crossing (streams, ponds, etc.):				
35' - 65' +		EA	$ -	$ 185,000/EA
10' - 35'		EA	$ -	$ 77,250/EA
Less than 10'		EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:		mile	$ -	$ 5,000/mile
Cultural:		mile	$ -	$ 2,500/mile
Biological:		mile	$ -	$ 2,800/mile
Additional length of power line construction:		ft.	$ -	$ 25/ft

Miscellaneous costs saved or added due to new pump station location from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the new pump station location: $ 13,600

4

LAND / UNIVERSAL FIELD *Doug Reichley*

a) Is a new landowner affected by proposed Pump Station relocation? Yes [X] No [ ]

b) Is the new landowner agreeable to the proposed Pump Station location? Yes [X] No [ ]

c) Is relocation proposed to satisfy landowner concerns? Yes [X] No [ ]

- If yes, name of landowner(s)/track number(s): ML-SD-TR-11970.000 (Graesser Family TR)

d) Has all the evaluation criteria been examined/provided for this specific discipline? Yes [ ] No [ ]

If no, please explain why:

5

ENGINEERING/CONSTRUCTION *David Guien*

a) Maximum deviation perpendicular to proposed alignment: 0 ft.

b) Is relocation proposed for engineering/construction reasons? Yes [ ] No [X]

c) Will site require noise mitigation measures? Yes [ ] No [ ]

6

ENVIRONMENTAL / TROW *Jonathan Minton*

a) Has the previous pump station been environmentally surveyed? Yes [X] No [ ]

b) Has the proposed pump station been environmentally surveyed? Yes [X] No [ ]

c) Was new pump station location proposed to satisfy environmental issues? Yes [ ] No [X]

d) Was pump station relocation proposed to satisfy agency request? Yes [ ] No [X]

-If yes, name of agency(s):

d) Environmental features:

Added (+): NA

Subtracted (-): NA

7

POWER INFRASTRUCTURE TECHNICAL *Larry Sibbald*

a) Will the new pump station location involve a new utility provider? Yes [ ] No [ ]

b) Will the new pump station location result in a significant change to the power line routing to the station? If yes, by how many miles? Yes [ ] No [ ] miles

c) Are there any apparent obstacles to routing a power line to the new station? Yes [ ] No [ ]

If yes, please list:

8

ENGINEERING / FACILITIES AND HYDRAULICS *Sandra Gigovic*

a) Is the proposed Pump Station area acceptable for PS design? Yes [X] No [ ]

b) Will pump station relocation impact hydraulics? Yes [X] No [ ]

c) Will new pump station location affect valve placement around HCA ar **N/A to PS Engineer** Yes [ ] No [ ]

9

STAKEHOLDER RELATIONS / TCPL *Bud Anderson*

a) Does the proposed pump station location result in any new stakeholders? Yes [ ] No [ ]

b) Does it require follow-up with specific stakeholder groups? Yes [ ] No [ ]

c) Was the new pump station location proposed to satisfy stakeholder request? Yes [ ] No [ ]

-If yes, please specify issue type (as it aligns to stakeholder database):

0186-SD-P2-594.7-594.7-S

10

Originator: Land

Date: 10/5/2010

11

Received by: *Centerline Coordinator*

Date: 10/5/2010

Fax to: ?

12

Assigned Tracking Number: 0186-SD-P2-594.7-594.7-S

13

Filed by: *Centerline Coordinator*

Date:

Fax to: ?

KEYSTONE PIPELINE PROJECT
PIPELINE ROUTE VARIATION AUTHORIZATION FORM

0186-SD-P2-594.7-594.7-S

KEYSTONE XL PIPELINE PROJECT PHASE - STEELE CITY SEGMENT
ROUTE VARIATION AUTHORIZATION FORM

Date: 10/5/2010
Description: Relocation of PS-21.
Tracking Number: 0186-SD-P2-594.7-594.7-S
Initial PS MP 591.9 Final PS MP 594.7
Originated By: Land
Variation Form Attached: Yes X No

Universal Field Services - Land	Doug Reichley	Variation: Approved X	Rejected	Doug Reichley	Date: 10/5/2010
Construction / Engineering	David Guien	Variation: Approved X	Rejected	David Guien	Date: 10/25/2010
Trow - Environmental	Jonathan Minton	Variation: Approved X	Rejected	Jonathan Minton	Date: 10/8/2010
AECOM - Risk Assesment	Heidi Tillquist	Variation: Approved	Rejected	Name?	Date:
Power Infrastructure Technical	Larry Sibbald	Variation: Approved	Rejected	Name?	Date:
Project Management	Butch Wallace	Variation: Approved X	Rejected	R.E. Wallace	Date: 10/6/2010
Stakeholder Relations	Bud Anderson	Variation: Approved	Rejected	Name?	Date:
Facilities:	Sandra Gigovic	Variation: Approved X	Rejected	Sandra Gigovic	Date: 10/19/2010
TransCanada:	Alan Lietz	Variation: Approved X	Rejected	Alan Lietz	Date: 10/26/2010

Comments: Final hydraulic check to be completed once the pipe routing & other PS MPs are finalized.

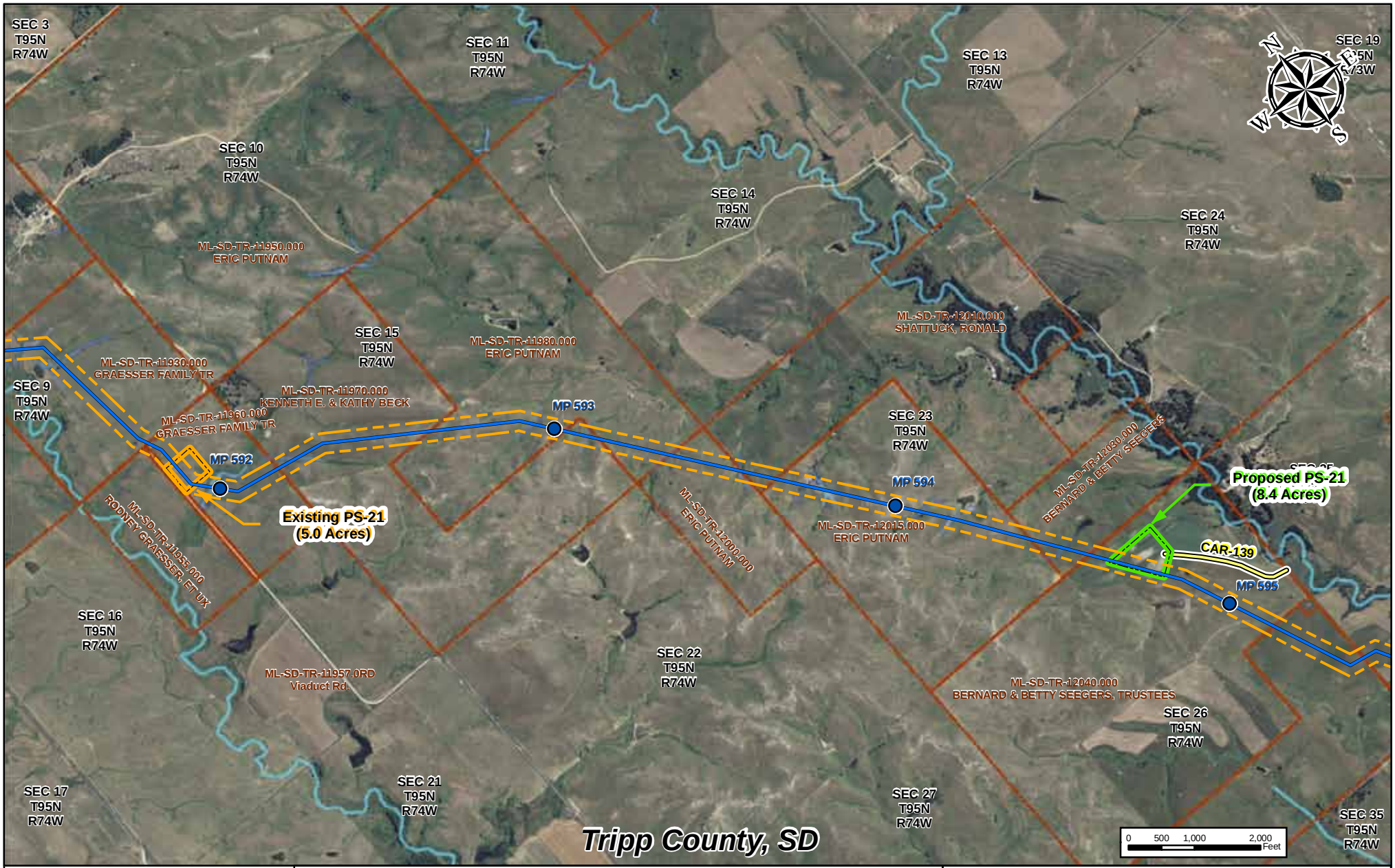
If Rejected Why?

Forward to:

Butch Wallace	X	Jonathan Minton	X	Heidi Tillquist	X
David Guien	X	Bud Andersen	X	Larry Sibbald	X
Doug Reichley	X	Sandra Gigovic	X	Alan Lietz	X

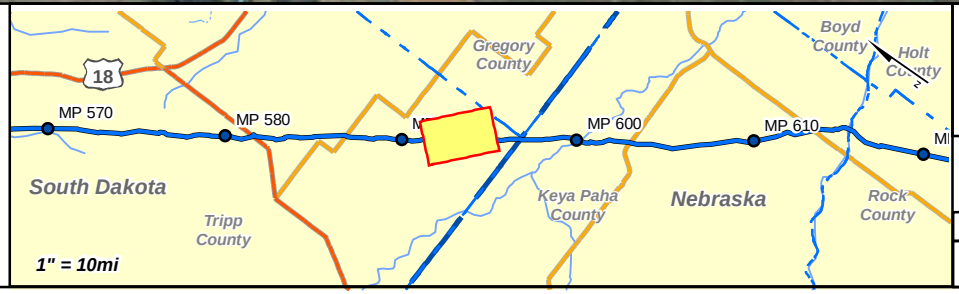
Dispute Resolution, if Required: Yes No
Comments:
Teleconference Required: Yes No
Decision:

Database - ? **Database -** ?
Filed By: Filed By:
Date: Date:
Fax to: ? *Fax to: ?*



Legend

- Milepost
- Centerline (2010-03-26)
- 300ft Corridor
- Current Pump Station
- Proposed Pump Station
- Access Roads
- Parcel Boundary
- Waterbody
- Wetland
- County Boundary
- State Boundary



KEYSTONE US PROJECT - PHASE IV
PROPOSED PS-21 (COLOME)
TRIPP COUNTY, SOUTH DAKOTA

Trow

DATE	PROJECT	MAP PARAMETERS
Sept. 28, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 1000'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
HKC	CPA	ALS	0186-SD-P2-594.7-594.7-S	001	0

Path: G:\2000DraftingandGIS\WorkingMaps\RouteVariations\PS21\PS21_20100928.mxd

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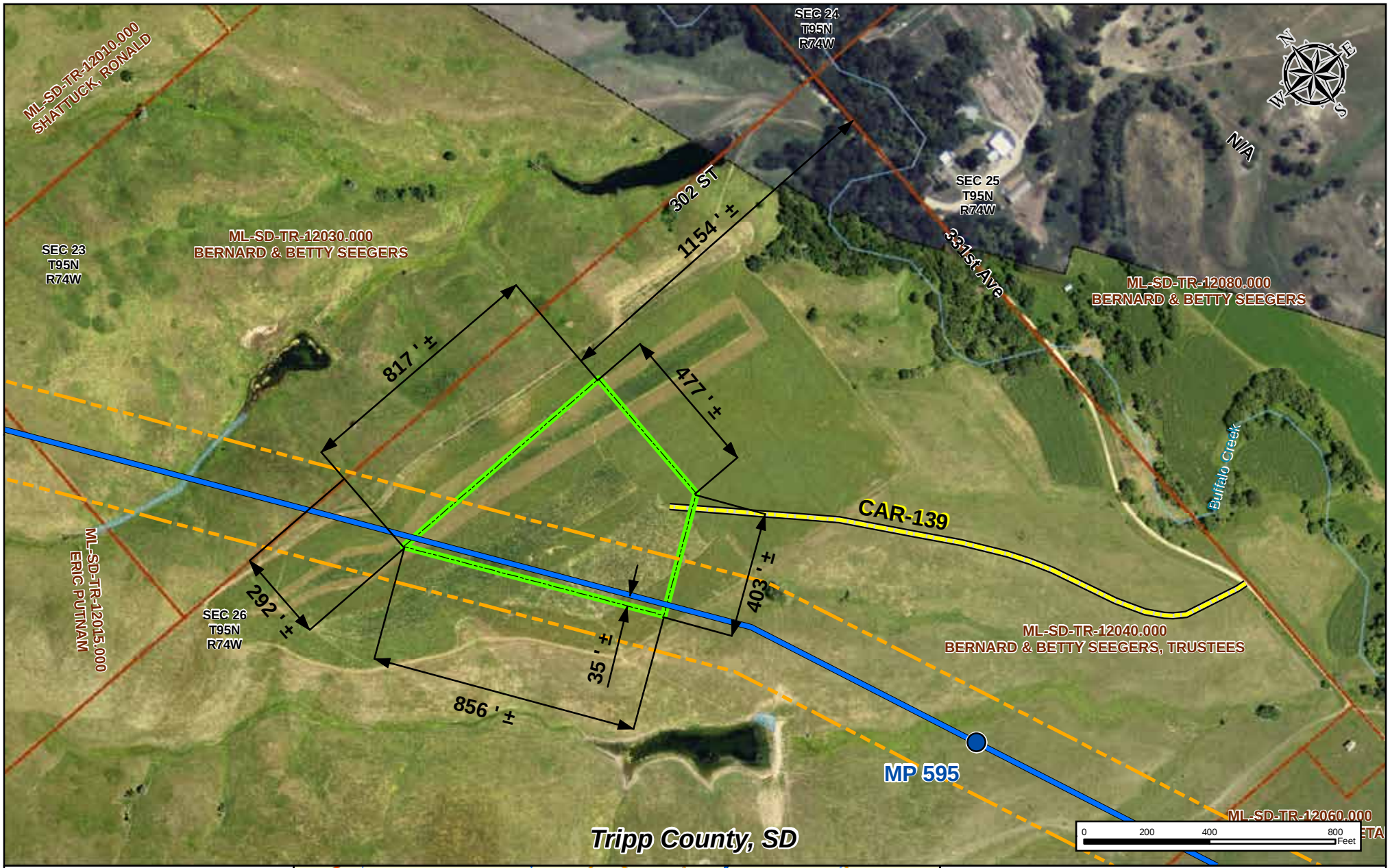
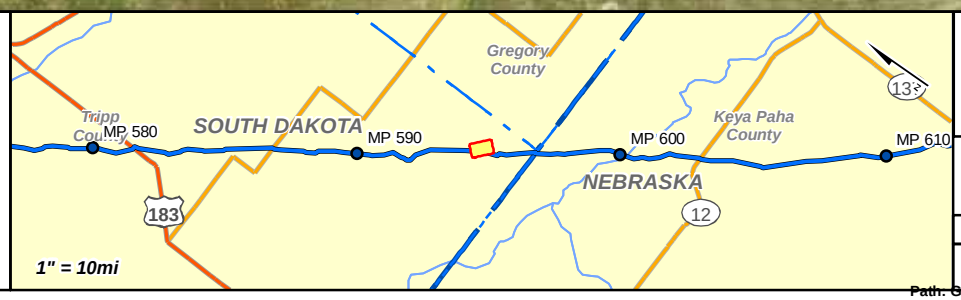


Legend

- Milepost
- Centerline (2010-03-26)
- 300ft Corridor
- Proposed Pump Station
- Permanent Access Road
- Parcel Boundary
- Waterbody
- Wetland
- County Boundary
- State Boundary



KEYSTONE US PROJECT - PHASE IV
PROPOSED PS-21 (COLOME)
TRIPP COUNTY, SOUTH DAKOTA

Trow

DATE	PROJECT	MAP PARAMETERS
Sept. 28, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 400'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
HKC	CPA	WSF	0186-SD-P2-594.7-594.7-S	001	0

Path: G:\2000DraftingandGIS\WorkingMaps\RouteVariations\PS-21\PS21_DIMENSION_20100928.mxd

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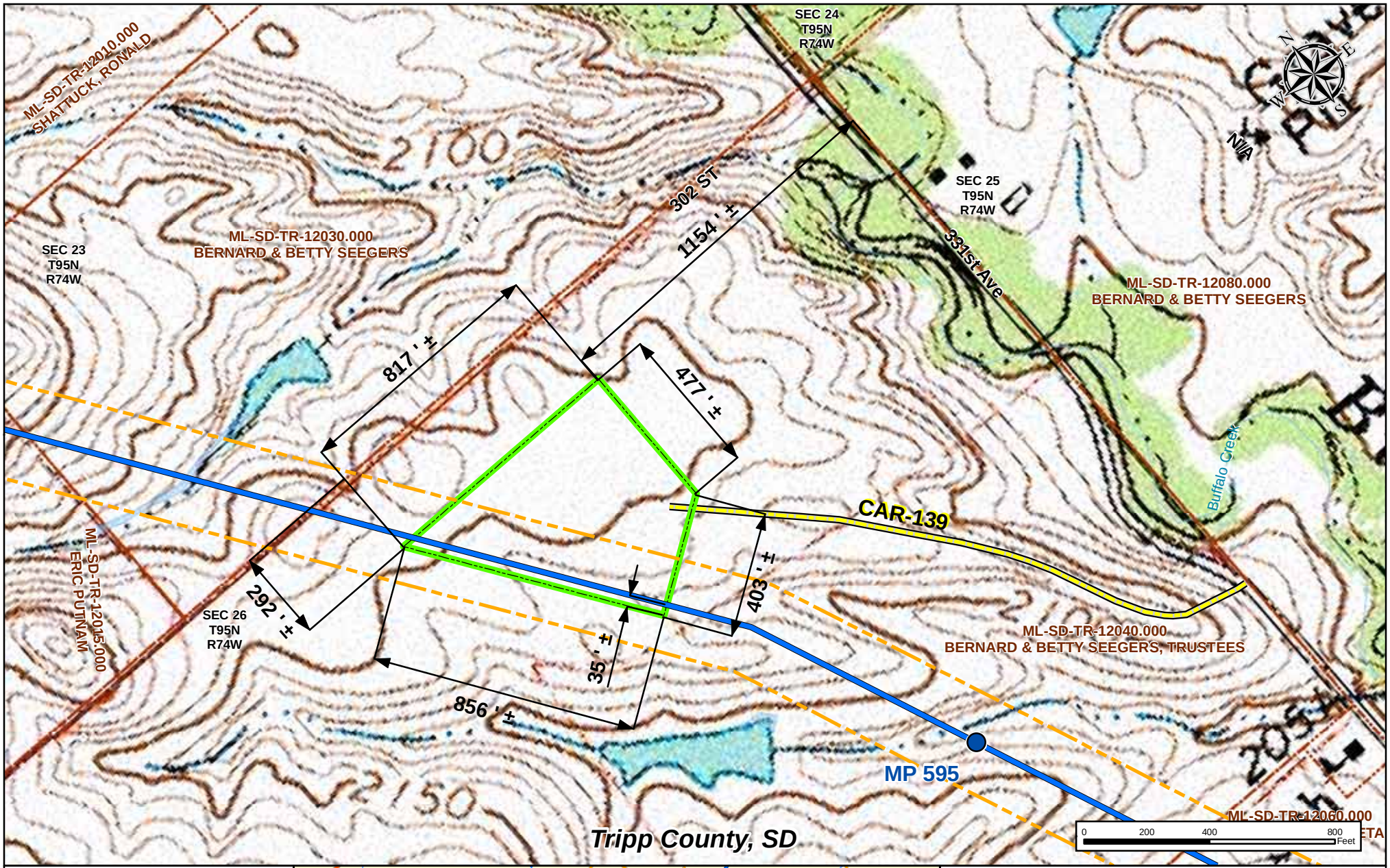
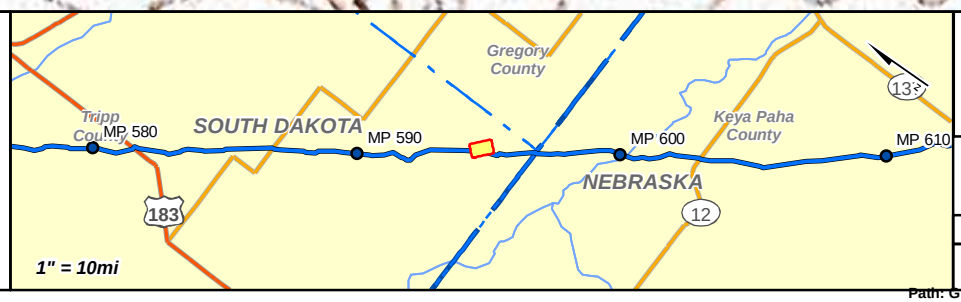


Legend

- Milepost
- Centerline (2010-03-26)
- 300ft Corridor
- Proposed Pump Station
- Permanent Access Road
- Parcel Boundary
- Waterbody
- Wetland
- County Boundary
- State Boundary



KEYSTONE US PROJECT - PHASE IV
PROPOSED PS-21 (COLOME)
TRIPP COUNTY, SOUTH DAKOTA

Trow

DATE	PROJECT	MAP PARAMETERS
Sept. 28, 2010	50388X	PROJECTION: UTM 13, NAD83, US FT SCALE: 1" = 400'

DRAWN BY	CHECKED BY	APPROVED BY	ROUTE VARIATION NO.	SHEET	REV.
HKC	CPA	WSF	0186-SD-P2-594.7-594.7-S	001	0

Path: G:\2000DraftingandGIS\WorkingMaps\RouteVariations\PS-21\PS21_DIMENSION_20100928.mxd

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0198-XX-P2-XXX.X-XXX.X-

KEYSTONE XL PIPELINE PROJECT - STEELE CITY SEGMENT
MANAGEMENT OF CHANGE FORM FOR VALVES

1
VARIATION TYPE: Centerline: | Valve Site: X | Pump Station:

2
LOCATION: Sketch: Attached Pictures: See attached.

State: Multiple County: Multiple Quad Map: N/A
Township: Multiple Range: Multiple Aerial Map: See attached map sheet
Section: Multiple Centerline: 11/18/2010 MP: XXX.X to XXX.X

3
REASON FOR VARIATION :

As per the PHMSA condition 32 - Mainline and Check Valve Control: Keystone must design and install mainline block valves and check valves on the Keystone XL system based on the worst case discharge as calculated by 49 CFR § 194.105. Keystone shall locate valves in accordance with 49 CFR § 195.260 and by taking into consideration elevation, population, and environmentally sensitive locations, to minimize the consequences of a release from the pipeline. Mainline valves must be placed based on the analysis above or no more than twenty (20) miles apart, whichever is smaller. Mainline valves must contain transit inhibit switches that prevent the valves from shutting at a rate (and in conjunction with pumps being shutdown) so that no pressure surges can occur, or other damage caused by unintended valve closures or too fast of a closure.

Valves must be remotely controlled and actuated, and the SCADA system must be capable of closing the valve and monitoring the valve position, upstream pressure and downstream pressure so as to minimize the response time in the case of a failure. Remote power backup is required to ensure communications are maintained during inclement weather. Mainline valves must be capable of closure at all times. If it is impracticable to install a remote controlled valve, Keystone must submit a valve design and installation plan to the appropriate PHMSA Region Director(s), Central, Western, and Southwest Region to confirm the alternative approach provides an equivalent level of safety. For any valves that cannot be remotely actuated, Keystone must document on a yearly basis, not to exceed fifteen (15) months that personnel response time to these valves will not take over one hour.

To comply with spacing requirement, Keystone determined areas its current valve spacing design exceeded a spacing of 20 miles and employed one of the following steps to mitigate the issue:
• Relocated the valve after a thorough analysis of the resulting spill volume and assuring the original intent of the valve was still realized
• Bringing remote actuation to the downstream manual ball valve of a check valve, block valve set.
• Adding a new remotely actuated mainline valve site.

DETAILS OF VARIATION :

The proposed valve sites are based on a combination of field visits, desktop analysis and a flyover video of the Centerline (11/18/2010 CL). These valves site locations may shift slightly based on further specific design and/or landowner concerns.

In the Supplemental Info tab, Blue rows represent the newly added valves and the Green rows represent the relocated valves.
The maximum valve spacing between motorized valves (including valves at Pump Stations) is now 20.7 miles.

ADDITIONAL IMPACTS :

The cost analysis for the additional/relocated valves, previously purchased land which cannot be used and other costs associated with the variation is not shown in this report and is calculated separately.

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:		ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
	35 - 65' +	EA	$ -	$ 185,000/EA
	10' - 19'	EA	$ -	$ 77,250/EA
	Less than 10'	EA	$ -	$ 32,500/EA
Additional survey required:				
	Civil:	mile	$ -	$ 5,000/mile
	Cultural:	mile	$ -	$ 2,500/mile
	Biological:	mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the route variation: $ - **(See "Additional Impacts" above)**

9
Originator: PHMSA
Date: 5/26/2011

10
Received by:
Date: 5/26/2011
Fax to: ?

11
Assigned Tracking Number: 0198-XX-P2-XXX.X-XXX.X-S

12
Filed by:
Date:
Fax to: ?

Keystone - Phase IV - US Steele City segment

0198-XX-P2-XXX.X-XXX.X-S - Valve addition and relocation for PHMSA Condition 32
Prepared: 05/27/2011 based on 11/18/2010 issued Centerline

Keystone Phase IV, US - Supplemental Information for Route Variation Report 0198

Prepared: 2011-05-26

Number	Status	Previous Scenario		New Scenario including PHMSA Condition 32		Relocated Distance (miles)	Upstream distance to next motorised valve or PS (miles)	Downstream distance to next motorised valve or PS (miles)	Spread	Previous Scenario	New Scenario including PHMSA Condition 32	County	State	Previous Scenario			New Scenario including PHMSA Condition 32			Tag (Motor operated valve)	Tag (Check valve)	Tag (Manual valve)	Closest Road	Side	Previous Scenario		New Scenario including PHMSA Condition 32		Engineering Approval/Comments	Environmental Approval/Comments	Required building setback from edge of ROW of road (ft)	Distance from Road ROW/FENCE to valve (whichever greater) (ft)	Distance from CL of Road to valve (ft)	Concerns/Action items.
		Milepost	Valve ID	Milepost	Valve ID					Type	Type			Legal	Latitude	Longitude	Legal	Latitude	Longitude						Tract Number	Owner	Tract Number	Owner						
1		20.3	MLV-01	20.3	MLV-01	0.0	19.0	20.1	1	MOV	MOV	Phillips	Montana	28-35N-34E	48° 46' 13.323" N	107° 17' 3.355" W	28-35N-34E	48° 46' 13.323" N	107° 17' 3.355" W	260-PHLPS-01A-BD-MLV-01			PERMANENT ACCESS ROAD	DOWNSTREAM	MS-MT-PH-00185.000	DEPUYDT FARMS, INC., ESTATE OF YEARS	MS-MT-PH-00185.000	DEPUYDT FARMS, INC., ESTATE OF YEARS	Approved by field visit		NONE	NA	60	
2		28.1	CK-MLV-02	28.1	CK-MLV-02	0.0			1	CHECK AND MANUAL	CHECK AND MANUAL	Valley	Montana	17-34N-35E	48° 42' 5.238" N	107° 9' 46.618" W	17-34N-35E	48° 42' 5.308" N	107° 9' 46.883" W		260-PHLPS-02A-BD-CKV-01	260-PHLPS-02A-BD-MLV-01	GENEVIEVE ROAD	UPSTREAM	MS-MT-VA-00050.000	ALEX B. MOGAN, JR. TRUST	MS-MT-VA-00050.000	ALEX B. MOGAN, JR. TRUST	Approved by field visit		NONE	100	148	
3	New			40.1	MLV-02		20.1	9.0	1		MOV	Valley	Montana				35-33N-36E	48° 34' 37.515" N	106° 58' 47.914" W				Rock Creek Road	UPSTREAM			MS-MT-VA-00200.000	DARREL & RHONDA BERGTOLL	Approved by field visit		NONE	60	93	Terrain feature upstream of valve
4		63.6	MLV-03	63.6	MLV-03	0.0	14.3	17.7	1a	MOV	MOV	Valley	Montana	28-30N-39E	48° 19' 48.716" N	106° 39' 1.919" W	28-30N-39E	48° 19' 48.749" N	106° 39' 2.047" W	260-VLLEY-01A-BD-MLV-01			JENSEN TRL	UPSTREAM	MS-MT-VA-00480.000	R. J. WINDERL	MS-MT-VA-00480.000	R. J. WINDERL	Approved by field visit		NONE	100	140	
5		71.8	CK-MLV-04	71.8	CK-MLV-04	0.0			1a	CHECK AND MANUAL	CHECK AND MANUAL	Valley	Montana	28-29N-40E	48° 14' 52.003" N	106° 31' 58.225" W	28-29N-40E	48° 14' 52.021" N	106° 31' 58.230" W		260-VLLEY-02A-BD-CKV-01	260-VLLEY-02A-BD-MLV-01	E HANSON ROAD	DOWNSTREAM	MS-MT-VA-00620.000	DONALD FAST	MS-MT-VA-00620.000	DONALD FAST	Approved by field visit		NONE	100	135	
6		81.3	MLV-05	81.3	MLV-05	0.0	17.7	17.0	1a	MOV	MOV	Valley	Montana	26-28N-41E	48° 9' 9.465" N	106° 22' 36.504" W	26-28N-41E	48° 9' 8.794" N	106° 22' 32.830" W	260-VLLEY-03A-BD-MLV-01			OLD SMOKEY RD	DOWNSTREAM	MS-MT-VA-00745.000	RICHARD E. & LORI L. VISTE	MS-MT-VA-00745.000	RICHARD E. & LORI L. VISTE	Approved by field visit and desktop		NONE	100	133	Moved downstream of road due to PI at the North, sharp PI to downstream of valve.
7		83.9	CK-MLV-06	83.9	CK-MLV-06	0.0			1a	CHECK AND MANUAL	CHECK AND MANUAL	Valley	Montana	12-27N-41E	48° 7' 1.129" N	106° 22' 54.426" W	12-27N-41E	48° 7' 1.073" N	106° 22' 54.344" W		260-VLLEY-04A-BD-CKV-01	260-VLLEY-04A-BD-MLV-01	SR 117	DOWNSTREAM	MS-MT-VA-00830.000	JOHN H. & LINDA K. BELLON	MS-MT-VA-00830.000	JOHN H. & LINDA K. BELLON	At road intersection, needs further review		NONE	100	133	The valve is placed at an intersection, permanent approach to this valve seems difficult and may need relocation.
8		91.1	CK-MLV-07	91.1	CK-MLV-07	0.0			1a	CHECK AND MANUAL	CHECK AND MANUAL	McCone	Montana	9-26N-42E	48° 1' 43.623" N	106° 18' 25.462" W	9-26N-42E	48° 1' 43.623" N	106° 18' 25.462" W		260-VLLEY-05A-BD-CKV-01	260-VLLEY-05A-BD-MLV-01	FORT PECK TOWER HILL ROAD	UPSTREAM	MS-MT-MC-00020.000	USDI BUREAU OF LAND MANAGEMENT	MS-MT-MC-00020.000	USDI BUREAU OF LAND MANAGEMENT	Approved by field visit		NONE	Private drive	150	Approved during field visit with MDEQ.
9	Relocated	123.5	MLV-08	117.7	MLV-08	-5.8	19.3	16.6	1a	MOV	MOV	McCone	Montana	7-22N-46E	47° 41' 14.416" N	105° 52' 33.593" W	16-23N-45E	47° 45' 0.015" N	105° 57' 22.667" W				PERMANENT ACCESS ROAD	UPSTREAM	MS-MT-MC-00355.000	ARNSTON RANCH, INC.	MS-MT-MC-00280.000	STATE OF MONTANA	Approved based on desktop		NONE	NA	100	Limited Access, ~4 miles access road to valve site.
10	New			134.3	MLV-08A		16.6	16.4	2		MOV	McCone	Montana				8-21N-47E	47° 35' 16.184" N	105° 42' 26.741" W				Spring Creek Road	UPSTREAM			MS-MT-MC-20465.000	SYLVIA & HANZ HAYNIE	Approved by field visit and desktop		NONE	247	287	Access road, approx. 500 ft from intersection may be required.
11	New			170.9	MLV-08B		20.2	7.9	2		MOV	McCone	Montana				31-17N-51E	47° 10' 54.842" N	105° 15' 47.259" W				SLR	UPSTREAM			MS-MT-VA-00125.000	LYLE ALVEN ANDERSON - DOROTHY D. ANDERSON LIFE ESTATE	Approved based on desktop		UNKNOWN	100	133	Falls on MTV-9 location.
12		178.8	MLV-09	178.9	MLV-09	0.0	7.9	16.6	2	MOV	MOV	Dawson	Montana	5-15N-52E	47° 5' 33.756" N	105° 9' 51.484" W	5-15N-52E	47° 5' 33.578" N	105° 9' 51.305" W	260-CRCLE-01A-BD-MLV-01			2 SB RD	DOWNSTREAM	MS-MT-DA-00250.000	LILES KENNETH, INC.	MS-MT-DA-00250.000	LILES KENNETH, INC.	Approved by field visit		UNKNOWN	100	138	Falls on MTV-9 location.
13		195.3	MLV-10	195.5	MLV-10	0.2	16.6	6.6	3	MOV	MOV	Dawson	Montana	11-13N-53E	46° 53' 57.144" N	104° 59' 4.402" W	11-13N-53E	46° 53' 48.732" N	104° 58' 56.774" W	260-CRCLE-02A-BD-MLV-01			ROAD 245	DOWNSTREAM	MS-MT-DA-00403.000	DORIS FROST	MS-MT-DA-00405.000	SIEGLE, INC.	Approved based on desktop, needs further review.		UNKNOWN	69	102	Moved downstream (~960') due to have better approach to valve and to move away from wet spot. May require relocation.
14		202.1	CK-11	202.1	CK-11	0.0			3	CHECK (IN PS-13 YARD)	CHECK (IN PS-13 YARD)	Prairie	Montana	33-13N-54E	46° 50' 11.032" N	104° 53' 20.440" W	33-13N-54E	46° 50' 11.032" N	104° 53' 20.440" W		154-PRAIR-80-CKV-0102		MARSH ROAD	DOWNSTREAM	MS-MT-PR-00050.000	FREDA R. HAJDLE	MS-MT-PR-00050.000	FREDA R. HAJDLE	NA		NONE	NA	NA	
15	Relocated	228.6	MLV-12	220.5	MLV-12	-8.1	18.4	17.4	3	MOV	MOV	Fallon	Montana	9-9N-57E	46° 32' 55.016" N	104° 38' 18.349" W	3-10N-58E	46° 38' 41.209" N	104° 58.870" W				Westmoore Road	UPSTREAM	MS-MT-FA-00140.000	ROBERT R. & ALVIN R. WENZ	MS-MT-FA-00010.000	BICKLE CATTLE COMPANY	Approved by field visit		NONE	100	145	
16		245.9	MLV-13	245.9	MLV-13	0.0	7.9	20.5	4	MOV	MOV	Fallon	Montana	9-7N-59E	46° 22' 6.676" N	104° 19' 55.358" W	9-7N-59E	46° 22' 6.986" N	104° 19' 55.362" W	260-FALLN-01A-BD-MLV-01			US HWY 12	UPSTREAM	MS-MT-FA-00410.000	AUDELL SCHNEIDER ESTES	MS-MT-FA-00410.000	AUDELLE SCHNEIDER ESTES	Approved by field visit		NONE	100	211	Approach from Hwy 12 to valve to be reviewed.
17		266.4	MLV-14	266.4	MLV-14	0.0	20.5	20.7	4	MOV	MOV	Fallon	Montana	8-4N-61E	46° 6' 47.265" N	104° 10' 15.304" W	8-4N-61E	46° 6' 47.485" N	104° 10' 15.336" W	260-FALLN-02A-BD-MLV-01			LITTLE BEAVER ROAD	UPSTREAM	MS-MT-FA-00710.000	LEWELL & BETTY JOHNSON	MS-MT-FA-00710.000	LEWELL & BETTY JOHNSON	Approved by field visit		NONE	100	148	
18		289.6	MLV-15	289.6	MLV-15	0.0	10.6	4	MOV	Harding	South Dakota	26-22N-15	45° 50' 38.251" N	103° 57' 19.413" W	26-22N-15	45° 50' 38.359" N	103° 57' 23.380" W	260-HRDNG-01A-BD-MLV-01			N CAMP CROOK / ROAD-867	UPSTREAM	MS-SD-HA-00210.000	GARY R. AND CAROL JEAN TENNANT	MS-SD-HA-00210.000	GARY R. AND CAROL JEAN TENNANT	Approved by field visit		NONE	100	193	
19		300.2	CK-MLV-16	300.2	CK-MLV-16	0.0	10.6	18.0	4a	CHECK AND MANUAL	CHECK AND MOV	Harding	South Dakota	20-21N-3E	45° 46' 5.081" N	103° 46' 11.496" W	20-21N-3E	45° 46' 5.097" N	103° 46' 11.687" W		260-HRDNG-02A-BD-CKV-01	260-HRDNG-02A-BD-MLV-01	BULLOCK ROAD / ROAD-733	UPSTREAM	MS-SD-HA-00790.000	PAINTERS INC	MS-SD-HA-00790.000	PAINTERS INC	Approved by field visit		NONE	100	143	PI on upstream ~40' away.
20	New			318.2	MLV-16A		18.0	17.5	4a		MOV	Harding	South Dakota				21-19N-5E	45° 36' 2.968" N	103° 31' 24.682" W				Lyons Road	DOWNSTREAM			MS-SD-HA-01770.000	DOGUTTLE WAGNER RANCH LLC C/O JAMES DOGUTTLE	Approved by field visit		NONE	75	116	Valve is closer to Lyons road (within setback req.) due to field road and terrain drop off downstream of valve.
21	New			352.3	MLV-16B		16.6	19.9	5		MOV	Harding	South Dakota				24-15N-8E	45° 15' 19.521" N	103° 4' 56.230" W				MARTY ROAD	DOWNSTREAM			MS-SD-HA-03420.000	STATE OF SOUTH DAKOTA	Approved by field visit and video		NONE	100	135	Moved to State of South Dakota land. South of Marty road to avoid long access road.
22	Relocated	364.1	MLV-17	372.2	MLV-17	8.1	19.9	17.6	5	MOV	MOV	Perkins	South Dakota	28-14N-10E	45° 8' 27.637" N	102° 54' 13.740" W	28-13N-11E	45° 3' 35.914" N	102° 47' 10.187" W				PERMANENT ACCESS ROAD	NA	MS-SD-PE-00120.000	CLYDE & LORRETTA HAFNER	MS-SD-PE-00380.000	STATE OF SOUTH DAKOTA	Approved by video		UNKNOWN	NA	75	Access road to valve ~11,000 ft, off 165th Ave.
23	New			407.3	MLV-17A		17.5	15.6	5		MOV	Meade	South Dakota				28-9N-15E	44° 42' 17.326" N	102° 18' 19.647" W				RED OWL ROAD	UPSTREAM			MS-SD-ME-00740.000	SCHULTES FAMILY LTD PARTNERSHIP	Approved by field visit		NONE	8' side/25'T-B	141	
24	Relocated	418.0	MLV-18	422.8	MLV-18	4.8	15.6	19.8	5	MOV	MOV	Meade	South Dakota	35-8N-16E	44° 36' 17.249" N	102° 8' 38.204" W	21-7N-17E	44° 33' 14.671" N	102° 4' 50.936" W				PERMANENT ACCESS ROAD	NA	MS-SD-ME-11040.000	FREDA WILSON, LIFE ESTATE, LINDA GRENZ, JENNIFER SILBAUGH	MS-SD-ME-01170.000	WINK CATTLE CO	Desktop analysis, needs further review.		8' side/25'T-B	NA	NA	Limited access to valve, requires field visit
25		434.1	CK-MLV-19	434.1	CK-MLV-19	0.0			5	CHECK AND MANUAL	CHECK AND MANUAL	Haakon	South Dakota	14-6N-18E	44° 28' 26.039" N	101° 54' 20.517" W	14-6N-18E	44° 28' 26.173" N	101° 54' 20.546" W		260-FAITH-02A-BD-CKV-01	260-FAITH-02A-BD-MLV-01	202ND STREET	UPSTREAM	MS-SD-HK-00170.000	KELLY BLAIR	MS-SD-HK-00170.000	KELLY BLAIR	Approved by field visit		UNKNOWN	100	139	
26	New			460.1	MLV-19A		17.5	18.2	6		MOV	Haakon	South Dakota				18-3N-21E	44° 13' 26.982" N	101° 31' 34.925" W				Tornado Ranch Road	DOWNSTREAM			MS-SD-HK-01070.000	RAMONA BUCHHOLZ	Approved by field visit		NONE	100	138	
27	Relocated	473.0	MLV-20	478.3	MLV-20	5.3	18.2	20.2	6	MOV	MOV	Haakon	South Dakota	23-2N-23E	44° 7' 29.031" N	101° 18' 36.391" W	27-2N-24E	44° 6' 20.543" N	101° 12' 27.348" W				Dusty Ridge Road	UPSTREAM	MS-SD-HK-01445.000	EDWIN & BECKY HEEB	MS-SD-HK-11600.000	ROGER & EDNA DALE	Approved by field visit		UNKNOWN	100	138	
28	Relocated	522.5	MLV-21	515.7	MLV-21	-6.8	17.2	16.5	6	MOV	MOV	Jones	South Dakota	21-2S-31E	43° 51' 1.971" N	100° 25' 35.316" W	5-2S-30E	43° 53' 44.178" N	100° 32' 50.966" W				County Road 56	UPSTREAM	MS-SD-JO-10900.000	TED & DOUGLAS NIES	MS-SD-JO-10750.000	FRANK SEAMANS & SONS INC.	Approved by video		50'	100	133	
29	Relocated	537.5	MLV-22	532.1	MLV-22	-5.4	16.5	16.8	7	MOV	MOV	Lyman	South Dakota	17-103N-78W	43° 43' 30.906" N	100° 11' 27.296" W	26-104N-79W	43° 46' 56.311" N	100° 15' 34.045" W	260-MURDO-02A-BD-MLV-01			294th Street	UPSTREAM	MS-SD-LY-10160.000	DOUGLAS & LINDA PERRY	MS-SD-LY-10160.000	THOMAS LANDS LLC	Approved by field visit		UNKNOWN	100	138	
30	Relocated	571.5	MLV-23	566.5	MLV-23	-5.0	17.6	18.6	7	MOV	MOV	Tripp	South Dakota	17-98N-76W	43° 18' 49.055" N	99° 51' 4.990" W	25-99N-77W	43° 22' 17.439" N	99° 54' 31.857" W				278th Street	DOWNSTREAM	MS-SD-TR-11180.000	LEROY JELINEK & JOYCE JELINEK	MS-SD-TR-10960.000	ALBERT PEDERSON & VERNICE FARMS INC.	Approved by field visit		NONE	100	138	
31	New			585.1	MLV-23A		18.6	18.6	7		MOV	Tripp	South Dakota				3-96N-79W	43° 3' 17.370" N	99° 42' 0.292" W				293rd Street	UPSTREAM			MS-SD-TR-11630.000	LEE O. & JUDELL A. WEIDNER	Approved by field visit		NONE	100	146	
32		599.1	MLV-24	599.0	MLV-24	0.0	2.1	18.3	8	MOV	MOV	Keya Paha	Nebraska	22-35N-19W	42° 59' 50.255" N	99° 32' 10.299" W	22-35N-19W	42° 59' 51.394" N	99° 32' 10.895" W	260-COLOM-01A-BD-MLV-01			304TH STREET	DOWNSTREAM	MS-NE-KP-10005.000	ROBERT L. DIEKMANN	MS-NE-KP-10005.000	ROBERT L. DIEKMANN	Approved by field visit		75 FEET	100	132	
33		602.9	CK-MLV-25	602.9	CK-MLV-25	0.0			8	CHECK AND MANUAL	CHECK AND MANUAL	Keya Paha	Nebraska	1-34N-19W	42° 57' 8.469" N	99° 29' 37.677" W	1-34N-19W	42° 57' 8.439" N	99° 29' 37.567" W		260-COLOM-02A-BD-CKV-01	260-COLOM-02A-BD-MLV-01	COUNTY ROAD 1	UPSTREAM	MS-NE-KP-10050.000	JOHN DAVID BECK ETAL	MS-NE-KP-10050.000	JOHN DAVID BECK ETAL	Approved by field visit		75 FEET	100	133	
34		617.3	MLV-26	617.3	MLV-26	0.0	18.3	19.8	8	MOV	MOV	Keya Paha	Nebraska	27-33N-17W	42° 47' 50.291" N	99° 18' 46.162" W	27-33N-17W	42° 47' 50.408" N	99° 18' 46.281" W	260-COLOM-03A-BD-MLV-01			CR	UPSTREAM	MS-NE-KP-00405.000	HAUGEN LIVING TRUST, GLEN F. & EILEEN HAUGEN	MS-NE-KP-00405.000	HAUGEN LIVING TRUST, GLEN F. & EILEEN HAUGEN	Approved by field visit		75 FEET	100	133	
35		619.7	CK-MLV-27	619.7	CK-MLV-27	0.0			8	CHECK AND MANUAL	CHECK AND MANUAL	Rock	Nebraska	10-32N-17W	42° 45' 53.172" N	99° 18' 16.635" W	10-32N-17W	42° 45' 53.160" N	99° 18' 16.545" W		260-COLOM-04A-BD-CKV-01	260-COLOM-04A-BD-MLV-01	459TH AVENUE	DOWNSTREAM	MS-NE-RK-00035.000	BEULAH FOCKEN LIV REV TRUST	MS-NE-RK-00035.000	BEULAH FOCKEN LIV REV TRUST	75 FEET	100	133	
36		637.1	MLV-27A	637.1	MLV-27A	0.0	19.8	7.5	8	MOV	MOV	Holt	Nebraska	27-30N-16W	42° 32' 12.390" N	99° 10' 37.057" W	27-30N-16W	42° 32' 11.819" N	99° 10' 37.038" W	260-COLOM-05A-BD-MLV-01			877TH ROAD	UPSTREAM	MS-NE-HT-10175.000	NEAL A. & DEBORAH KRAMER	MS-NE-HT-10175.000	NEAL A. & DEBORAH KRAMER	Approved by field visit		100 FEET	125	158	
37		663.5	MLV-28	663.5	MLV-28	0.0	18.9	18.1	8	MOV	MOV	Holt	Nebraska	32-26N-14W	42° 11' 22.006" N	98° 58' 29.534" W	32-26N-14W	42° 11' 21.608" N	98° 58' 29.421" W	260-ATKNS-01A-BD-MLV-01			853RD ROAD	DOWNSTREAM	MS-NE-HT-00405.000	STANLEY & SANDRA THOMPSON	MS-NE-HT-00405.000	STANLEY & SANDRA THOMPSON	Approved by video		100 FEET	129	160	
38	New			681.6	MLV-28A		18.1	15.5	9		MOV	Garfield	Nebraska				12-23N-13W	41° 58' 58.088" N	98° 46' 6.102" W				PERMANENT ACCESS ROAD	NA			MS-NE-GR-00095.000	WARREN J. OLSON RANCH INC.	Approved by video desktop		25 FEET	NA	75	
39	Relocated	719.8	MLV-29	714.5	MLV-29	-5.3	17.5	20.5	9	MOV	MOV	Greeley	Nebraska	8-18N-9W	41° 52' 24.895" N	98° 22' 7.992" W	26-19N-10W	41° 35' 25.884" N	98° 26' 38.118" W				B12th Road	UPSTREAM	MS-NE-GY-00290.000	CHARLES R. AND DIANE K. MAHONY TRUSTEES	MS-NE-GY-00200.000	MARTENA B. BOVER, TRUSTEE - C/O DENNIS W. BJORKLUND	Approved by video desktop		20 FEET	60	88	
40	Relocated	738.7	MLV-30	735.1	MLV-30	-3.7	20.5	19.2	9	MOV	MOV	Nance	Nebraska	17-16N-7W	41° 21' 11.131" N	98° 8' 16.867" W	31-17N-7W	41° 24' 4.390" N	98° 9' 48.913" W				North 515th Street	DOWNSTREAM	MS-NE-NA-00230.000	EMIL A DUBAS TRUSTEE	MS-NE-NA-00150.000	GLORIA J. & LOUIS E. MYERS, JR.	Approved by video and desktop		50 FEET	50	83	Closer to road due to terrain feature downstream of valve.
41		749.5	CK-MLV-31	749.5	CK-MLV-31	0.0			9	CHECK AND MANUAL	CHECK AND MANUAL	Merrick	Nebraska	28-15N-6W	41° 14' 17.184" N	98° 0' 43.082" W	28-15N-6W	41° 14' 17.184" N	98° 0' 43.082" W		260-ERCSN-03A-BD-CKV-01	260-ERCSN-03A-BD-MLV-01	PERMANENT ACCESS ROAD	NA	MS-NE-MR-00090.000	BRANDES INC., EARL BRANDES AND EVAN BRANDES ARE POINT OF CONTACT	MS-NE-MR-00090.000	BRANDES INC., EARL BRANDES AND EVAN BRANDES ARE POINT OF CONTACT	Field approved and purchased		100 FEET	NA	1250	
42		767.1	CK-MLV-32	767.1	CK-MLV-32	0.0	12.9	7.3	10	CHECK AND MANUAL	CHECK AND MOV	Hamilton	Nebraska	1-12N-5W	41° 2' 3.739" N	97° 49' 35.980" W	1-12N-5W	41° 2' 3.713" N	97° 49' 35.818" W		260-CLCTY-01A-BD-CKV-01	260-CLCTY-01A-BD-MLV-01	Z ROAD	UPSTREAM	MS-NE-HM-00175.000	JOHN G GLAD ETAL	MS-NE-HM-00175.000	JOHN G GLAD ETAL	Approved by field visit		45 FEET	73	106	Crop land
43	Relocated	775.8	MLV-33	774.3	MLV-33	-1.5	7.3	18.2	10	MOV	MOV	York	Nebraska	12-11N-4W	40° 56' 8.113" N	97° 47' 50.078" W	3-11N-4W	40° 57' 0.048" N	97° 45' 1.610" W				Road E	UPSTREAM	MS-NE-YK-00225.000	LUELLA M PETTEY TRUSTEE & CAROL J MASON	MS-NE-YK-00185.000	THOMAS & ARTIS M. KIRKPATRICK	Approved by video desktop		30 FEET	58	92	Crop land
44		792.5	CK-MLV-34	792.6	CK-MLV-34	0.0	18.2	10.5	10	CHECK AND MANUAL	CHECK AND MOV	York	Nebraska	17-9N-2W	40° 44' 59.391" N	97° 34' 8.500" W	17-9N-2W	40° 44' 56.979" N	97° 34' 8.023" W		260-CLCTY-03A-BD-CKV-01	260-CLCTY-03A-BD-MLV-01	ROAD 450	DOWNSTREAM	MS-NE-YK-00655.000	DARREN CARL GROTZ	MS-NE-YK-00670.000		Approved by field visit and video		30 FEET	57	90	Crop land
45		823.1	MLV-35	823.1	MLV-35	0.0	20.1	16.8	10	MOV	MOV	Saline	Nebraska	7-5N-2E	40° 24' 31.714" N	97° 14' 40.189" W	7-5N-2E	40° 24' 30.649" N	97° 14' 39.565" W	260-EXETR-01A-BD-MLV-01			U ROAD	UPSTREAM	MS-NE-SA-00310.000	ERIC MILTON	MS-NE-SA-00310.000	ERIC MILTON			UNKNOWN	104	137	
46	New			839.9	MLV-35A		16.8	13.9	10		MOV	Jefferson	Nebraska				15-3N-3E	40° 13' 9.798" N	97° 4' 31.107" W				717th Road	UPSTREAM	MS-NE-JF-00295.000	DOUGLAS R. & SHARON J. SELLENRICK, TENANTS IN COMMON	Approved by video desktop		25 FEET	100	133	On terraced land.

Keystone Phase IV, US - Approval form for Route Variation Report 0198

Prepared: 2011-05-26

# on Suplemental Info Table:		New (#3)	Relocated (#9)	New (#10)	New (#11)	Relocated (#15)	New (#20)	New (#21)	Relocated (#22)	New (#23)	Relocated (#24)	New (#26)
RV ID		**MLV-02A**	**MLV-08**	**MLV-08A**	**MLV-08B**	**MLV-12**	**MLV-16A**	**MLV-16B**	**MLV-17**	**MLV-17A**	**MLV-18**	**MLV-19A**
LAND (UFS) Doug Riechley	Approval (Y/N)											
	Comments											
ENGINEERING (TransCanada) Meera Kothari / David Guien	Approval (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Comments	Approved by field visit	Approved based on desktop	Approved by field visit and desktop	Approved based on desktop	Approved by field visit	Approved by field visit	Approved by field visit and video	Approved by video	Approved by field visit	Desktop anaylsis, needs further review.	Approved by field visit
ENGINEERING (exp) Butch Wallace	Approval (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Comments	Approved by field visit	Approved based on desktop	Approved by field visit and desktop	Approved based on desktop	Approved by field visit	Approved by field visit	Approved by field visit and video	Approved by video	Approved by field visit	Desktop anaylsis, needs further review.	Approved by field visit
CONSTRUCTION (TransCanada) Bobby Curbow	Approval (Y/N)											
	Comments											
ENVIRONMENTAL (exp) Jonathan Minton	Approval (Y/N)											
	Comments											
SAFETY (exp.) Jason Mllenbruch	Approval (Y/N)											
	Comments											
FACILITIES (TransCanada) Sandra Gigovic	Approval (Y/N)											
	Comments											
PROJECT MANAGEMENT (TransCanada) Alan Lietz	Approval (Y/N)											
	Comments											
PROJECT MANAGEMENT (TransCanada) Steve Marr	Approval (Y/N)											
	Comments											

# on Suplemental Info Table:		Relocated (#27)	Relocated (#28)	Relocated (#29)	Relocated (#30)	New (#31)	New (#38)	Relocated (#39)	Relocated (#40)	Relocated (#43)	New (#46)	
RV ID		**MLV-20**	**MLV-21**	**MLV-22**	**MLV-23**	**MLV-23A**	**MLV-28A**	**MLV-29**	**MLV-30**	**MLV-33**	**MLV-35A**	
LAND (UFS) Doug Riechley	Approval (Y/N)											
	Comments											
ENGINEERING (TransCanada) Meera Kothari / David Guien	Approval (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Comments	Approved by field visit	Approved by video	Approved by field visit	Approved by field visit	Approved by field visit	Approved by video desktop	Approved by video desktop	Approved by video and desktop	Approved by video desktop	Approved by video desktop	
ENGINEERING (exp) Butch Wallace	Approval (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Comments	Approved by field visit	Approved by video	Approved by field visit	Approved by field visit	Approved by field visit	Approved by video desktop	Approved by video desktop	Approved by video and desktop	Approved by video desktop	Approved by video desktop	
CONSTRUCTION (TransCanada) Bobby Curbow	Approval (Y/N)											
	Comments											
ENVIRONMENTAL (exp) Jonathan Minton	Approval (Y/N)											
	Comments											
SAFETY (exp.) Jason Mllenbruch	Approval (Y/N)											
	Comments											
FACILITIES (TransCanada) Sandra Gigovic	Approval (Y/N)											
	Comments											
PROJECT MANAGEMENT (TransCanada) Alan Lietz	Approval (Y/N)											
	Comments											
PROJECT MANAGEMENT (TransCanada) Steve Marr	Approval (Y/N)											
	Comments											

VALVE SITE DIMENSION MAP *MLV-02A*

TransCanada
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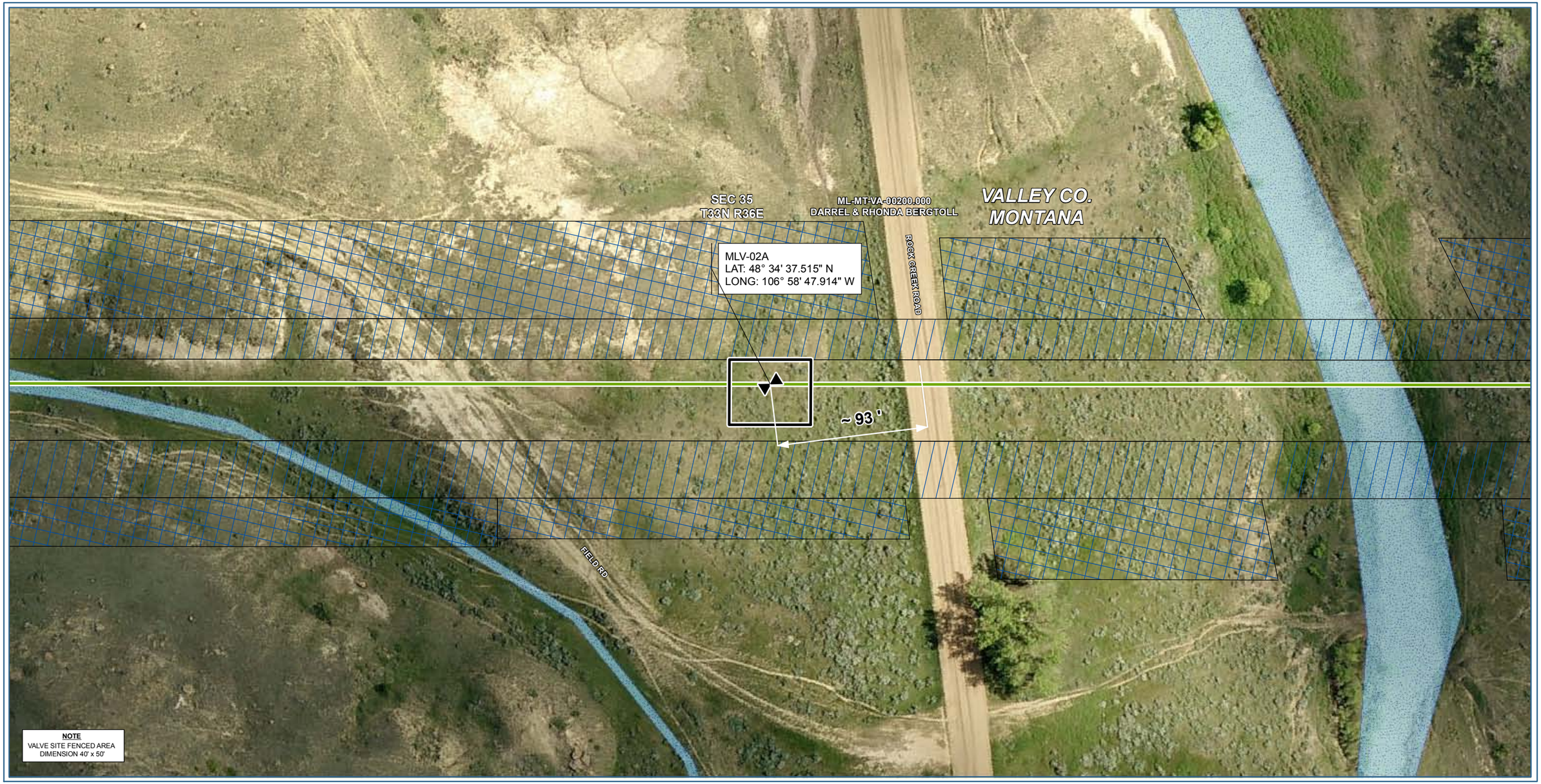

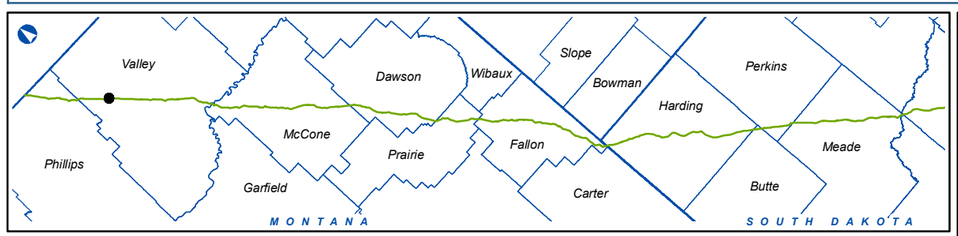

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-02A

COUNTY:	VALLEY	***DRAWN BY:***	PD
STATE:	MONTANA	***CHECKED BY:***	JP
SHEET:	3	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

PREPARED BY:

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VALVE SITE DIMENSION MAP *MLV-08*

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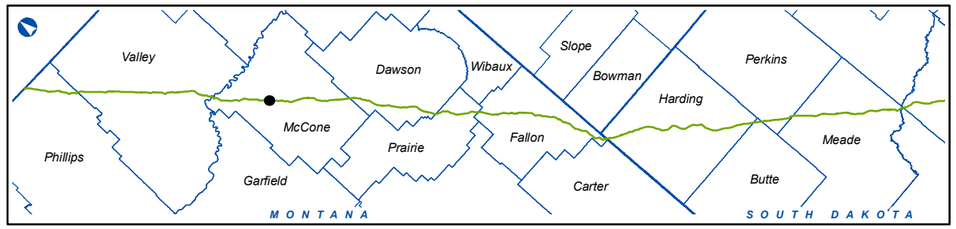

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-08

COUNTY:	MCCONE	***DRAWN BY:***	PD
STATE:	MONTANA	***CHECKED BY:***	JP
SHEET:	9	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

PREPARED BY:

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016506

VALVE SITE DIMENSION MAP *MLV-08A*

TransCanada
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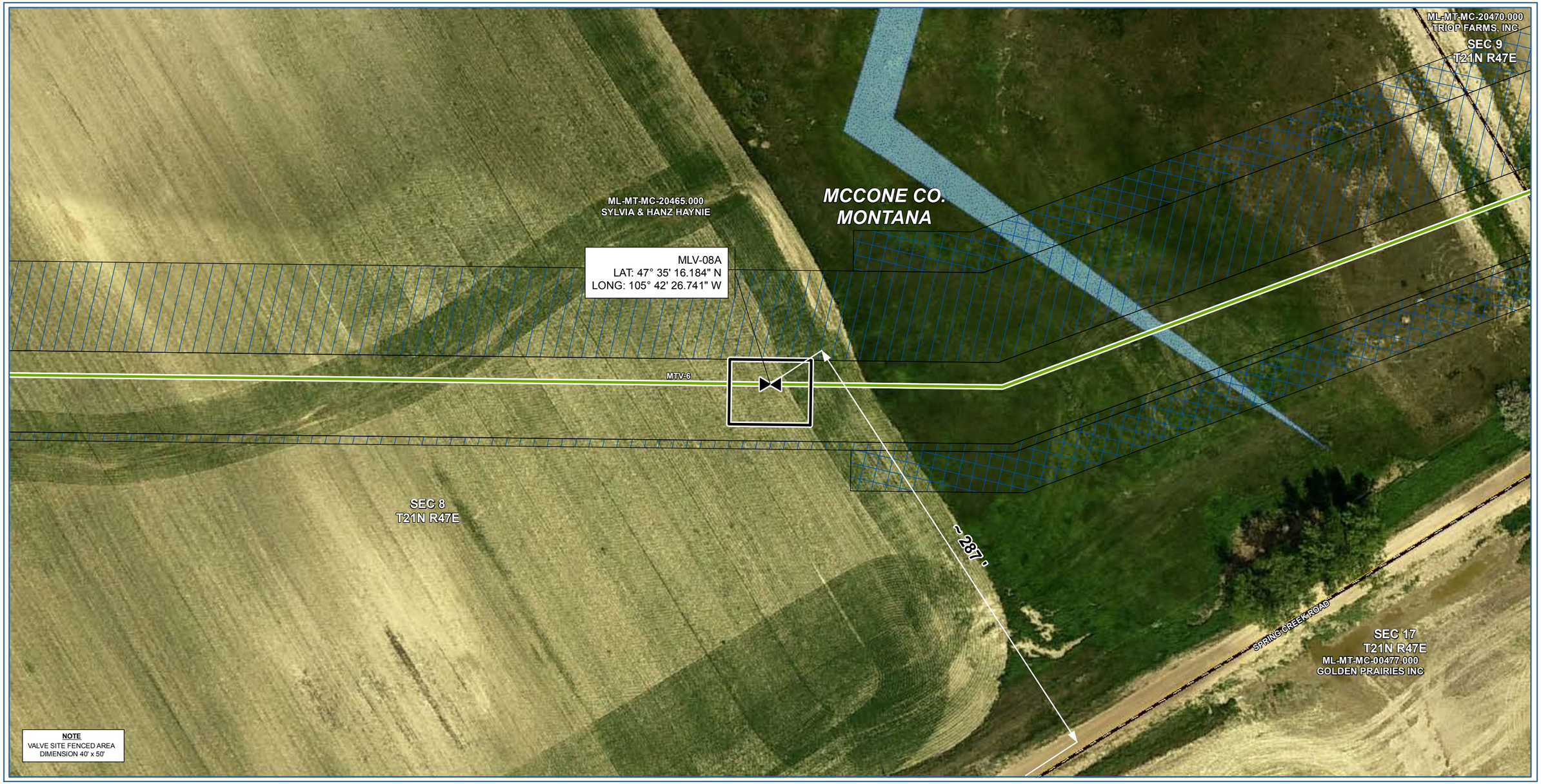

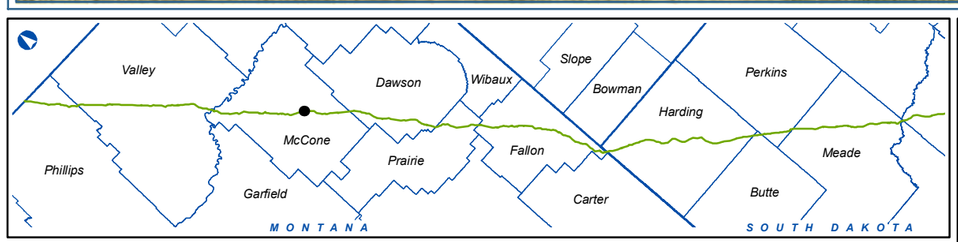

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-08A

COUNTY:	MCCONE	***DRAWN BY:***	PD
STATE:	MONTANA	***CHECKED BY:***	JP
SHEET:	10	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
PRELIMINARY			
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-08B*

TransCanada
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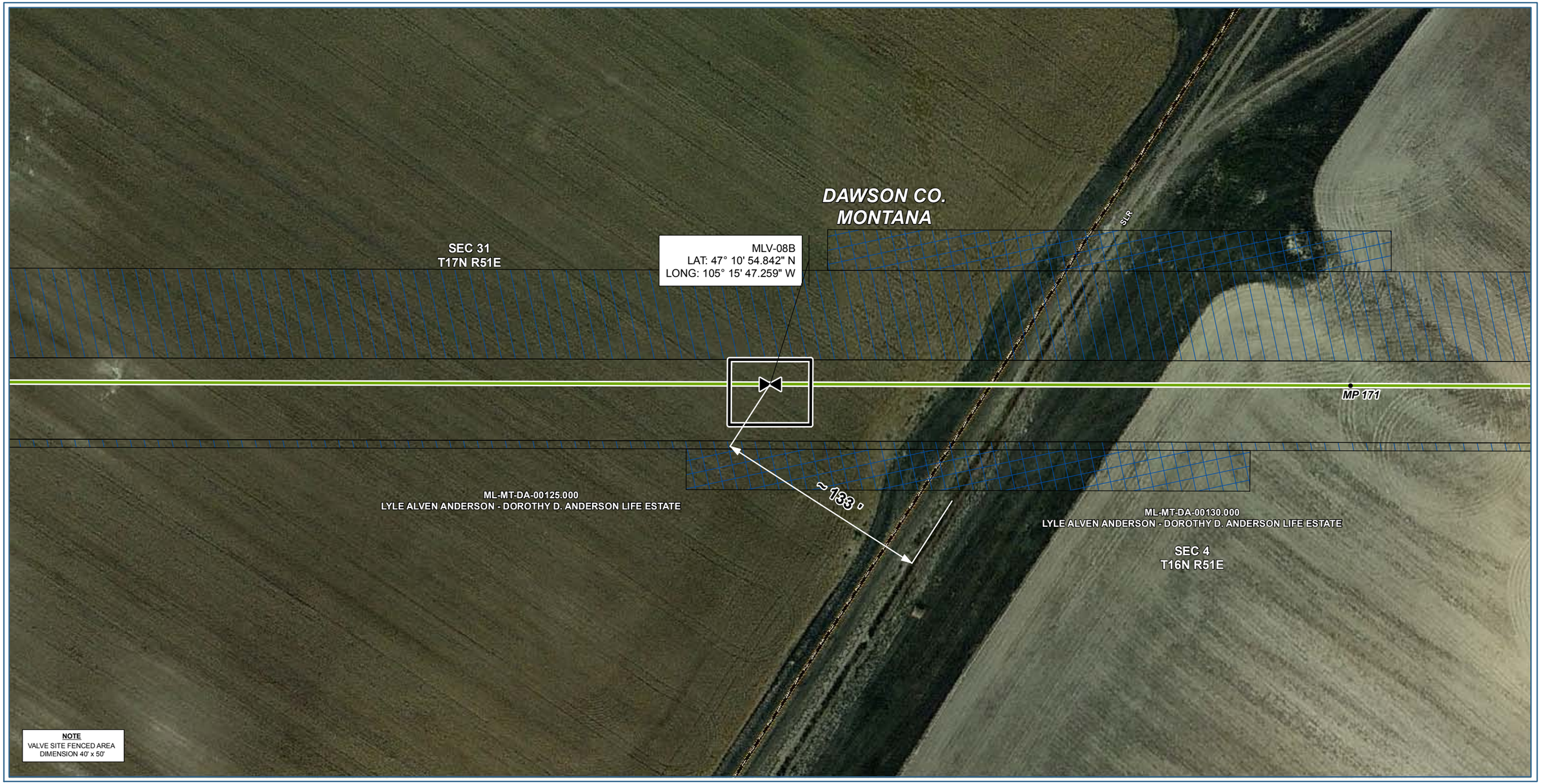

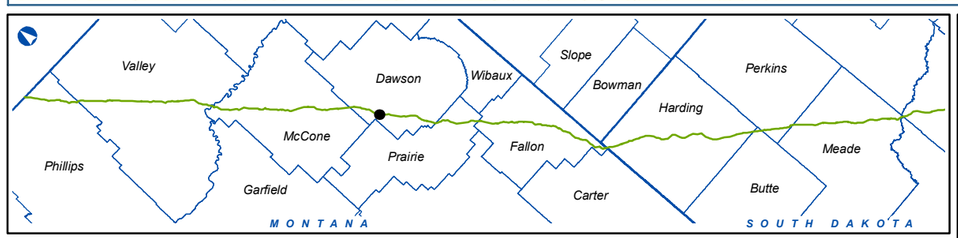

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-08B

COUNTY:	DAWSON	***DRAWN BY:***	PD
STATE:	MONTANA	***CHECKED BY:***	JP
SHEET:	11	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-12*

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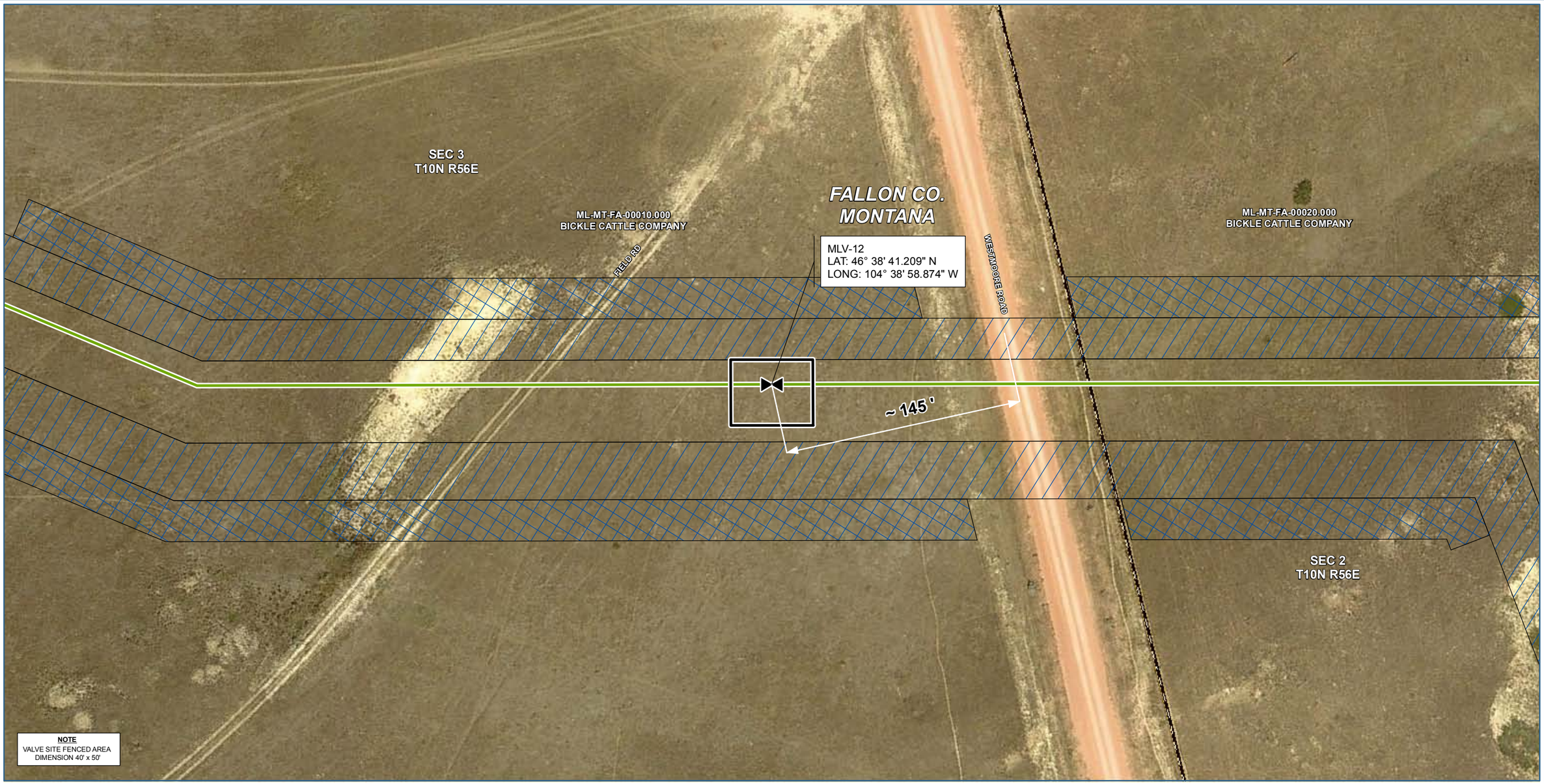

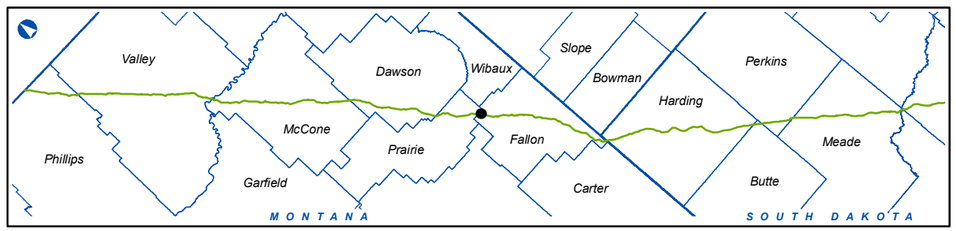

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-12

COUNTY:	FALLON	***DRAWN BY:***	PD
STATE:	MONTANA	***CHECKED BY:***	JP
SHEET:	14	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
PRELIMINARY			
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-16A*

TransCanada
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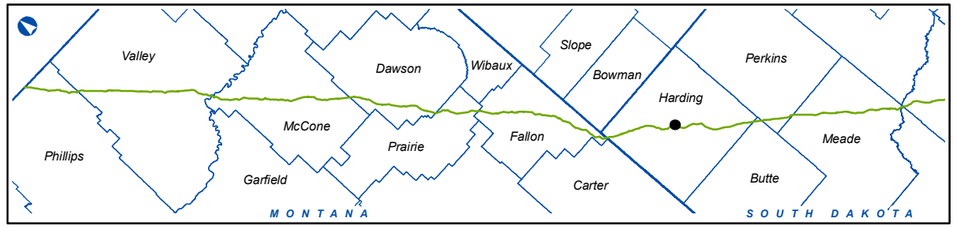

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-16A

COUNTY:	HARDING	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	19	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
	PRELIMINARY		
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-16B*

TransCanada
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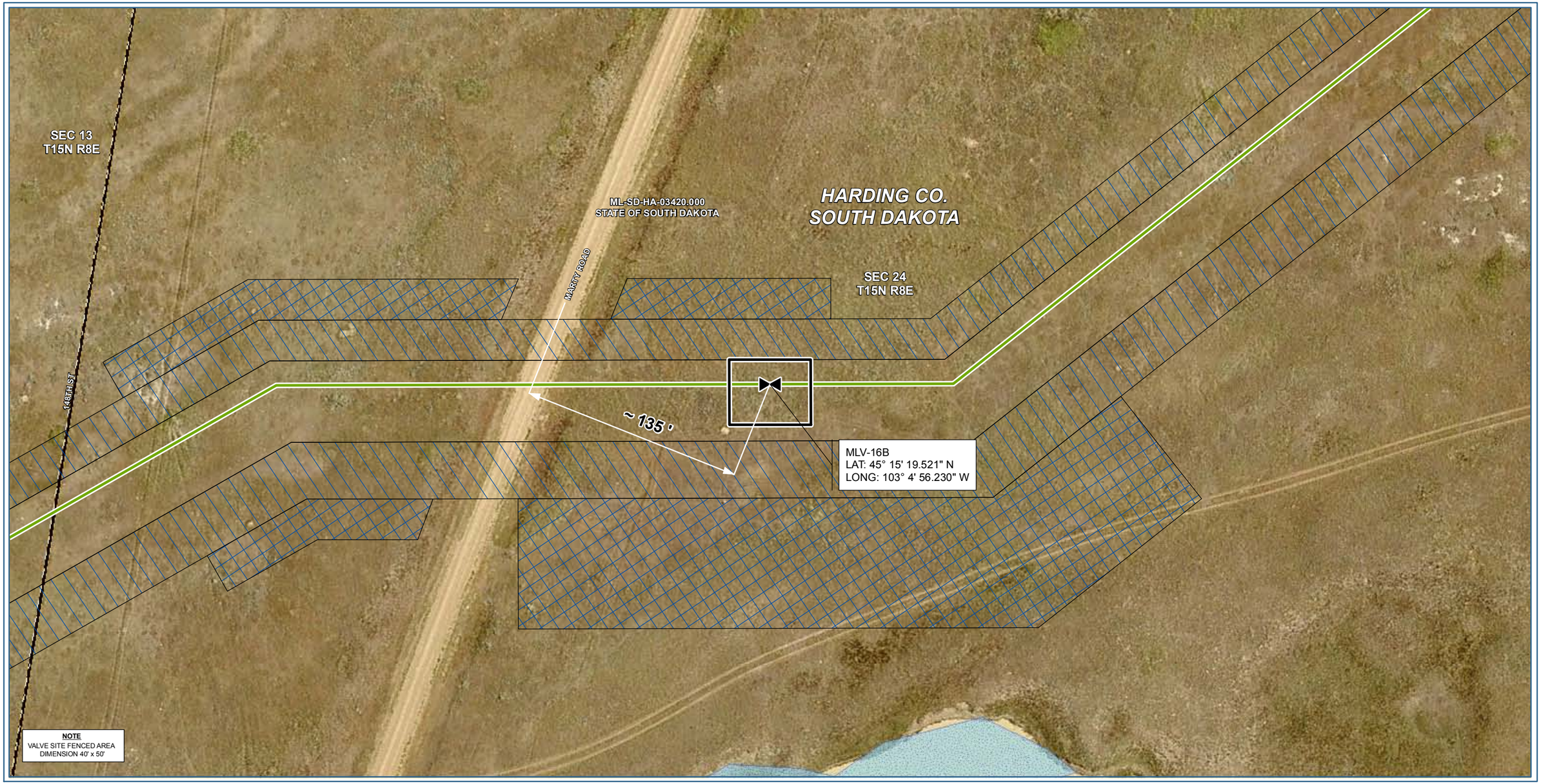

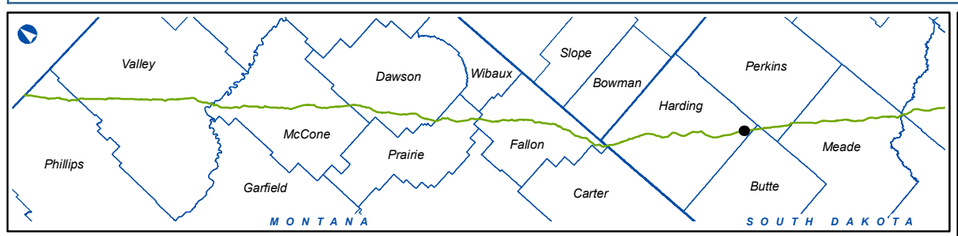

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-16B

COUNTY:	HARDING	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	44	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-17*

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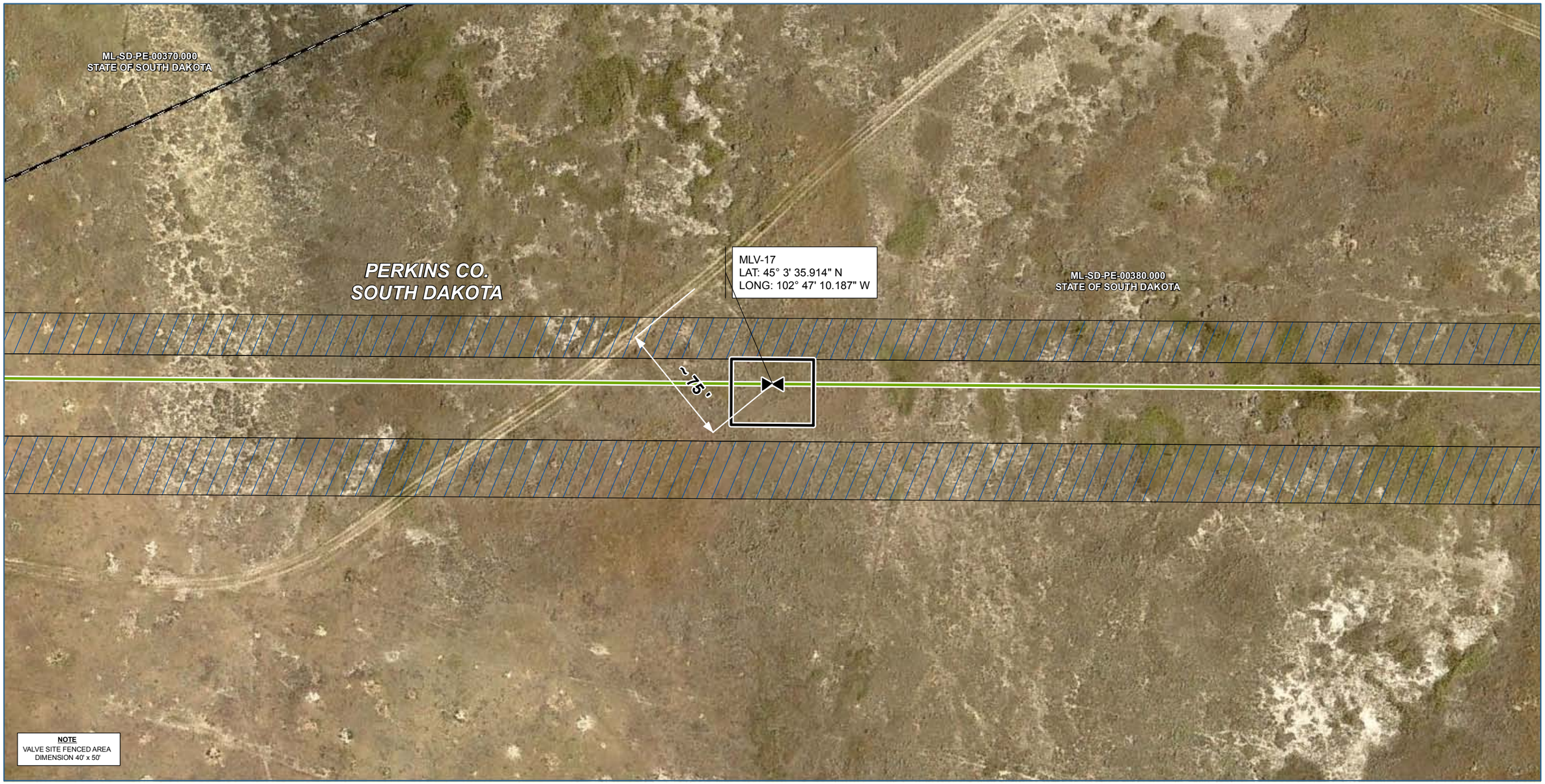

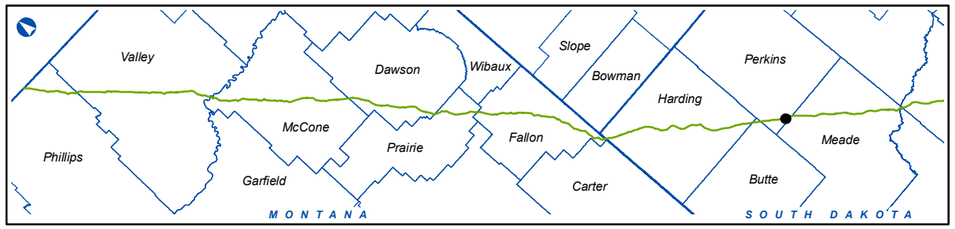

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
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- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-17

COUNTY:	PERKINS	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	20	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

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PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-17A*

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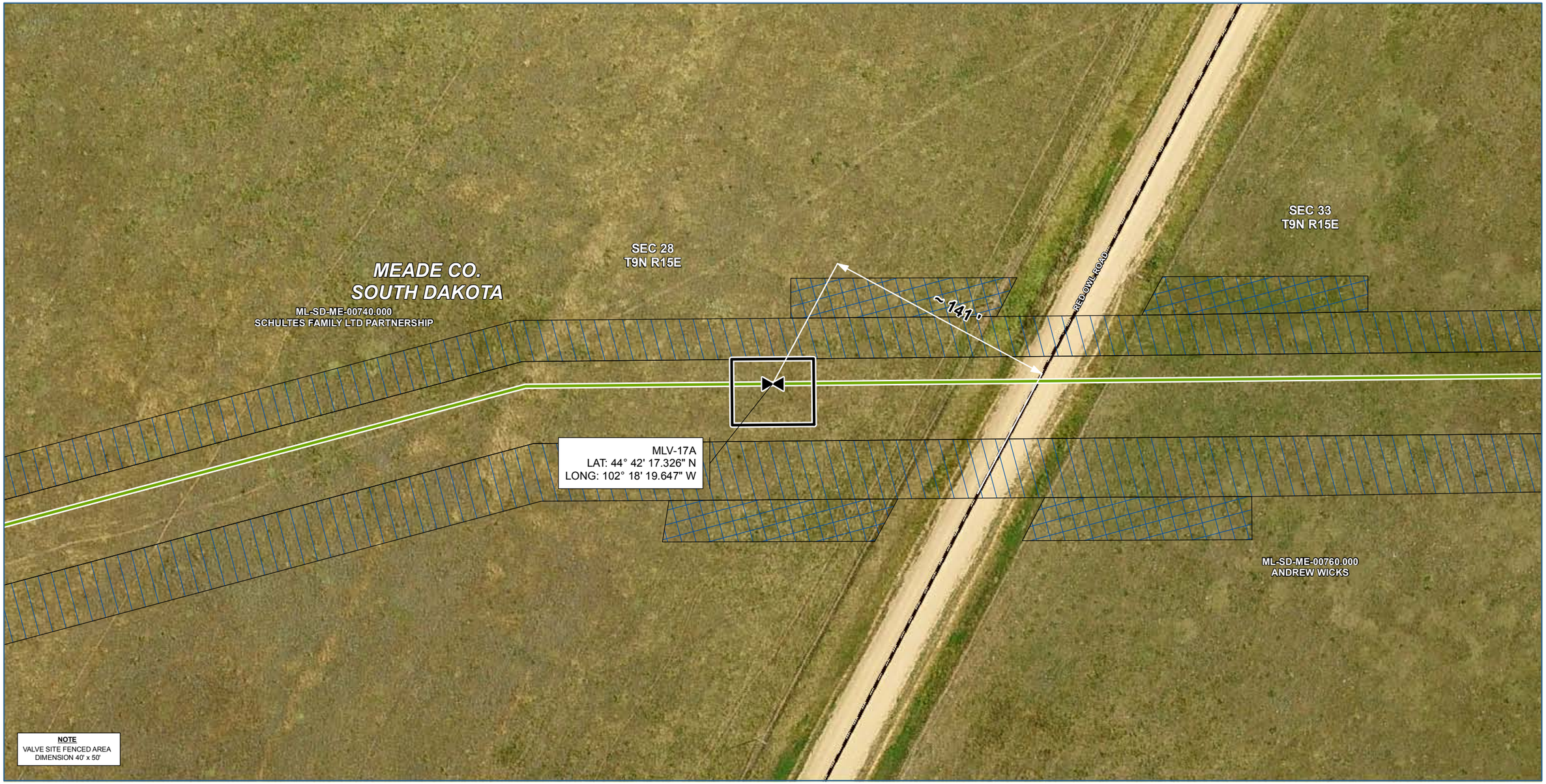

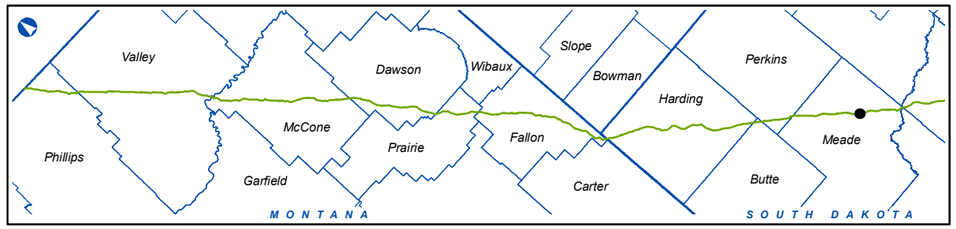

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-17A

COUNTY:	MEADE	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	45	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-18*

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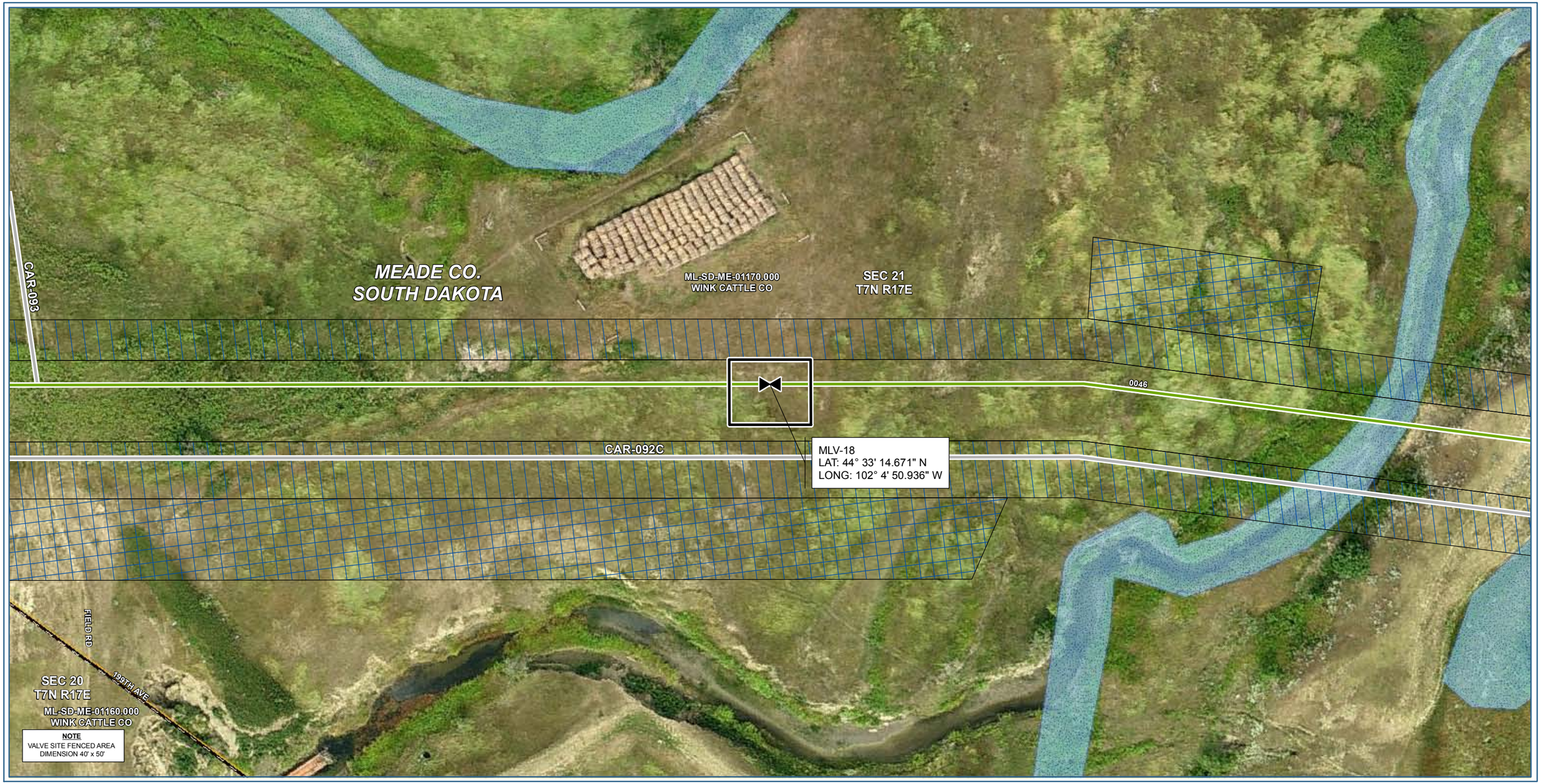

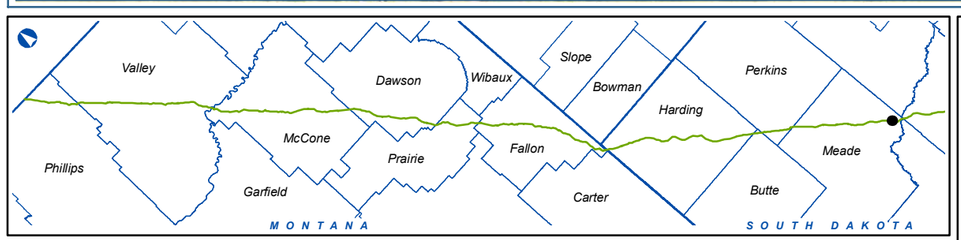

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-18

COUNTY:	MEADE	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP
SHEET:	21	**APPROVED BY:**	RG

REVISION		DATE
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	**DWG:**	XL-00-ML-9110
DATE:	2011-05-26	**REV. NO.:**	3

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VALVE SITE DIMENSION MAP *MLV-19A*

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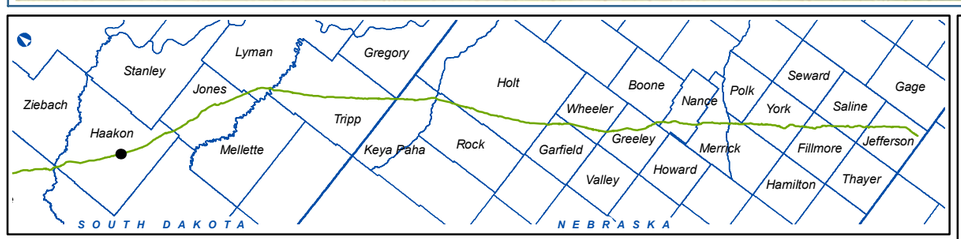

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-19A

COUNTY:	HAAKON	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	23	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
PRELIMINARY			
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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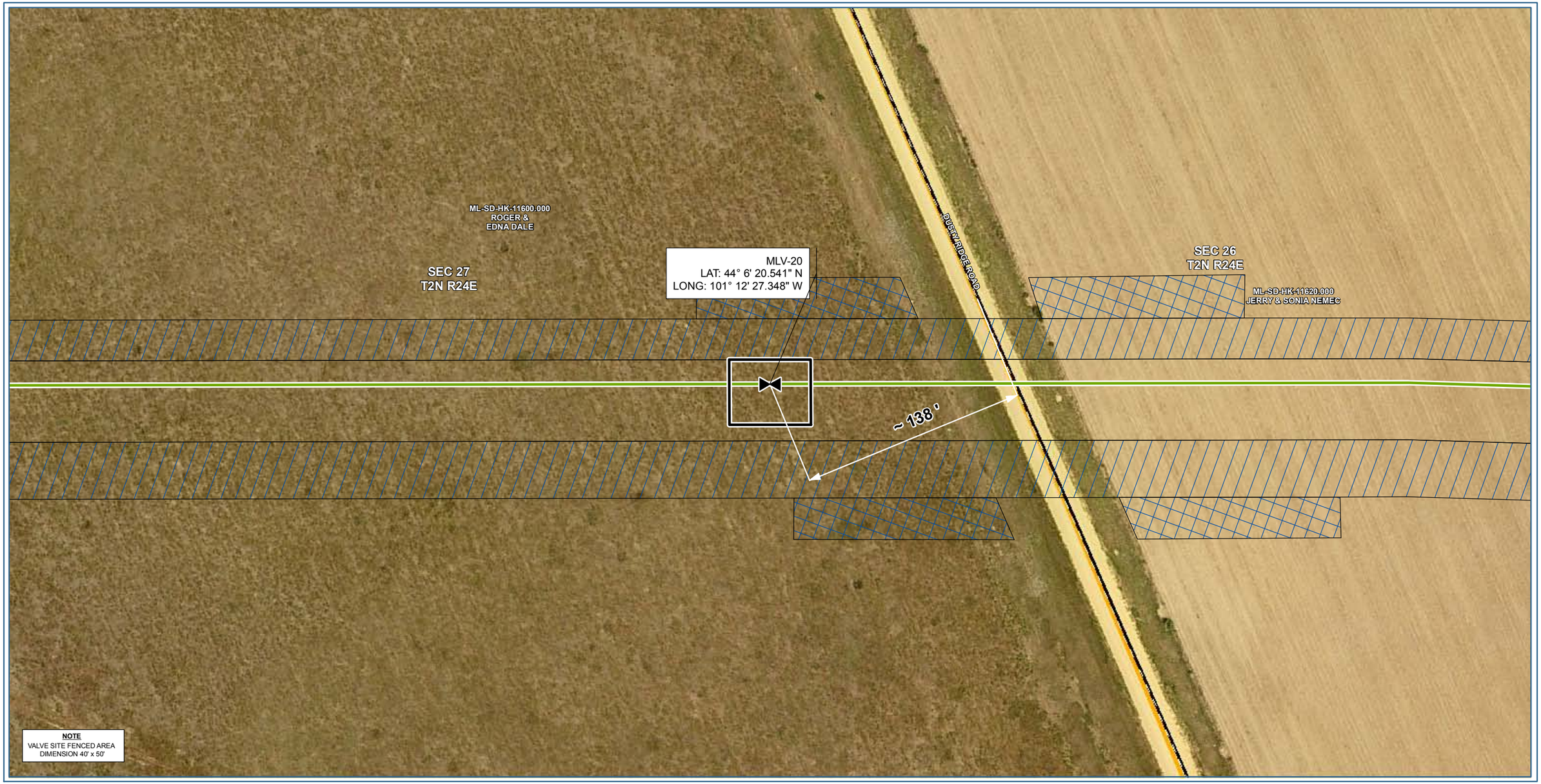
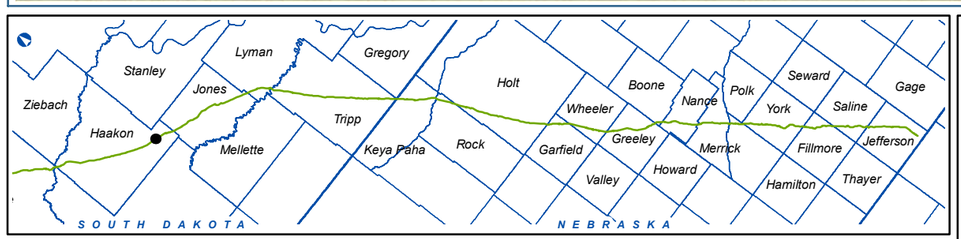
VALVE SITE DIMENSION MAP *MLV-20*

TransCanada
In business to deliver





Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-20

COUNTY:	HAAKON	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	24	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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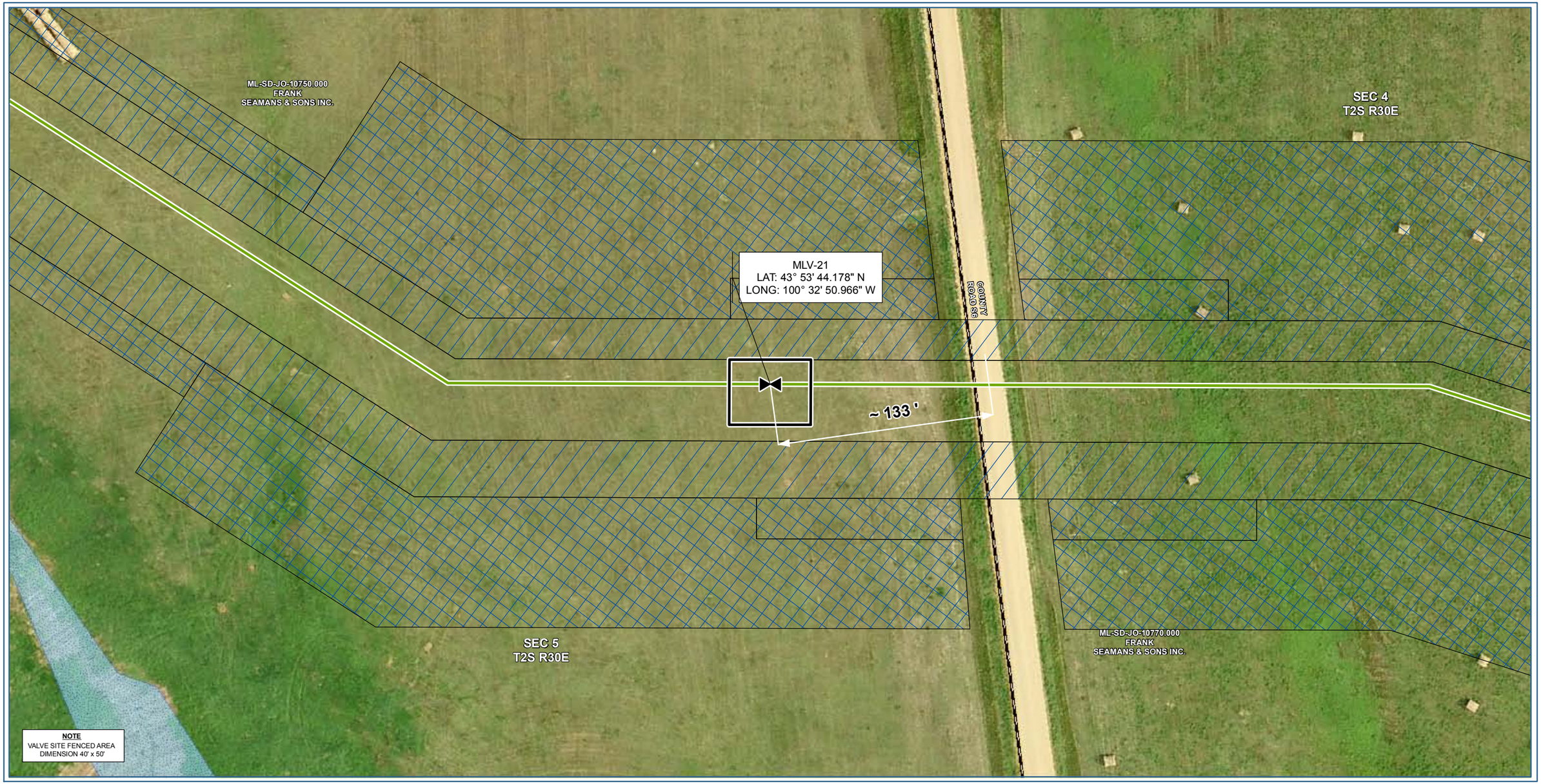
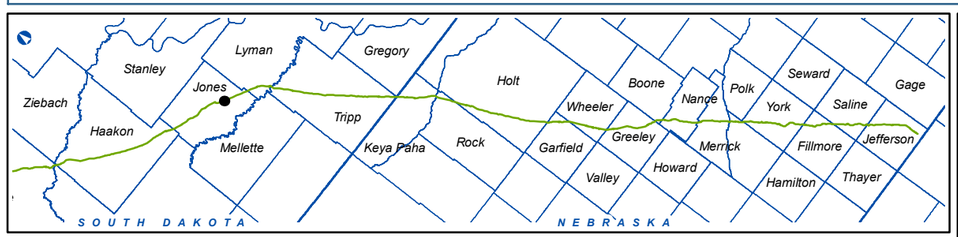
VALVE SITE DIMENSION MAP *MLV-21*

TransCanada
In business to deliver





Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-21

COUNTY:	JONES	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	25	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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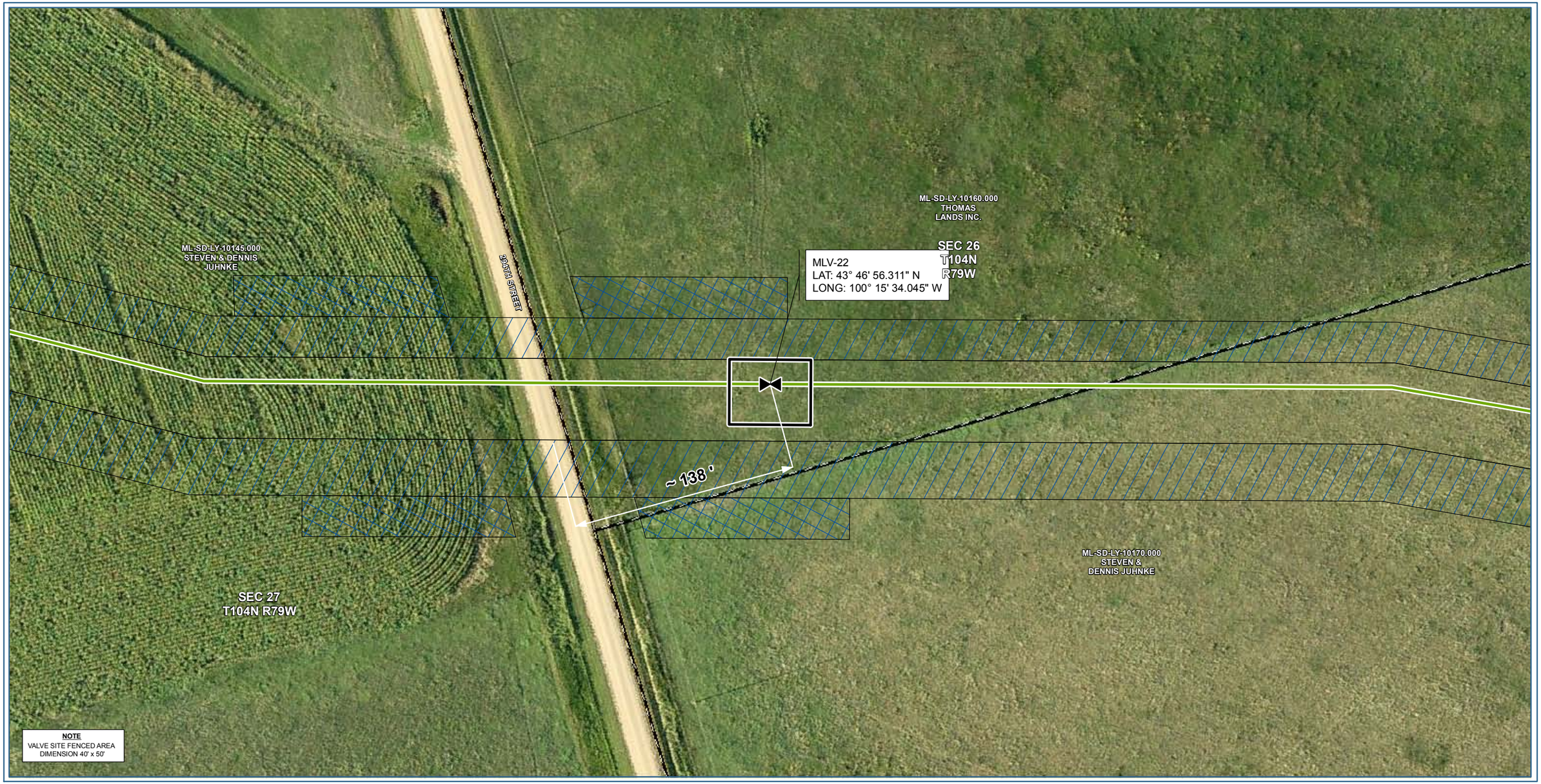
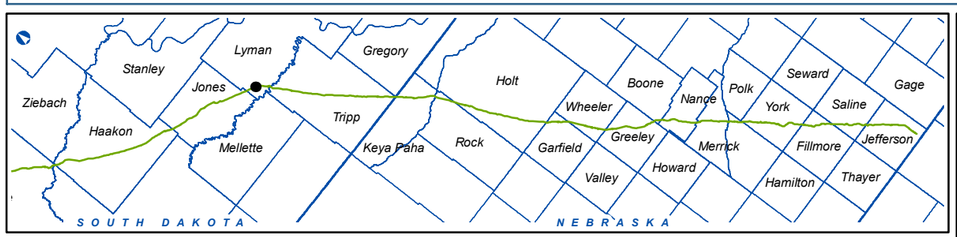
VALVE SITE DIMENSION MAP *MLV-22*

TransCanada
In business to deliver





Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-22

COUNTY:	LYMAN	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	26	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
	PRELIMINARY		
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-23*

TransCanada
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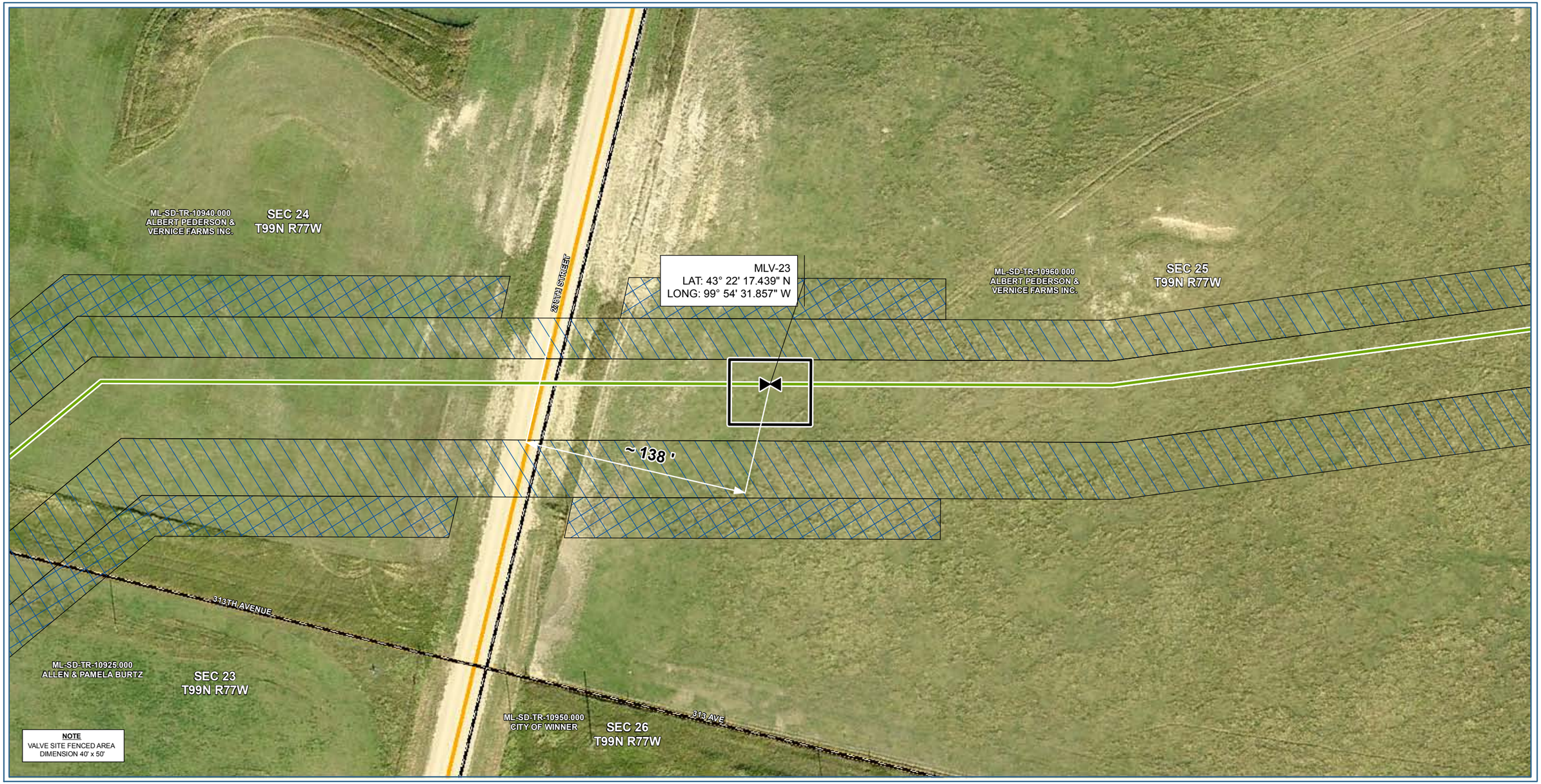

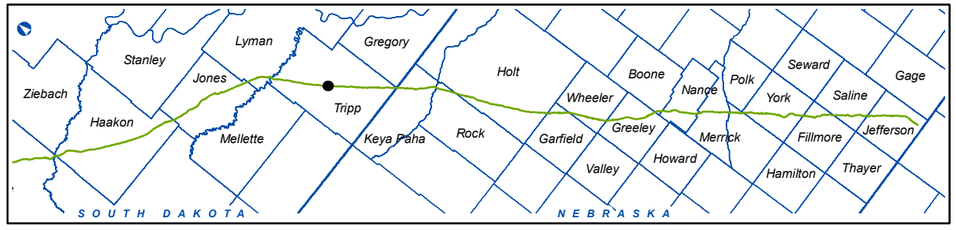

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-23

COUNTY:	TRIPP	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	27	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
PRELIMINARY			
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-23A*

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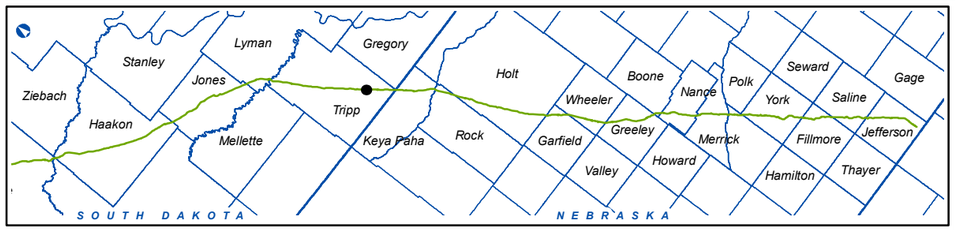

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-23A

COUNTY:	TRIPP	***DRAWN BY:***	PD
STATE:	SOUTH DAKOTA	***CHECKED BY:***	JP
SHEET:	28	***APPROVED BY:***	RG
REVISION			***DATE***
3	ISSUED FOR REVIEW		2011-05-26
	PRELIMINARY		
PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-28A*

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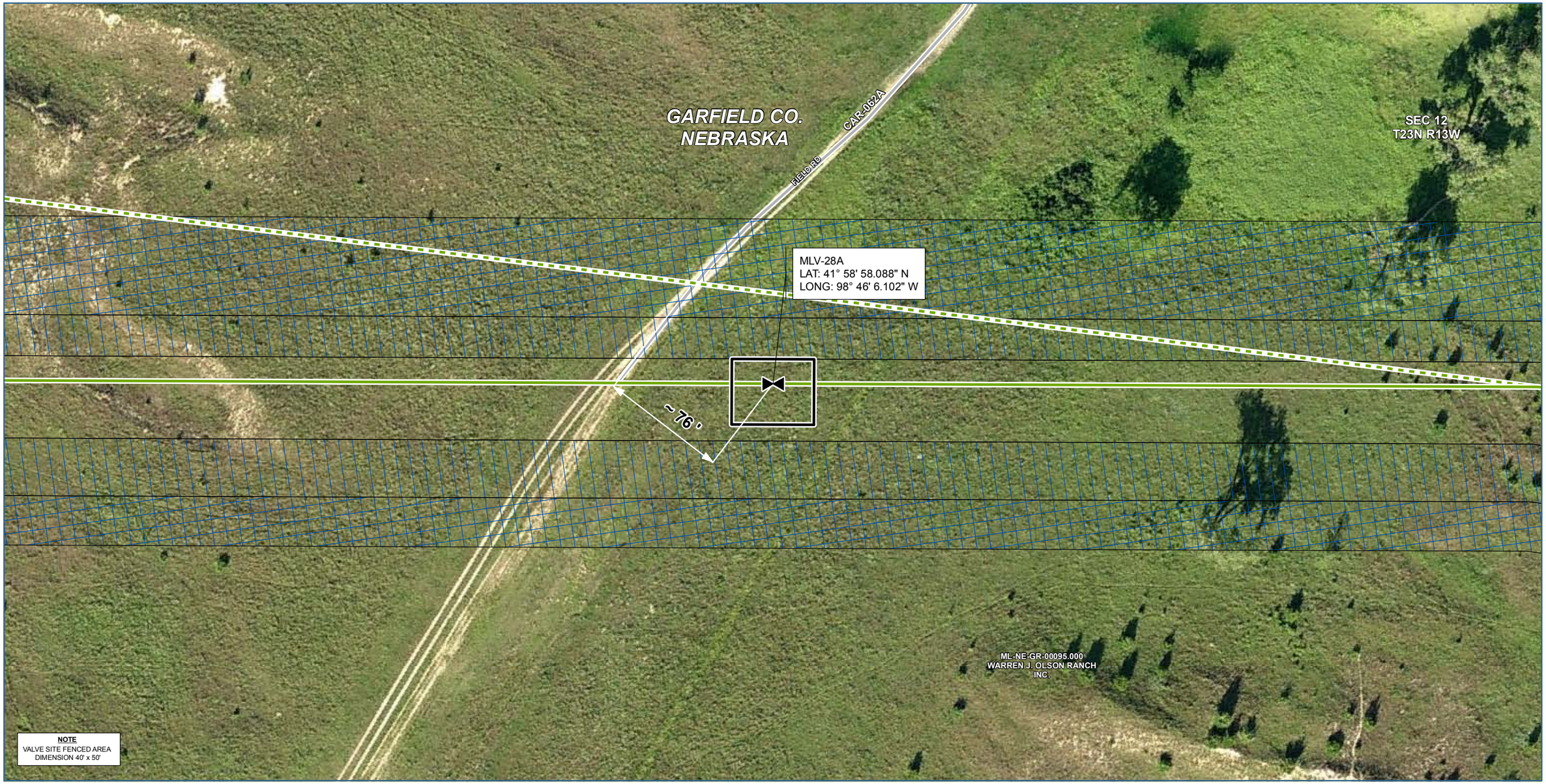
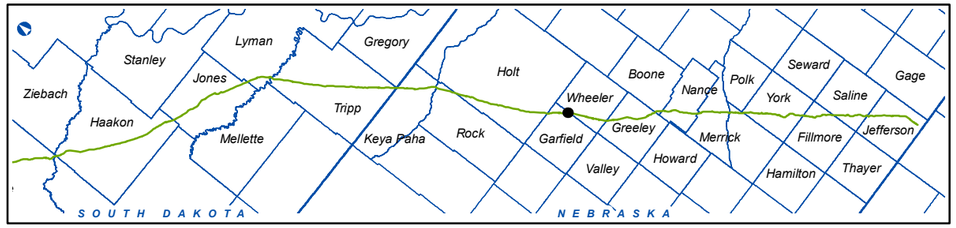


NOTE
VALVE SITE FENCED AREA
DIMENSION 40' x 50'



Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-28A

COUNTY:	GARFIELD	***DRAWN BY:***	PD
STATE:	NEBRASKA	***CHECKED BY:***	JP
SHEET:	35	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-29*

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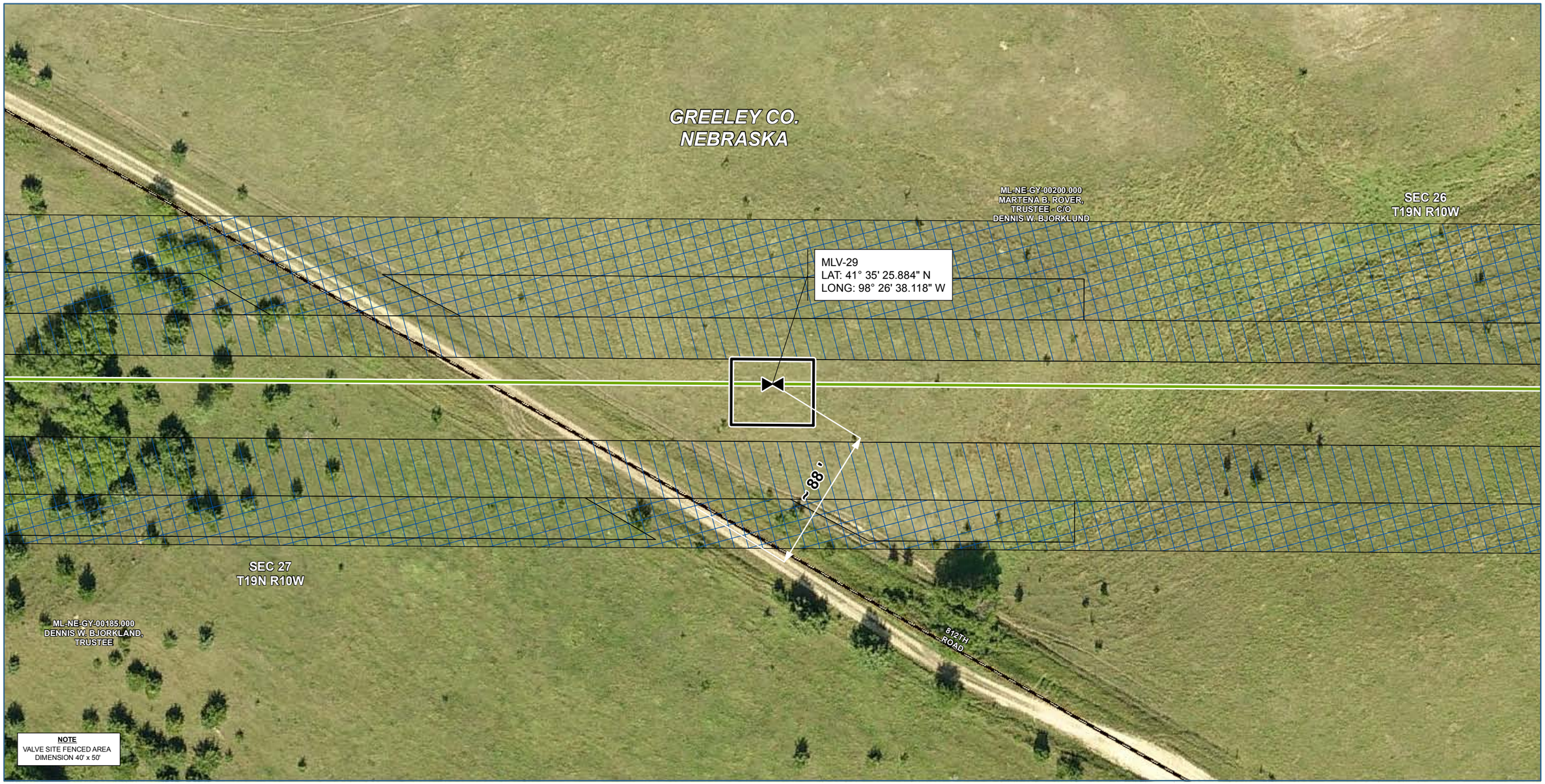

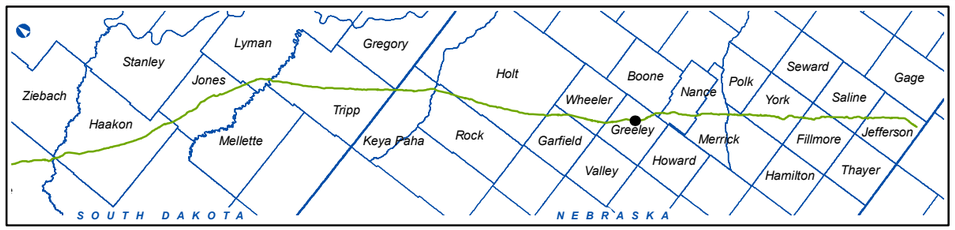

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-29

COUNTY:	GREELEY	***DRAWN BY:***	PD
STATE:	NEBRASKA	***CHECKED BY:***	JP
SHEET:	36	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-30*

TransCanada
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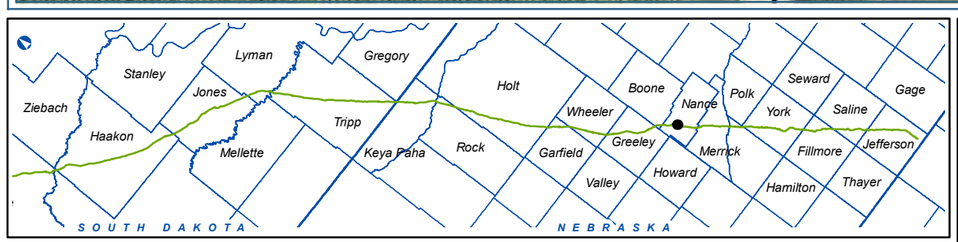

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-30

COUNTY:	NANCE	***DRAWN BY:***	PD
STATE:	NEBRASKA	***CHECKED BY:***	JP
SHEET:	37	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-33*

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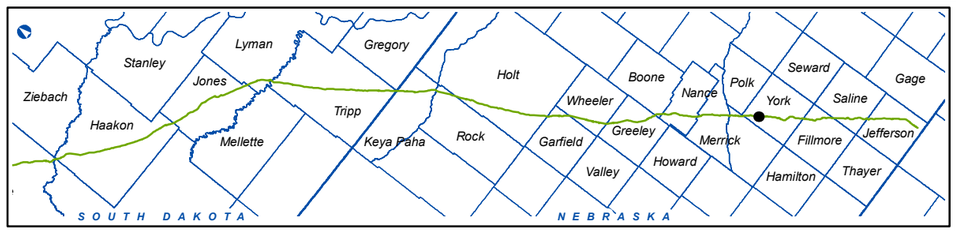

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-33

COUNTY:	YORK	***DRAWN BY:***	PD
STATE:	NEBRASKA	***CHECKED BY:***	JP
SHEET:	40	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26
	PRELIMINARY	

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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VALVE SITE DIMENSION MAP *MLV-35A*

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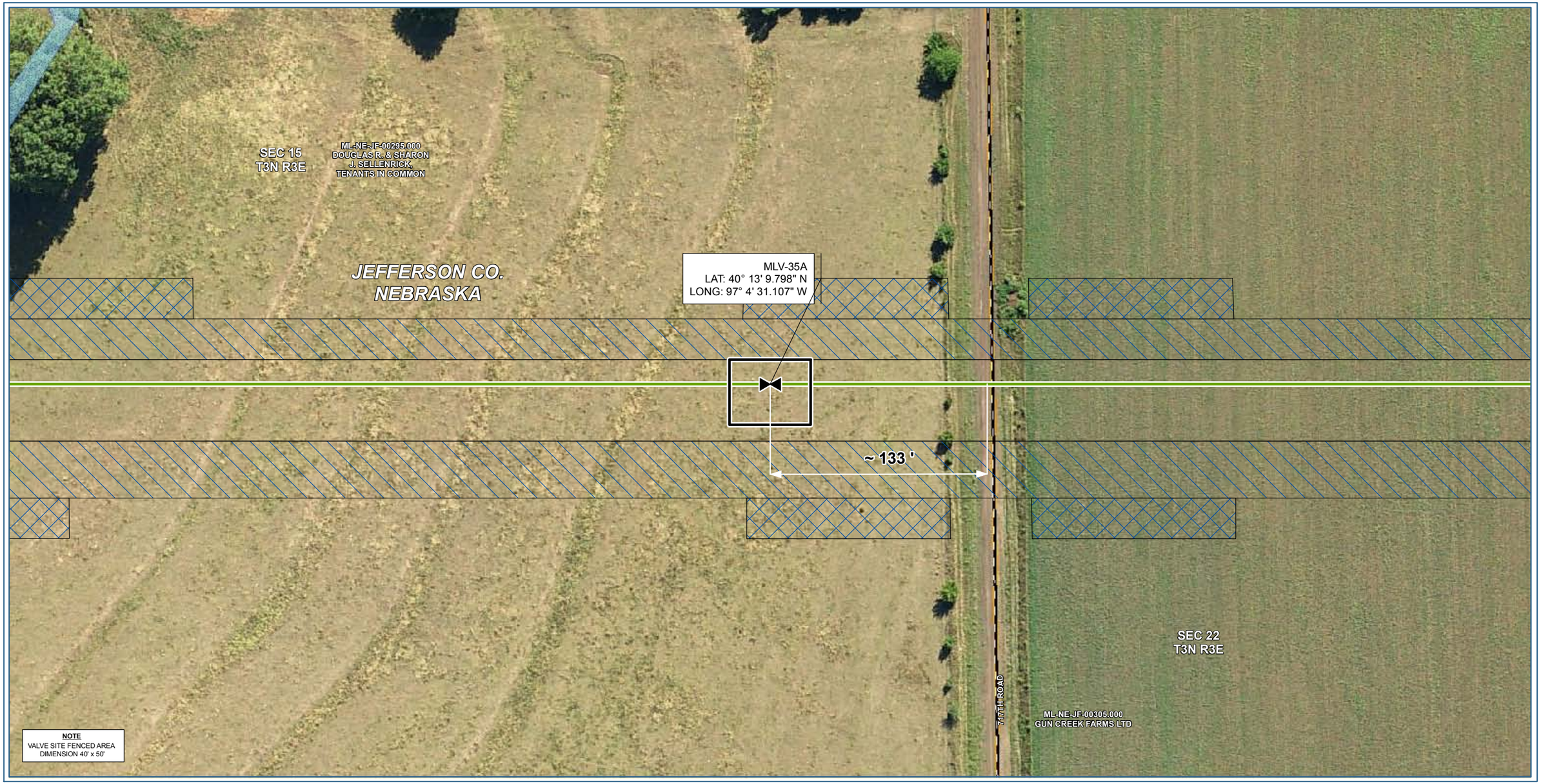

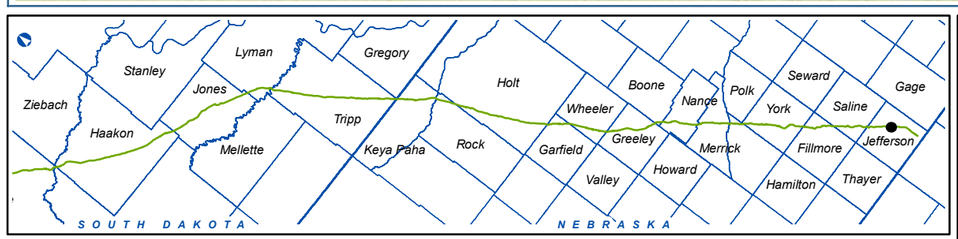

Keystone Phase IV, US

LEGEND

- MILEPOST
- PHASE IV CL (2010-11-18)
- ROUTE VARIATION
- VALVE LOCATION
- VALVE SITE BOUNDARY
- PERMAMENT EASEMENT
- TEMPORARY EASEMENT
- ADDITIONAL TEMPORARY WORKSPACE
- ACCESS ROAD
- TRANSMISSION LINE
- COUNTY LINE
- PROPERTY PARCEL
- SECTION LINE
- WATERBODY
- WETLAND

Keystone Phase IV, US

MLV-35A

COUNTY:	JEFFERSON	***DRAWN BY:***	PD
STATE:	NEBRASKA	***CHECKED BY:***	JP
SHEET:	43	***APPROVED BY:***	RG

REVISION		***DATE***
3	ISSUED FOR REVIEW	2011-05-26

PRELIMINARY

PROJECT:	THES0050388X	***DWG:***	XL-00-ML-9110
DATE:	2011-05-26	***REV. NO.:***	3

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KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

0286-SD-P4-461.3-461.8-I

1 **VARIATION TYPE:** Refinement: | Reroute: X | Footprint: X | Design:
Centerline: X | Pump Station: | Valve Site: X | CAR: X

2 **LOCATION:** Sketch: | Pictures: N/A

State: SD | County: Haakon | Quad Map: N/A
Township: 03N | Range: 21E, 22E | Aerial Map: See attached map sheet
Section: 12, 13, 18 | Centerline: 3/14/2012 | MP: 461.34 to 461.78

3 **REASON FOR ROUTE VARIATION** (Please include reason for route variation):

The primary reason for this reroute is to eliminate PI and straighten line. Additionally, this reroute will place MLV-19A on higher ground, move CL/workspaces away from an existing culvert (located south of current CL).

The reroute has been proposed based on the field reconnaissance efforts.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

Route variation starts near MP 461.3 and deviates ~17° east of CL. The reroute extends in this direction for ~2,276 ft and rejoins the current CL near MP 461.8. Along this section reroute eliminates 1 PI.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

No New Landowners are impacted by this route variation. Three tracts are impacted by reroute:
ML-SD-HK-01030.000 and ML-SD-HK-01050.000 (Both tracts: Ross Williams)
ML-SD-HK-01070.000 (Ramona Buchholz)

Route Variation impacts the relocation of MLV-19A and VAR-19A.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	-89	ft.	$ (31,997.77)	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +		EA	$ -	$ 185,000/EA
10' - 19'		EA	$ -	$ 77,250/EA
Less than 10'		EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.43	mile	$ 2,155.23	$ 5,000/mile
Cultural:	0.43	mile	$ 1,077.62	$ 2,500/mile
Biological:	0.43	mile	$ 1,206.93	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the route variation: $ (27,558.00) **(See "Additional Impacts" above)**

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes X	No
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	315 ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes N/A	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes X	No
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

6 **ENVIRONMENTAL / exp** *Jonathan Minton*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes	No X
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes	No X

-If yes, name of agency(s):

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes	No
c) Are additional valves required at HCA's or water crossing?	Yes	No
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

9
Originator: Engineering
Date: 3/22/2012

10
Received by:
Date: 3/22/2012
Fax to: ?

11
Assigned Tracking Number: 0286-SD-P4-461.3-461.8-I

12
Filed by:
Date:
Fax to: ?

0286-SD-P4-461.3-461.8-I

Document Control Number:
KXL10-00006-01-AA-180 (Form 1) 016527

0286-SD-P4-461.3-461.8-I

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

Date: 3/22/2012

Description: The primary reason for this reroute is to smooth out and shorten (eliminate 1 PI) the route through the area.

Tracking Number: 0286-SD-P4-461.3-461.8-I

MP: 461.3 to 461.8

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	
Comments:		Date: 4-16-12	
		If Rejected Why?	
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected	
Comments:		Date: 4-27-20	
		If Rejected Why?	
Exp - Engineering	Butch Wallace	Variation: Approved X Rejected	
Comments:		Date: 4-17-2012	
		If Rejected Why?	
Exp - Environmental	Jonathan Minton	Variation: Approved ✓ Rejected	
Comments: Pending Survey		Date: 5-11-12	
		If Rejected Why?	
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
Facilities - TransCanada	Sandra Gigovic	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ✓ Rejected	
Comments:		Date: May 23, 2012	
		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - Keystone XL Manager	Steve Marr	Variation: Approved ✓ Rejected	
Comments:		Date: Jun 15/12	
		If Rejected Why?	

Forward to:

Tina Hall	Jonathan Minton	James Odom
Meera Kothari	Heidi Tillquist	Robert Bradley
Butch Wallace	Sandra Gigovic	Steve Marr
	Alan Lietz	

PROPOSED ROUTE VARIATION 0286-01

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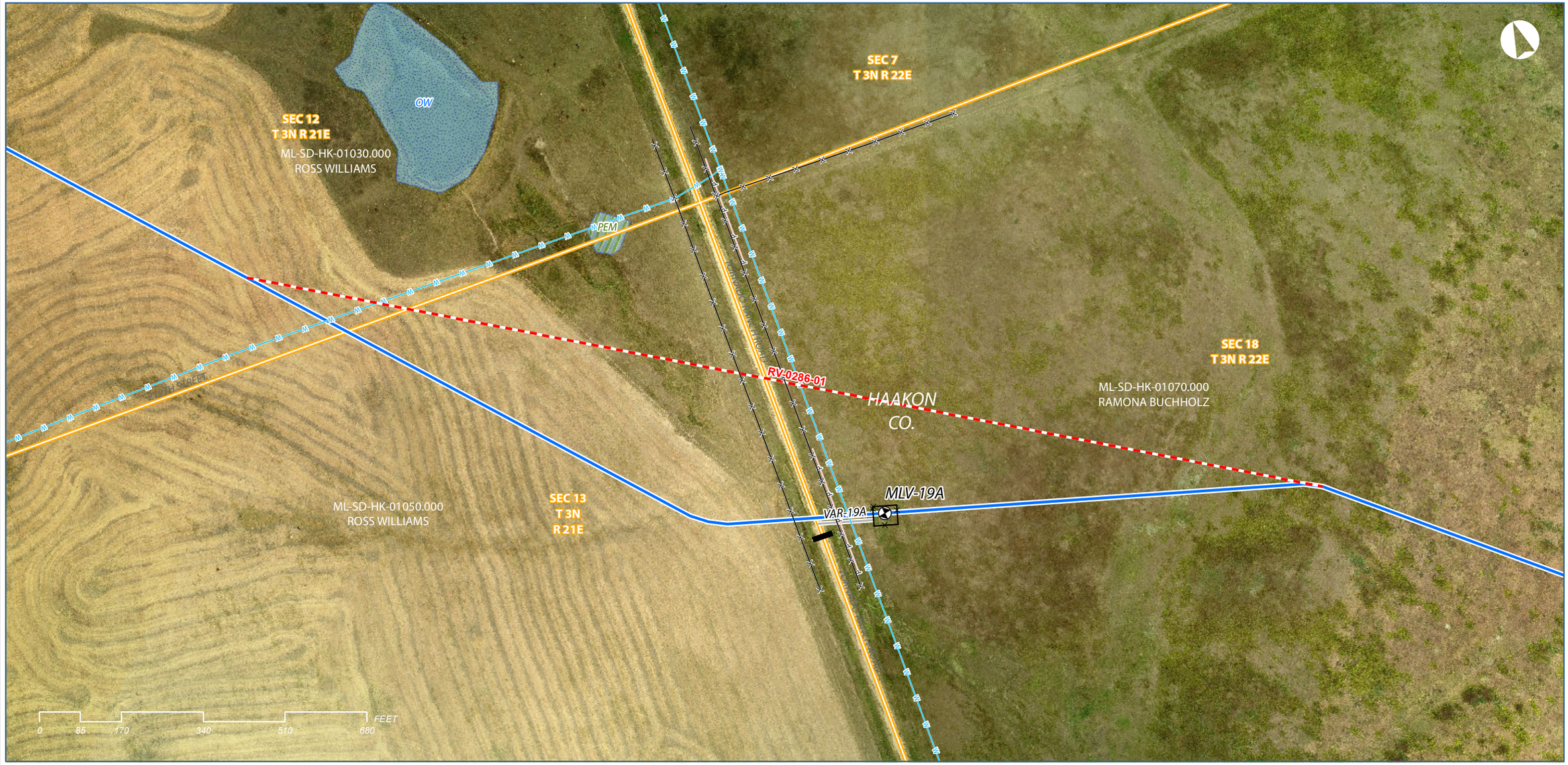
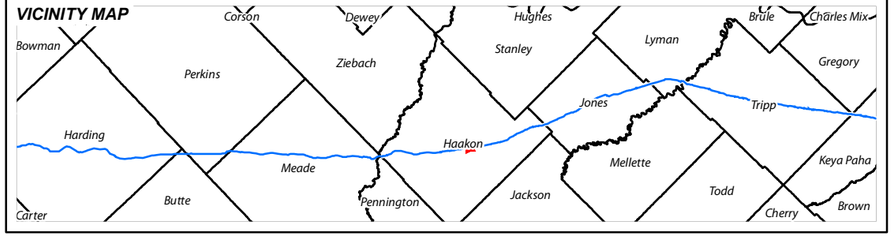


VICINITY MAP



LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-03-14)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- VALVE
- SURVEYED FENCE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY
- 500FT MDEQ CORRIDOR
- CULVERT

KEYSTONE XLPROJECT

Proposed Route Variation 0286-01

COUNTY:	HAAKON	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-03-21

PRELIMINARY

DATE:	2012-03-21	**PROJECTION:**	NAD83 | UTM14 N

PREPARED BY:

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DWG:	XL-30-P-9200	**SHEET:**	1

Keystone XL Project

016529

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

0287-SD-P4-533.5-533.8-S

1 **VARIATION TYPE:**

Refinement:		Reroute:	X	Footprint:	X	Design:	
Centerline:	X	Pump Station:		Valve Site:	X	CAR:	X

2 **LOCATION:** Sketch: | Pictures: see attached

State:	SD	County:	Lyman	Quad Map:	N/A		
Township:	104N	Range:	79W	Aerial Map:	See attached map sheet		
Section:	27, 26	Centerline:	3/14/2012	MP:	533.53	to	533.79

3 **REASON FOR ROUTE VARIATION** (Please include reason for route variation):

The primary reason for this reroute is to straighten road crossing and move MLV-22 to better ground.

The reroute has been proposed based on the field reconnaissance efforts.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

Route variation starts near MP 533.5 and deviates ~13.5° southeast of CL. It extends in this direction for ~750 ft. Then the reroute turns east towards the current CL and continues in that direction for ~604 ft to rejoin the CL near MP 533.8.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

No New Landowners are impacted by this route variation. Three tracts are impacted by reroute:
ML-SD-LY-10160.000 (Thomas Lands, Inc)
ML-SD-LY-10145.000 and ML-SD-LY-10170.000 (both tracts: Steven & Dennis Juhnke)

Route Variation impact the relocation of MLV-22 and VAR-22 to better ground.

Miscellaneous Costs savings include constructability savings.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	21	ft.	$ 7,412.44	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +		EA	$ -	$ 185,000/EA
10' - 19'		EA	$ -	$ 77,250/EA
Less than 10'		EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.26	mile	$ 1,282.18	$ 5,000/mile
Cultural:	0.26	mile	$ 641.09	$ 2,500/mile
Biological:	0.26	mile	$ 718.02	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above: $ (15,000)

Overall estimated costs of the route variation: $ (4,946.26) **(See "Additional Impacts" above)**

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

016530

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes X	No
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	178 ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes N/A	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes X	No
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

6 **ENVIRONMENTAL / exp** *Jonathan Minton*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes	No X
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes	No X
-If yes, name of agency(s):		

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes	No
c) Are additional valves required at HCA's or water crossing?	Yes	No
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

9 Originator: Engineering
Date: 3/21/2012

10 Received by:
Date: 3/21/2012
Fax to: ?

11 Assigned Tracking Number: 0287-SD-P4-533.5-533.8-S

12 Filed by:
Date:
Fax to: ?

0287-SD-P4-533.5-533.8-S

Document Control Number:
KXL10-00006-01-AA-180 (Form 1) 016531

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0287-SD-P4-533.5-533.8-S

Date: 3/21/2012

Description: The primary reason for this reroute is to straighten road crossing and move MLV-22 to better ground.

Tracking Number: 0287-SD-P4-533.5-533.8-S

MP: 533.5 to 533.8

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	Date: 4-16-12
Comments:		If Rejected Why?	
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected	Date: 4-27-12
Comments:		If Rejected Why?	
Exp - Engineering	Butch Wallace	Variation: Approved X Rejected	Date: 4-17-2012
Comments:		If Rejected Why?	
Exp - Environmental	Jonathan Minton	Variation: Approved ✓ Rejected	Date: 5-11-12
Comments: Pending Survey		If Rejected Why?	
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
Facilities - TransCanada	Sandra Gigovic	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ✓ Rejected	Date:
Comments: Need to get new MLV site acquired.		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - Keystone XL Manager	Steve Marr	Variation: Approved ✓ Rejected	Date: Jun 15/12
Comments:		If Rejected Why?	

Forward to:

Tina Hall	Jonathan Minton	James Odom
Meera Kothari	Heidi Tillquist	Robert Bradley
Butch Wallace	Sandra Gigovic	Steve Marr
	Alan Lietz	

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0287-SD-P4-533.5-533.8-S

Date: 3/21/2012

Description: The primary reason for this reroute is to straighten road crossing and move MLV-22 to better ground.

Tracking Number: 0287-SD-P4-533.5-533.8-S

MP: 533.5 to 533.8

Originated By: Engineering

Variation Form Attached: Yes X No

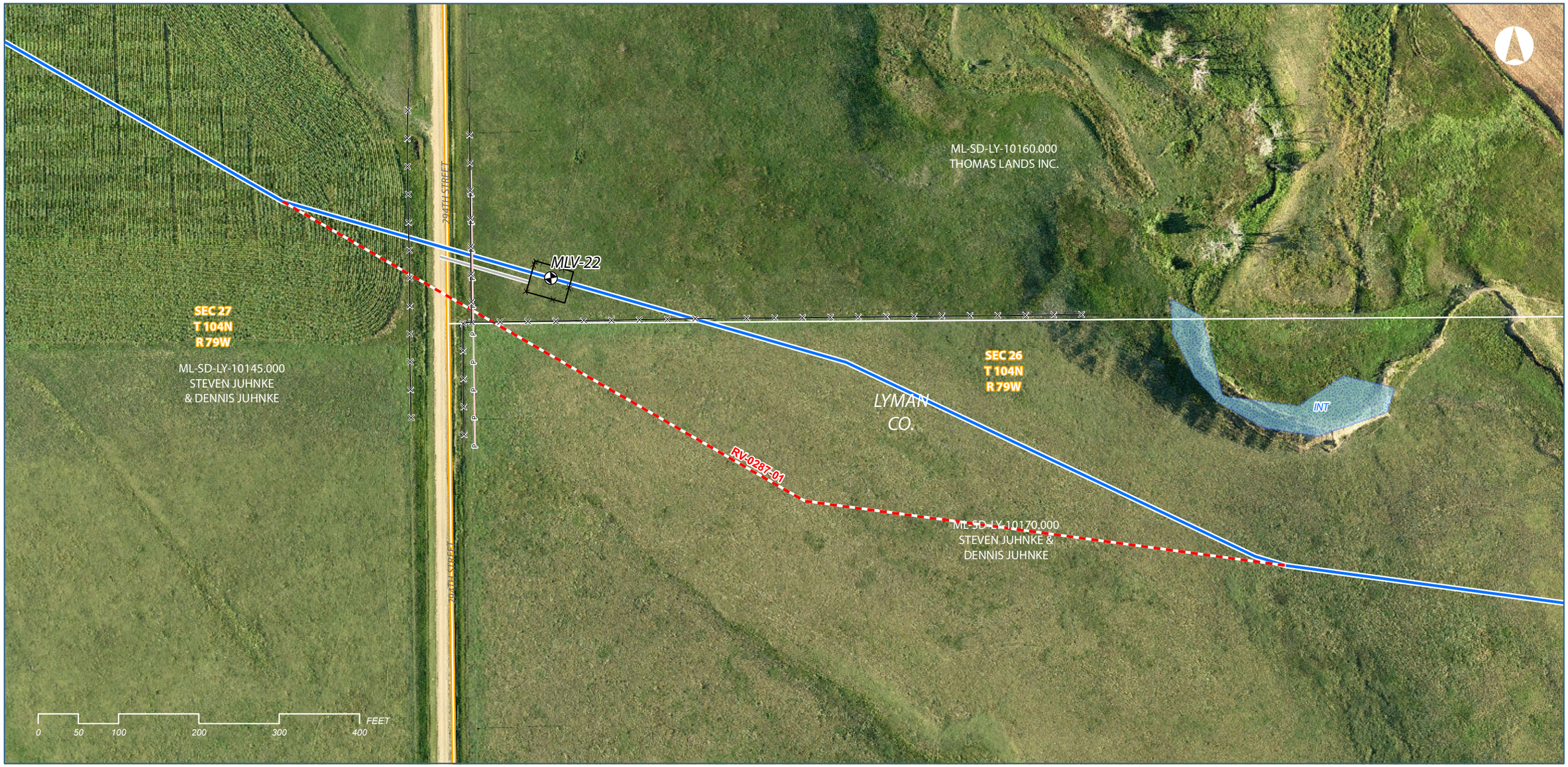
TransCanada - Land	Tina Hall	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
TransCanada- Engineering	Meera Kothari	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
Exp - Engineering	Butch Wallace	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
Exp - Environmental	Jonathan Minton	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
Facilities - TransCanada	Sandra Gigovic	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	
TransCanada - Keystone XL Manager	Steve Marr	Variation: Approved	Rejected
Comments:		Date:	
		If Rejected Why?	

Forward to:

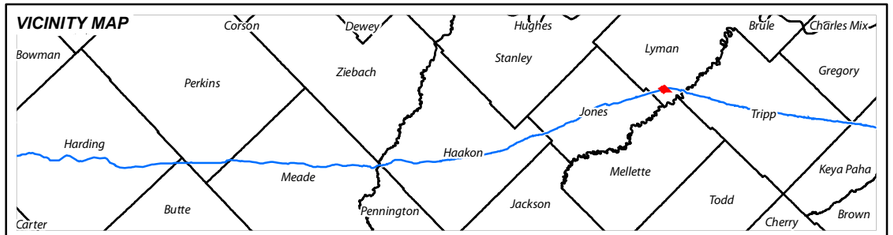
Tina Hall		Jonathan Minton		James Odom	
Meera Kothari		Heidi Tillquist		Robert Bradley	
Butch Wallace		Sandra Gigovic		Steve Marr	
		Alan Lietz			

PROPOSED ROUTE VARIATION 0287-01

TransCanada
In business to deliver



VICINITY MAP



Keystone Phase IV, US

LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-03-14)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- VALVE
- SURVEYED FENCE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY
- 500FT MDEQ CORRIDOR

KEYSTONE PHASE IV, US

Proposed Route Variation 0287-01

COUNTY:	LYMAN	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-03-19

PRELIMINARY

DATE:	2012-03-19	**PROJECTION:**	NAD83 | UTM14 N

PREPARED BY:

exp Energy Services Inc.

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• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

DWG:	XL-30-P-9200	**SHEET:**	1

016534

RV-0287-01 - Looking Southeast at minute 05:04.037
03/14/2012 CL - Blue line
Reroute - Red Line

RV-0287-01 - Looking Southeast at minute 05:06.205
03/14/2012 CL - Blue line
Reroute - Red Line

RV-0287-01 - Looking Northwest at minute 04:52.592
03/14/2012 CL - Blue line
Reroute - Red Line

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

0294-SD-P4-586.2-586.6-I

1 **VARIATION TYPE:** Refinement: | Reroute: X | Footprint: X | Design:
Centerline: X | Pump Station: | Valve Site: X | CAR: X

2 **LOCATION:** Sketch: | Pictures: See attached

State: SD | County: Tripp | Quad Map: N/A
Township: 96N | Range: 75W | Aerial Map: See attached map sheet
Section: 03, 10 | Centerline: 3/14/2012 | MP: 586.23 to 586.64

3 **REASON FOR ROUTE VARIATION** (Please include reason for route variation):

The primary reason for this reroute is to avoid a well (temporary workspaces impact well). Furthermore, current temporary workspaces also impact a fence surrounding a historical site. This proposed route variation will impact the current location of MLV-23A and VAR-23A. The valve will be moved south of 293rd. Street to ML-SD-TR-11650.000 (Chandlor E. Shippy) tract.

The reroute has been proposed based on the field reconnaissance efforts and has been civil surveyed.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

Route variation starts near MP 586.2 and deviates ~7° in the southeast direction. It extends for ~2,104 ft. to rejoin the CL near MP 586.6.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

No New Landowners are impacted by this route variation. Three tracts are impacted by reroute:
ML-SD-TR-11620.000 (David & Sherry Rohde)
ML-SD-TR-11630.000 (Judell A Weidner and Lee O. Trustees...)
ML-SD-TR-11650.000 (Chandlor E. Shippy)

Route Variation impacts the relocation of MLV-23A and VAR-23A south of 293rd Street.

Miscellaneous Costs savings include landownwer and construction savings (avoid well).

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	-27	ft.	$ (9,728.03)	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +		EA	$ -	$ 185,000/EA
10' - 19'		EA	$ -	$ 77,250/EA
Less than 10'		EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.00	mile	$ -	$ 5,000/mile
Cultural:	0.21	mile	$ 527.21	$ 2,500/mile
Biological:	0.21	mile	$ 590.48	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above: $ (10,000)

Overall estimated costs of the route variation: $ (18,610.34) **(See "Additional Impacts" above)**

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)
016538

4 **LAND / TransCanada** *Tina Hall*

	Yes	No
a) Is a new landowner affected by the proposed variation?		X
b) Is the affected landowner/tract a possible condemnation?		
c) Does proposed route variation impact Tribal Lands?		X
d) Does proposed route variation impact any Federal/State Lands?		X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	X	
f) Is realignment proposed to satisfy landowner request?		X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?		
If no, please explain why:		

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

	Yes	No
a) Maximum deviation perpendicular to proposed alignment:	162 ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	N/A	
c) Has the centerline been staked for construction?		X
d) Does route variation affect HDD crossing alignment?		X
e) Is realignment proposed for engineering/construction reasons?	X	
f) Will the route variation require the relocation of a pump station?		X
g) Has all the evaluation criteria been examined/provided for this specific discipline?		
If no, please explain why:		

6 **ENVIRONMENTAL / exp** *Jonathan Minton*

	Yes	No
a) Has the corridor been environmentally surveyed?	X	
b) Has the proposed variation been environmentally surveyed?		X
c) Does proposed route variation impact Sage Grouse areas?		X
d) Does route variation impact ABB areas?		X
e) Was variation proposed to satisfy environmental issues?		X
f) Was realignment proposed to satisfy agency request?		X
-If yes, name of agency(s):		

g) Environmental features:

Added (+):

Subtracted (-):

Wetland ID # for newly impacted wetlands:

	Yes	No
h) Has all the evaluation criteria been examined/provided for this specific discipline?		
If no, please explain why:		

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

	Yes	No
a) Will the route variation require the relocation of a pump station?		X
b) Will route variation impact hydraulics?		
c) Are additional valves required at HCA's or water crossing?		
d) Has all the evaluation criteria been examined/provided for this specific discipline?		
If no, please explain why:		

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

	Yes	No
a) Does the variation result in any new stakeholders?		X
b) Does the variation require follow-up with specific stakeholder groups?		
c) Was the variation proposed to satisfy stakeholder request?		X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?		
If no, please explain why:		

9
Originator: Engineering
Date: 4/5/2012

10
Received by:
Date: 4/5/2012
Fax to: ?

11
Assigned Tracking Number: 0294-SD-P4-586.2-586.6-I

12
Filed by:
Date:
Fax to: ?

0294-SD-P4-586.2-586.6-I

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0294-SD-P4-586.2-586.6-I

Date: 4/5/2012

Description: The primary reason for this reroute is to avoid a well (temporary workspaces impact well). This proposed route variation will impact the current location of MLV-23A and VAR-23A.

Tracking Number: 0294-SD-P4-586.2-586.6-I

MP: 586.2 to 586.6

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	Date: 4-16-12
Comments:		If Rejected Why?	
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected	Date: 4-20-12
Comments:		If Rejected Why?	
Exp - Engineering	Butch Wallace	Variation: Approved X Rejected	Date: 4-17-2012
Comments:		If Rejected Why?	
Exp - Environmental	Jonathan Minton	Variation: Approved ✓ Rejected	Date: 5/7/12
Comments:	Pending Survey	If Rejected Why?	
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
Facilities - TransCanada	Sandra Gigovic	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - Keystone XL Manager	Steve Marr	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	

Forward to:

Tina Hall	Jonathan Minton	James Odom
Meera Kothari	Heidi Tillquist	Robert Bradley
Butch Wallace	Sandra Gigovic	Steve Marr
	Alan Lietz	

PROPOSED ROUTE VARIATION 0294-01

TransCanada
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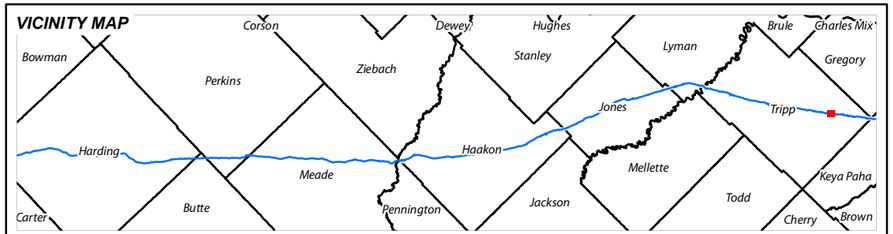
VICINITY MAP



LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-03-14)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- VALVE
- SURVEYED FENCE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY
- 500FT MDEQ CORRIDOR
- WELL

KEYSTONE XL PROJECT

Proposed Route Variation 0294-01

COUNTY:	TRIPP	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-04-05

PRELIMINARY

DATE:	2012-04-05	**PROJECTION:**	NAD83 | UTM14 N

PREPARED BY:

exp Energy Services Inc.

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Tallahassee, FL 32308
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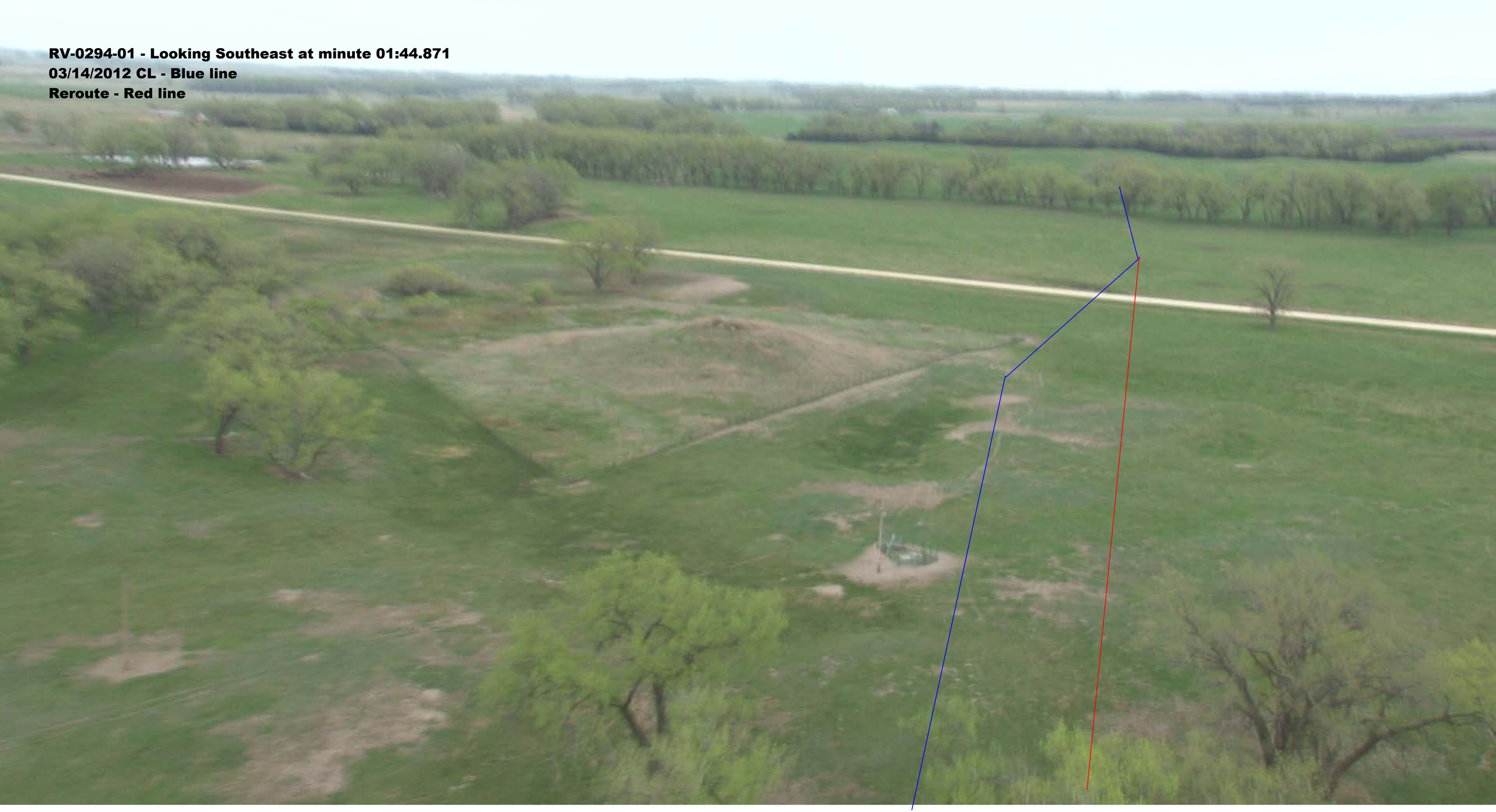
DWG:	XL-30-P-9200	**SHEET:**	1

Keystone XL Project

016541

RV-0294-01 - Looking Southeast at minute 01:33.393
03/14/2012 CL - Blue line
Reroute - Red line


RV-0294-01 - Looking Southeast at minute 01:44.871
03/14/2012 CL - Blue line
Reroute - Red line

RV-0294-01 - Looking Northwest at minute 06:51.844
03/14/2012 CL - Blue line
Reroute - Red line

0315-SD-P4-XXX.X-XXX.X-S

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: | Footprint: X | Design:
Centerline: | Pump Station: | Valve Site: X | CAR: X

2

LOCATION: Sketch: | Pictures: N/A

State: SD | County: Meade, Haakon | Quad Map: N/A
Township: 08N, (06N) | Range: 16E, (18E) | Aerial Map: See attached map sheet
Section: 35, (014) | Centerline: 7/13/2012 | MP: XXX.X to XXX.X

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

This report consists of 2 proposed Valve MLV-18 (relocation, RV-0315-01) and CK-MLV-19 (actuation, RV-0315-02). MLV-18 relocation from a low lying area to an easily accessible location for operations. This move will make the spacing greater than 20 miles, so CK-MLV-19 has to be actuated.

As per the PHMSA condition 32 - Mainline and Check Valve Control: Keystone must design and install mainline block valves and check valves on the Keystone XL system based on the worst case discharge as calculated by 49 CFR § 194.105. Keystone shall locate valves in accordance with 49 CFR § 195.260 and by taking into consideration elevation, population, and environmentally sensitive locations, to minimize the consequences of a release from the pipeline. Mainline valves must be placed based on the analysis above or no more than twenty (20) miles apart, whichever is smaller.
To comply with spacing requirement, Keystone determined areas its current valve spacing design exceeded a spacing of 20 miles and employed one of the following steps to mitigate the issue:
• Relocated the valve after a thorough analysis of the resulting spill volume and assuring the original intent of the valve was still realized
• Bringing remote actuation to the downstream manual ball valve of a check valve, block valve set.
• Adding a new remotely actuated mainline valve site.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

RV-315-01: Listed in "Supplemental Info" Tab.

RV-315-02: Listed in "Supplemental Info" Tab.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

RV-315-01: MLV-18 relocation: CAR-093 (to be deleted) and CAR-148 (to become a permanent Access road) will be impacted; Tracts Impacted: ML-SD-ME-11040.000 (Freda Wilson, Life Estate, Linda Grenz, Jennifer Silbaugh) - New MLV-18 Location
ML-SD-ME-01170.000 (Wink Cattle Co.) - Previous MLV-18 location.

Cost Analysis:
For 315-01: The cost associated with relocation of MLV-18 is $100,000 for access across landowner; in addition the upgrade of the access road (CAR-148 ~624 ft. at $50/ft.) ~$31,200 and site built up ~$20,000. Cost Savings are related to the upgrade of CAR-093 (~30206.51 ft at $50/ft) ~-$ 1,510,325

For 315-02: Cost associated to actuate CK-MLV-19 is $250,000.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:		ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
	35 - 65' +	0 EA	$ -	$ 185,000/EA
	10' - 19'	0 EA	$ -	$ 77,250/EA
	Less than 10'	0 EA	$ -	$ 32,500/EA
Additional survey required:				
	Civil:	0.00 mile	$ -	$ 5,000/mile
	Cultural:	0.00 mile	$ -	$ 2,500/mile
	Biological:	0.00 mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above: $ (1,109,125)

Overall estimated costs of the route variation: $ (1,109,125.00) **(See "Additional Impacts" above)**

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes	No X
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	N/A ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes N/A	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes X	No
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

6 **ENVIRONMENTAL / TransCanada** *Sandra Barnett*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes	No X
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes X	No
-If yes, name of agency(s):	PHMSA Condition 32	

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes X	No
c) Are additional valves required at HCA's or water crossing?	Yes	No
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No X
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

9 Originator: Engineering
Date: 8/14/2012

10 Received by:
Date: 8/14/2012
Fax to: ?

11 Assigned Tracking Number: 0315-SD-P4-XXX.X-XXX.X-S

12 Filed by:
Date:
Fax to: ?

0315-SD-P4-XXX.X-XXX.X-S

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

Keystone XL Pipeline - Supplemental Information for Route Variation Report 0315

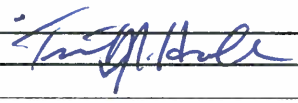
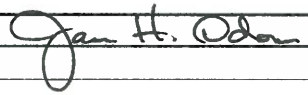
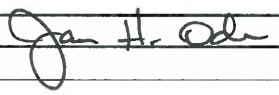
Prepared: 2012-08-14

RV-ID	Status	Previous Scenario		New Scenario		Relocated Distance (miles)	Upstream distance to next motorised valve or PS (miles)	Downstream distance to next motorised valve or PS (miles)	Spread	Previous Scenario	New Scenario	County	State	Previous Scenario			New Scenario			Tag (Motor operated valve)	Tag (Check valve)	Tag (Manual valve)
		Milepost	Valve ID	Milepost	Valve ID					Type	Type			Legal	Latitude	Longitude	Legal	Latitude	Longitude			
0315-01		424.4	MLV-18	419.6	MLV-18	4.8			6	MOV	MOV	Meade	South Dakota	035-033N-36E	44° 33' 14.671" N	102° 4' 50.936" W	035-008N-16E	44° 36' 17.249" N	102° 8' 38.204" W	260-FAITH-01A-B0-MLV-01		
0315-02		435.7	CK-MLV-19	435.7	CK-MLV-19	0.0			6	CHECK AND MANUAL	CHECK AND MOV	Haakon	South Dakota	014-06N-018E	44° 28' 26.173" N	101° 54' 20.546" W	014-06N-018E	44° 28' 26.173" N	101° 54' 20.546" W		260-FAITH-02A-B0-CKV-01	260-FAITH-02A-B0-MLV-01

RV-ID	New Scenario		Closest Road	Side	Previous Scenario		New Scenario		Required building setback	Distance from Road ROW/FENCE to valve (whichever greater) (ft)	Distance from CL of Road to valve (ft)
	Milepost	Valve ID			Tract Number	Owner	Tract Number	Owner			
0315-01	419.6	MLV-18	CAR-148; HWY-34	UPSTREAM	ML-SD-ME-01170.000	Wink Cattle Co.	ML-SD-ME-11040.000	Freda Wilson, Life Estate, Linda Grenz, Jennifer Silbaugh	NONE	100	130
0315-02	435.7	CK-MLV-19	202ND Street	UPSTREAM	ML-SD-HK-00170.000	Kelly Blair	ML-SD-HK-00170.000	Kelly Blair	NONE	100	130

Keystone XL Pipeline - Approval form for Route Variation Report 0315

Prepared: 2012-08-14

RV ID		RV-315-01: MLV-18 Relocation	RV-315-02: CK-MLV-19 (Actuation)
LAND (TransCanada) Tina Hall	Approval (Y/N)	Y	Y
	Comments		
	Signature		
ENGINEERING (TransCanada) Meera Kothari	Approval (Y/N)		
	Comments		
	Signature		
ENGINEERING (exp) Butch Wallace	Approval (Y/N)		
	Comments		
	Signature		
ENVIRONMENTAL (TransCanada) Sandra Barnett	Approval (Y/N)		
	Comments		
	Signature		
FACILITIES (TransCanada) Sandra Gigovic	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - MONTANA (TransCanada) Alan Lietz	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - SOUTH DAKOTA (TransCanada) James Odom	Approval (Y/N)	Y	Y
	Comments		
	Signature		
PROJECT MANAGEMENT - NEBRASKA (TransCanada) Robert Bradley	Approval (Y/N)		
	Comments		
	Signature		
KEYSTONE XL MANAGER (TransCanada) Steve Marr	Approval (Y/N)		
	Comments		
	Signature		

Keystone XL Pipeline - Approval form for Route Variation Report 0315

Prepared: 2012-08-14

RV ID		RV-315-01: MLV-18 Relocation	RV-315-02: CK-MLV-19 (Actuation)
LAND (TransCanada) Tina Hall	Approval (Y/N)		
	Comments		
	Signature		
ENGINEERING (TransCanada) Meera Kothari	Approval (Y/N)		
	Comments		
	Signature		
ENGINEERING (exp) Butch Wallace	Approval (Y/N)	Y	Y
	Comments		
	Signature	R.E. Wallace	R.E. Wallace
ENVIRONMENTAL (TransCanada) Sandra Barnett	Approval (Y/N)		
	Comments		
	Signature		
FACILITIES (TransCanada) Sandra Gigovic	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - MONTANA (TransCanada) Alan Lietz	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - SOUTH DAKOTA (TransCanada) James Odom	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - NEBRASKA (TransCanada) Robert Bradley	Approval (Y/N)		
	Comments		
	Signature		
KEYSTONE XL MANAGER (TransCanada) Steve Marr	Approval (Y/N)		
	Comments		
	Signature		

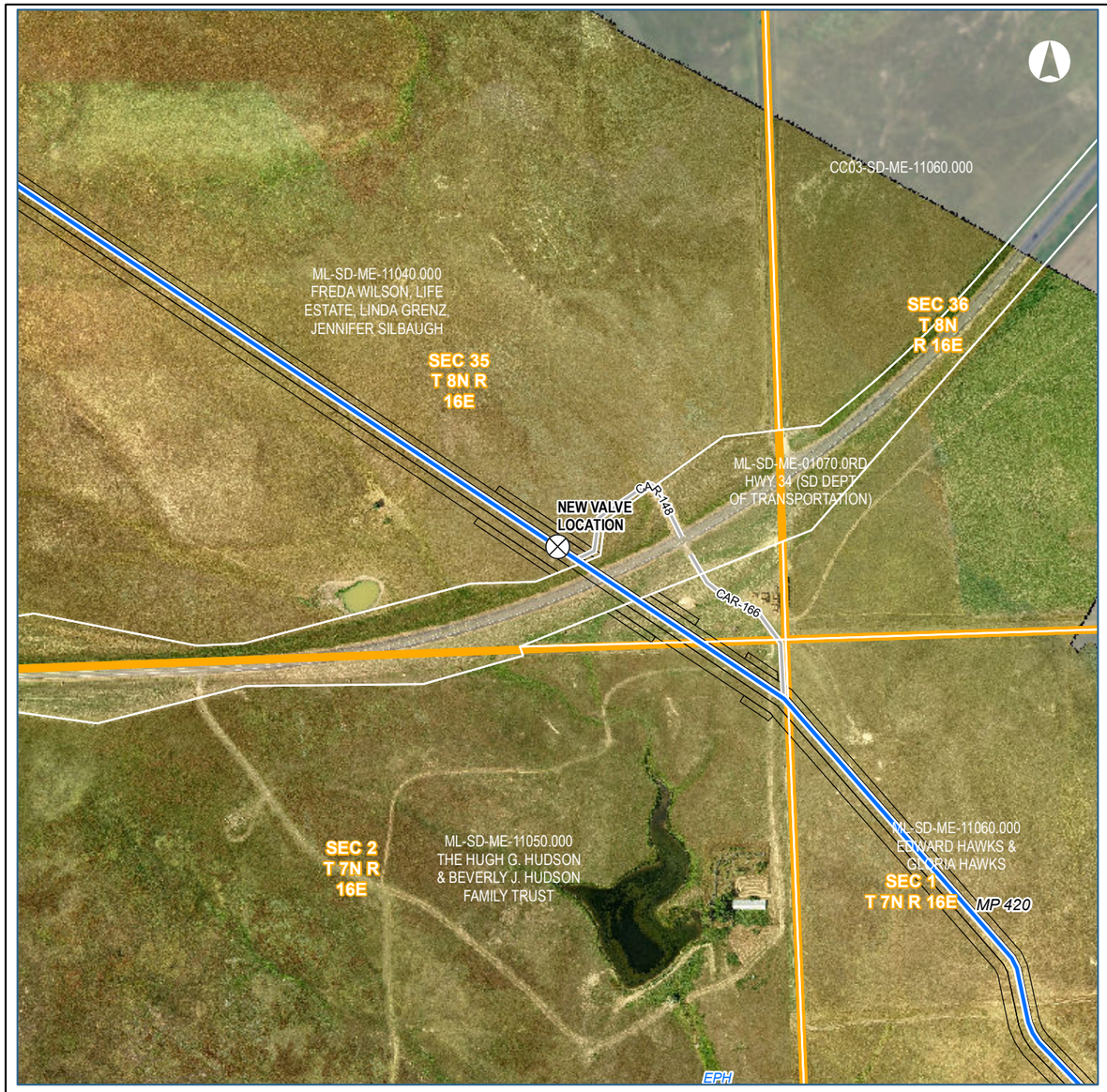
Keystone XL Pipeline - Approval form for Route Variation Report 0315

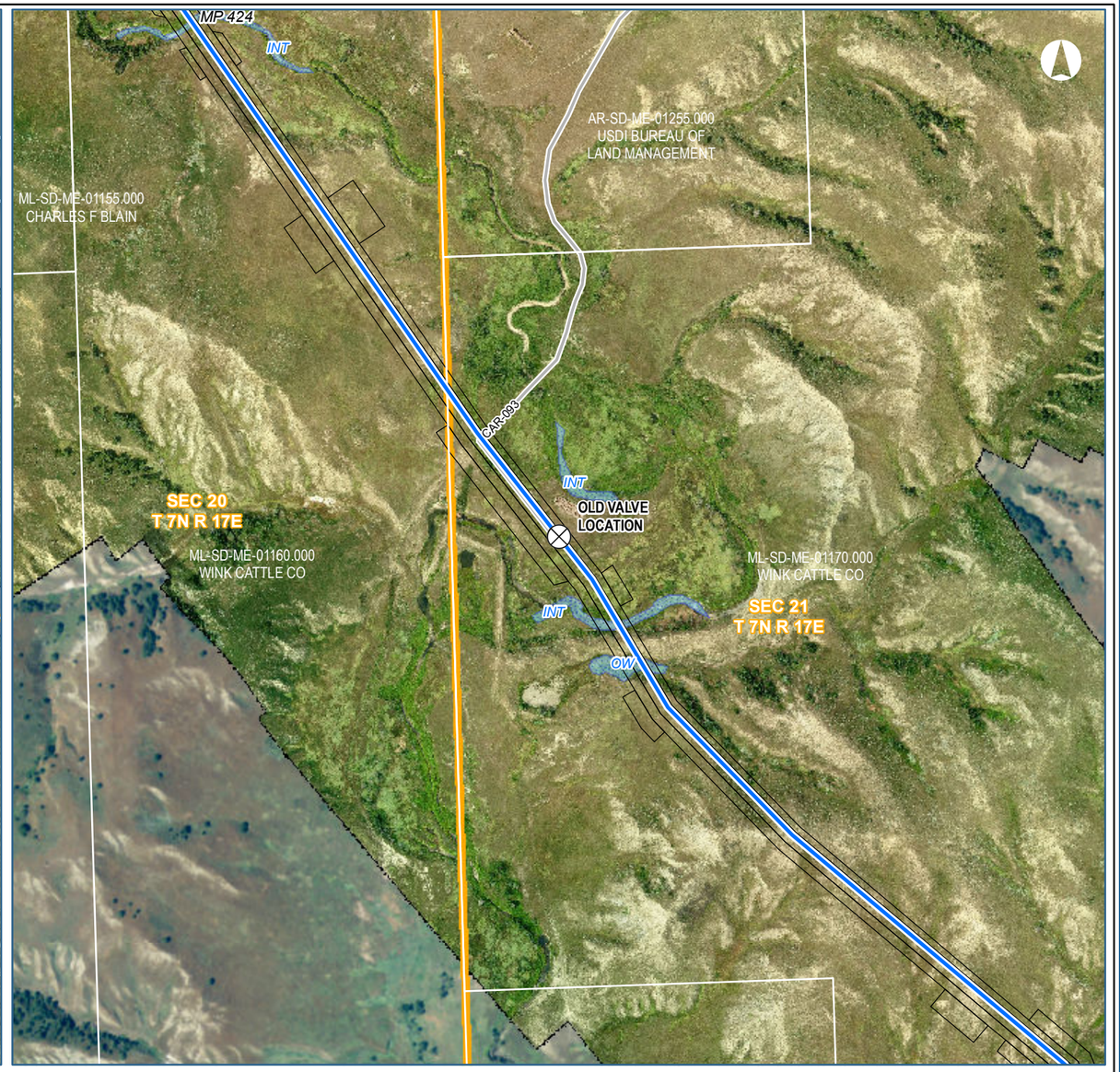
Prepared: 2012-08-14

RV ID		RV-315-01: MLV-18 Relocation	RV-315-02: CK-MLV-19 (Actuation)
LAND (TransCanada) Tina Hall	Approval (Y/N)	Y	Y
	Comments		
	Signature		
ENGINEERING (TransCanada) Meera Kothari	Approval (Y/N)		
	Comments		
	Signature		
ENGINEERING (exp) Butch Wallace	Approval (Y/N)		
	Comments		
	Signature		
ENVIRONMENTAL (TransCanada) Sandra Barnett	Approval (Y/N)		
	Comments		
	Signature		
FACILITIES (TransCanada) Sandra Gigovic	Approval (Y/N)	Y	Y
	Comments	Sept 7, 2012	Sept 7, 2012
	Signature	G. Gigovic A.	G. Gigovic A.
PROJECT MANAGEMENT - MONTANA (TransCanada) Alan Lietz	Approval (Y/N)		
	Comments		
	Signature		
PROJECT MANAGEMENT - SOUTH DAKOTA (TransCanada) James Odom	Approval (Y/N)	Y	Y
	Comments		
	Signature		
PROJECT MANAGEMENT - NEBRASKA (TransCanada) Robert Bradley	Approval (Y/N)		
	Comments		
	Signature		
KEYSTONE XL MANAGER (TransCanada) Steve Marr	Approval (Y/N)		
	Comments		
	Signature		

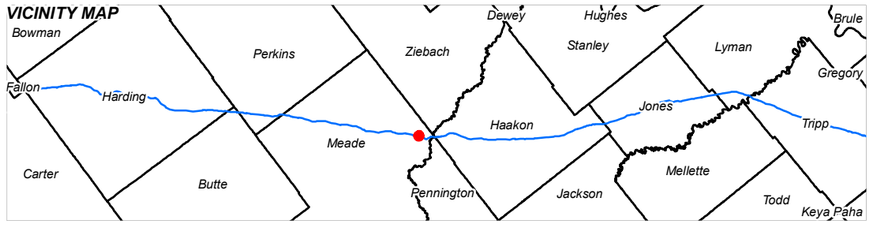
PROPOSED VALVE RELOCATION (MLV-18 - RV-0315-01)

TransCanada
In business to deliver





VICINITY MAP



LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-03-14)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- VALVE
- SURVEYED FENCE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY
- 500FT MDEQ CORRIDOR
- HDD ENTRY / EXIT

KEYSTONE XL PROJECT
PROPOSED VALVE RELOCATION
(MLV-18 - RV-0315-01)

COUNTY:	MEADE	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-08-13

PRELIMINARY

DATE:	2012-08-13	**PROJECTION:**	NAD83 | UTM13 N

PREPARED BY:
exp Energy Services Inc.
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Tallahassee, FL 32308
U.S.A.
www.exp.com
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• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

DWG:	XL-30-P-9200	**SHEET:**	1

Keystone XL Project

016551

0372-SD-P4-434.5-436.1-I

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: X | Footprint: | Design:
Centerline: X | Pump Station: | Valve Site: X | CAR:

2

LOCATION: Sketch: Attached | Pictures: N/A

State: SD | County: Haakon | Quad Map: N/A
Township: 06N | Range: 18E | Aerial Map: See attached map sheet
Section: 014, 015 | Centerline: 8/15/2012 | MP: 434.52 to 436.12

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

The primary reason for this route variation is to avoid valve site for CK-MLV-19 be located at a PI by extending the straight portion of the centerline and thus shifting the PI location further north. This centerline reroute allows for the accomodation of the valve and PI breakdown.

This reroute is requested by Engineering based on engineering review and aerial, pictometry images.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

The proposed route variation starts near MP 434.5 and deviates ~1° northeast of current centerline. It continues in the southeast direction for ~8,428.4 ft. Then it turns south and extends straight for ~42 ft. to rejoin the current CL near MP 436.12. The location of CK-MLV-19 is not impacted by the reroute, only the fence (will be straighten out to parallel the straight line).

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

3 Tracts are impacted by this Centerline reroute:
AR-SD-HK-15040.000, ML-SD-HK-00170.000 (both Kelly Blair)
ML-SD-HK-00130.000 (J. Grant Olsen)

The proposed route variation avoids the need to install a fitting (~35,000). Furthermore, there are no additional cost for environmental surveys. The reroute falls within the current surveyed corridor.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	23	ft.	$ 8,129.91	$ 360/ft
Additional length of side-hill construction:	0	ft.	$ -	$ 19/ft
Additional length of wetland construction:	0	ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +	0	EA	$ -	$ 185,000/EA
10' - 19'	0	EA	$ -	$ 77,250/EA
Less than 10'	0	EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	1.60	mile	$ 8,020.87	$ 5,000/mile
Cultural:	0.00	mile	$ -	$ 2,500/mile
Biological:	0.00	mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above: $ (35,000)

Overall estimated costs of the route variation: $ (18,849.21) **(See "Additional Impacts" above)**

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No X
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes	No X
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	55 ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes N/A	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes X	No
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

6 **ENVIRONMENTAL - TransCanada** *Sandra Barnett*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes X	No
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes	No X
-If yes, name of agency(s):		

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes	No X
c) Are additional valves required at HCA's or water crossing?	Yes	No X
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No X
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

9 Originator: Engineering
Date: 10/29/2012

10 Received by:
Date: 10/29/2012
Fax to: ?

11 Assigned Tracking Number: 0372-SD-P4-434.5-436.1-I

12 Filed by:
Date:
Fax to: ?

0372-SD-P4-434.5-436.1-I

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0372-SD-P4-434.5-436.1-I

Date: 10/29/2012

Description: The primary reason for this route variation is to avoid valve site for CK-MLV-19 be located at a PI by extending the straight portion of the centerline and thus shifting the PI location further north.

Tracking Number: 0372-SD-P4-434.5-436.1-I

MP 434.5 to 436.1

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	Date: 11-5-12
Comments:		If Rejected Why?	
TransCanada - Engineering	Meera Kothari	Variation: Approved ✓ Rejected	Date: 11/29/12
Comments:		If Rejected Why?	
Exp - Engineering	Kevin McGlynn	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - Environmental	Sandra Barnett	Variation: Approved ✓ Rejected	Date: 12.3.12
Comments:		If Rejected Why?	
Stantec - Risk Assessment	Heidi Tillquist	Variation: Approved Rejected	Date:
Comments: N/A.		If Rejected Why?	
TransCanada - Facilities	Sandra Gigovic	Variation: Approved Rejected	Date:
Comments: N/A. Does not affect facilities		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ✓ Rejected	Date: 12/10/12
Comments:		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	
TransCanada - Area Manager	Steve Marr	Variation: Approved Rejected	Date:
Comments:		If Rejected Why?	

Forward to:

Tina Hall	Sandra Barnett	James Odom
Meera Kothari	Heidi Tillquist	Robert Bradley
Kevin McGlynn	Sandra Gigovic	Steve Marr
	Alan Lietz	

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0372-SD-P4-434.5-436.1-I

Date: 10/29/2012	Tracking Number: 0372-SD-P4-434.5-436.1-I
Description: The primary reason for this route variation is to avoid valve site for CK-MLV-18 be located at a PI by extending the straight portion of the centerline and thus shifting the PI location further north.	MP: 434.5 to 436.1
	Originated By: Engineering
	Variation Form Attached: Yes X No

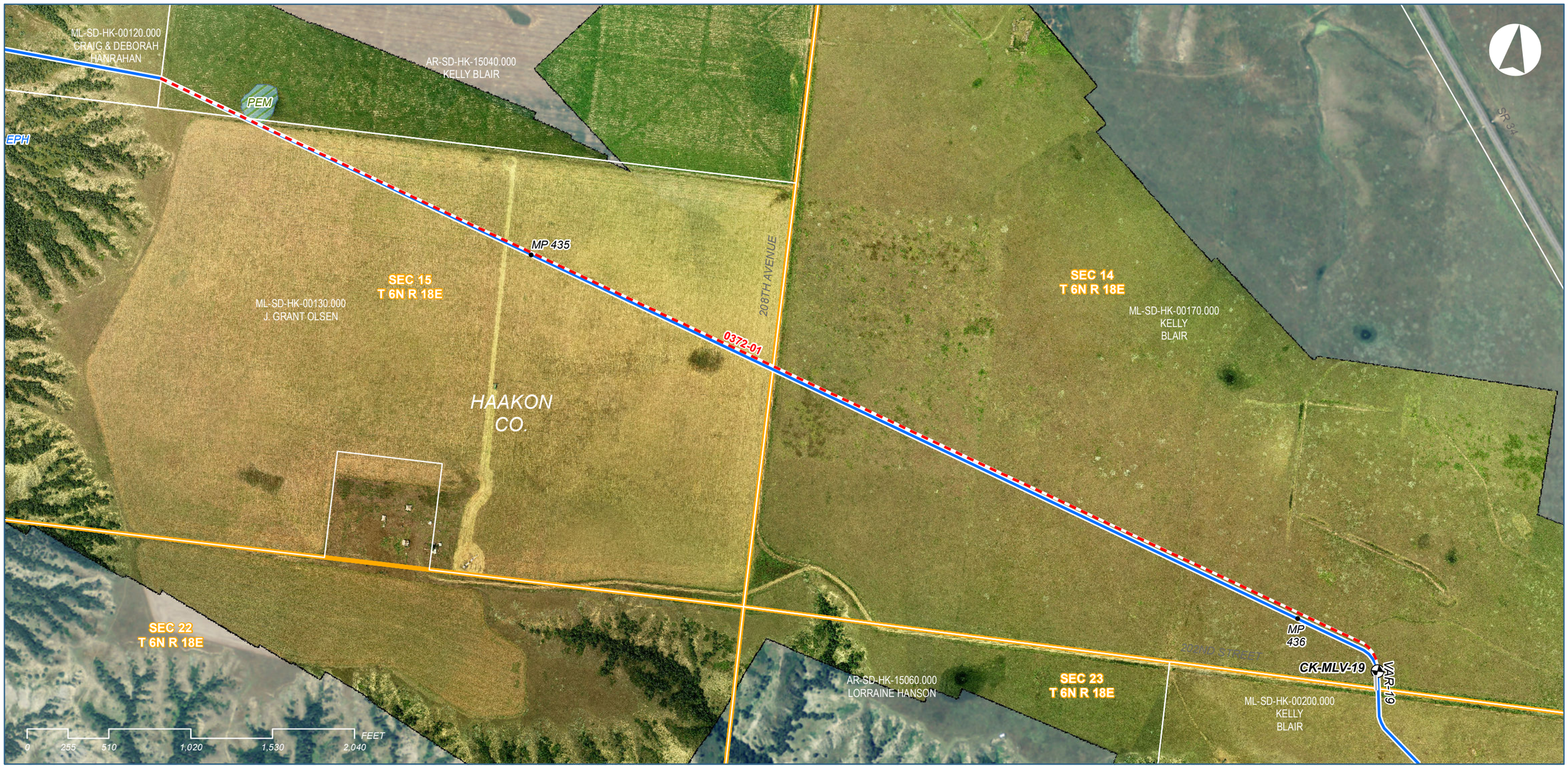
TransCanada - Land — Tina Hall Comments:	Variation: Approved Rejected Date: If Rejected Why?
TransCanada - Engineering — Meera Kothari Comments:	Variation: Approved Rejected Date: If Rejected Why?
Exp - Engineering — Kevin McGlynn Comments:	Variation: Approved ✓ Rejected Date: 12.20.12 If Rejected Why?
TransCanada - Environmental — Sandra Barnett Comments:	Variation: Approved Rejected Date: If Rejected Why?
Stantec - Risk Assesment — Heidi Tilquist Comments: N/A.	Variation: Approved Rejected Date: If Rejected Why?
TransCanada - Facilities — Sandra Gigovic Comments: N/A. Does not affect facilities	Variation: Approved ✓ Rejected Date: Dec 5 2012 If Rejected Why?
TransCanada - PM (Montana) — Alan Lietz Comments:	Variation: Approved Rejected Date: If Rejected Why?
TransCanada - PM (South Dakota) — James Odom Comments:	Variation: Approved Rejected Date: If Rejected Why?
TransCanada - PM (Nebraska) — Robert Bradley Comments:	Variation: Approved Rejected Date: If Rejected Why?
TransCanada - Area Manager — Steve Marr Comments:	Variation: Approved Rejected Date: If Rejected Why?

Forward to:

Tina Hall		Sandra Barnett		James Odom	
Meera Kothari		Heidi Tilquist		Robert Bradley	
Kevin McGlynn		Sandra Gigovic		Steve Marr	
		Alan Lietz			

PROPOSED ROUTE VARIATION 0372-01

TransCanada
In business to deliver



VICINITY MAP

LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-08-15)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- VALVE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY

KEYSTONE XL PROJECT

Proposed Route Variation 0372-01

COUNTY:	HAAKON	**DRAWN BY:**	CR
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-10-29

PRELIMINARY

DATE:	2012-10-29	**PROJECTION:**	NAD83 | UTM14 N

PREPARED BY:

exp Energy Services Inc.

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1300 Metropolitan Blvd.
Tallahassee, FL 32308
U.S.A.

www.exp.com

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DWG:	XL-00-P-9200_RVS	**SHEET:**	1

Keystone XL Project

016556

0414-SD-P4-XXX.X-XXX.X-S

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: X | Footprint: | Design:
Centerline: | Pump Station: | Valve Site: X | CAR: X

2

LOCATION: Sketch: | Pictures: N/A

State: SD | County: Haakon | Quad Map: N/A
Township: 02N | Range: 24E | Aerial Map: See attached map sheet
Section: 26 | Centerline: 3/14/2012 | MP: XXX.X to XXX.X

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

The primary reason for this footprint change is the relocation of MLV-20 per field reconnaissance recommendation.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

MLV-20: Per field reconnaissance performed of the proposed site on 6/19/2012. Proposed location upstream of CAR-161 is good location. Slightly higher ground with mild slope and all crop. Power is available downstream of road and access road is good and reported by Land to be county maintained. Recommendation to place valve on Coming inside of road due to dual power lines located south of field road.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

1 Tract impacted:
HK-11620 (Jerry Nemec & Sonia Nemec) - Proposed MLV-20 new location.
HK-11600 (Roger and Edna Dale) - Current MLV-20 location

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	0	ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +	0	EA	$ -	$ 185,000/EA
10' - 19'	0	EA	$ -	$ 77,250/EA
Less than 10'	0	EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.00	mile	$ -	$ 5,000/mile
Cultural:	0.00	mile	$ -	$ 2,500/mile
Biological:	0.00	mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the route variation: $ - **(See "Additional Impacts" above)**

016557

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes	No X
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	N/A ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes X	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes	No X
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

6 **ENVIRONMENTAL / TransCanada** *Sandra Barnett*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes	No X
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes	No X
-If yes, name of agency(s):		
g) Environmental features:		
Added (+):	Subtracted (-):	
Wetland ID # for newly impacted wetlands:		
h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes	No
c) Are additional valves required at HCA's or water crossing?	Yes	No
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No
If no, please explain why:		

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No X
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No
If no, please explain why:		

9 Originator: Engineering
Date: 7/12/2012

10 Received by:
Date: 7/12/2012
Fax to: ?

11 Assigned Tracking Number: 0414-SD-P4-XXX.X-XXX.X-S

12 Filed by:
Date:
Fax to: ?

0414-SD-P4-XXX.X-XXX.X-S

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

Keystone XL Pipeline - Supplemental Information for Route Variation Report 0414

Prepared: 2012-07-12

RV-ID	Status	Previous Scenario		New Scenario		Relocated Distance (miles)	Upstream distance to next motorised valve or PS (miles)	Downstream distance to next motorised valve or PS (miles)	Spread	Previous Scenario	New Scenario	County	State	Previous Scenario			New Scenario			Tag (Motor operated valve)	Tag (Check valve)	Tag (Manual valve)
		Milepost	Valve ID	Milepost	Valve ID					Type	Type			Legal	Latitude	Longitude	Legal	Latitude	Longitude			
0414-01		479.8	MLV-20	480.6	MLV-08B	0.83			6	MOV	MOV	Haakon	South Dakota	027-02N-024E	44° 6' 20.541" N	101° 12' 27.348" W	026-002N-24E	44° 6' 2.567"N	101° 11' 33.262"W	260-HAKON-01A-B0-MLV-01		

RV-ID	New Scenario		Closest Road	Side	Previous Scenario		New Scenario		Required building setback	Distance from Road ROW/FENCE to valve (whichever greater) (ft)	Distance from CL of Road to valve (ft)
	Milepost	Valve ID			Tract Number	Owner	Tract Number	Owner			
0414-01	480.6	MLV-20	CAR-161	UPSTREAM	ML-SD-HK-11600.000	Roger Dale & Edna Dale	ML-SD-HK-11620.000	Jerry Nemec & Sonia Nemec	NONE	80	110.0

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0414-SD-P4-XXX X-XXX X-S

Date: 7/12/2012

Tracking Number: 0414-SD-P4-XXX X-XXX X-S

Description: The primary reason for this footprint change is the relocation of MLV-20 per field reconnaissance recommendation.

MP: XXX X to XXX X

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected ____ Date: 7/13/12 If Rejected Why?
Comments:		
Exp - Engineering	Butch Wallace	Variation: Approved X Rejected ____ Date: 7-13-2012 If Rejected Why?
Comments:		
TransCanada- Environmental	Sandra Barnett	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
Stantec - Risk Assessment	Heidi Tilquist	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada - Facilities	Sandra Gigovic	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		
TransCanada - Area Manager	Steve Marr	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Comments:		

Forward to:

Tina Hall	____	Sandra Barnett	____	James Odom	____
Meera Kothari	____	Heidi Tilquist	____	Robert Bradley	____
Butch Wallace	____	Sandra Gigovic	____	Steve Marr	____
		Alan Lietz	____		

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0414-SD-P4-XXX.X-XXX.X-S

Date: 7/12/2012

Description: The primary reason for this footprint change is the relocation of MLV-20 per field reconnaissance recommendation.

Tracking Number: 0414-SD-P4-XXX.X-XXX.X-S

MP: XXX.X to XXX.X

Originated By: Engineering

Variation Form Attached: Yes X No

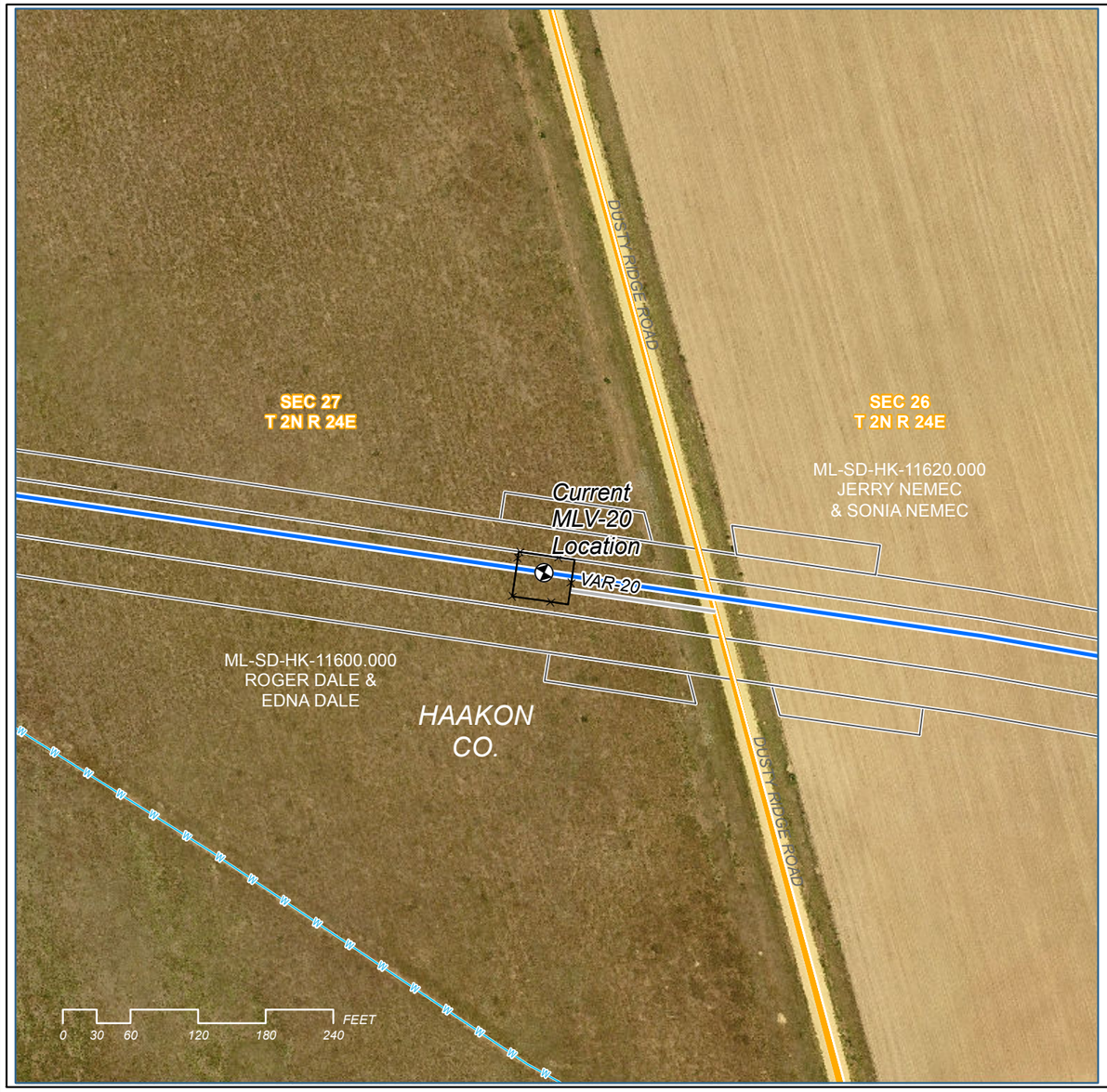
TransCanada - Land	Tina Hall	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada- Engineering	Meera Kothari	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
Exp - Engineering	Butch Wallace	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada- Environmental	Sandra Barnett	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada - Facilities	Sandra Gigovic	Variation: Approved ✓ Rejected ____ G. Gigovic A. Date: Sept 7, 2012
Comments:		If Rejected Why?
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?
TransCanada - Area Manager	Steve Marr	Variation: Approved ____ Rejected ____ Date: ____
Comments:		If Rejected Why?

Forward to:

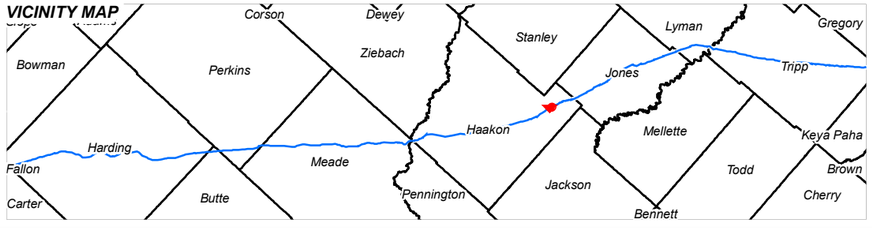
Tina Hall	____	Sandra Barnett	____	James Odom	____
Meera Kothari	____	Heidi Tillquist	____	Robert Bradley	____
Butch Wallace	____	Sandra Gigovic	____	Steve Marr	____
		Alan Lietz	____		

PROPOSED VALVE RELOCATION (MLV-20) 0414-01

TransCanada
In business to deliver



VICINITY MAP



LEGEND

- MILEPOST
- KEYSTONE XL CL (2012-03-14)
- PROPOSED ROUTE VARIATION
- SECTION LINE
- ACCESS ROAD
- PUMP STATION
- POWER POLE
- OVERHEAD POWER LINE
- PROPERTY PARCEL
- CULTURAL SITE
- WETLAND
- WATERBODY

KEYSTONE XL PROJECT

Proposed Valve Relocation 0414-01

COUNTY:	HAAKON	**DRAWN BY:**	PD
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-07-11

PRELIMINARY

DATE:	2012-07-11	**PROJECTION:**	NAD83 | UTM14 N

PREPARED BY:

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DWG:	XL-30-P-9200	**SHEET:**	1

Keystone XL Project

016562

0439-SD-P4-534.1-534.1-I

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: | Footprint: X | Design: | Centerline: | Pump Station: | Valve Site: | CAR: X

2

LOCATION: Sketch: Attached | Pictures: N/A

State: SD | County: LYMAN | Quad Map: N/A

Township: 104N | Range: 79W | Aerial Map: See attached map sheet

Section: 26 | Centerline: 3/14/2012 | MP: 534.10 to 534.12

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

The primary reason for this footprint change is to shift Valve Access Road VAR-22 ~ 9 ft. south to avoid VAR easement impact to ML-SD-LY-10160 (Thomas Lands, Inc.). Per land, this shift will avoid a gate at the property line between the two tracts. The landowners are afraid of livestock getting mixed if the gate was left open, and would prefer the access road stay on tract LY-10170.000

This footprint change is requested by Land.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

VAR-022 = Current length ~119.4 ft. and perpendicular distance from SD-LY-10160 southern property boundary of ~1 ft. Thus leaving ~14 ft. of AR easement inside SD-LY-10160. Propsoed VAR length is ~ 117.3 ft. and offset (measured perpendicularly) to SD-LY-10160 southern boundary is ~9 ft. Proposed VAR-022 starts at 294th St. and continues for approximately 59 ft. prior to turning southeast and thus following the original VAR-022 path towards MLV-22 Valve Site.

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

2 tracts are impacted by the reroute:
ML-SD-LY-10160.000 (Thomas Lands, Inc.)
ML-SD-LY-10170.000 (Steven Juhnke & Dennis Juhnke)

No additional costs associated with environmental survey.

Additionally, costs associated with CAR acquisition costs are as follows: To acquire a 15 ft. CAR is estimated a $3300/acre of affected area (1 acre = 43,560 sq.ft.). So, for VAR-022: (not including permanent ROW portions) to acquire was ~14.3 ft x 15 ft = 213.95 sq.ft. For a total CAR acquisition costs of ~$16.18.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	0	ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +	0	EA	$ -	$ 185,000/EA
10' - 19'	0	EA	$ -	$ 77,250/EA
Less than 10'	0	EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.02	mile	$ 84.34	$ 5,000/mile
Cultural:	0.00	mile	$ -	$ 2,500/mile
Biological:	0.00	mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above: $ 16.18

Overall estimated costs of the route variation: $ 100.52 **(See "Additional Impacts" above)**

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

4	**LAND / TransCanada**	*Tina Hall*		
	a) Is a new landowner affected by the proposed variation?	Yes		No X
	b) Is the affected landowner/tract a possible condemnation?	Yes		No
	c) Does proposed route variation impact Tribal Lands?	Yes		No X
	d) Does proposed route variation impact any Federal/State Lands?	Yes		No X
	-If yes, name type (i.e. USFWS, BLM, etc.):			
	e) Is proposed realignment outside the easement/workspace?	Yes		No X
	f) Is realignment proposed to satisfy landowner request?	Yes		No X
	-If yes, name of landowner(s)/track number(s):			
	g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	X	No
	If no, please explain why:			
5	**ENGINEERING/CONSTRUCTION - TransCanada**	*Meera Kothari*		
	a) Maximum deviation perpendicular to proposed alignment:		N/A ft.	
	b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes	N/A	No
	c) Has the centerline been staked for construction?	Yes		No X
	d) Does route variation affect HDD crossing alignment?	Yes		No X
	e) Is realignment proposed for engineering/construction reasons?	Yes	X	No
	f) Will the route variation require the relocation of a pump station?	Yes		No X
	g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	X	No
	If no, please explain why:			
6	**ENVIRONMENTAL - TransCanada**	*Sandra Barnett*		
	a) Has the corridor been environmentally surveyed?	Yes	X	No
	b) Has the proposed variation been environmentally surveyed?	Yes	X	No
	c) Does proposed route variation impact Sage Grouse areas?	Yes		No X
	d) Does route variation impact ABB areas?	Yes		No X
	e) Was variation proposed to satisfy environmental issues?	Yes		No X
	f) Was realignment proposed to satisfy agency request?	Yes		No X
	-If yes, name of agency(s):			
	g) Environmental features:			
	Added (+):		Subtracted (-):	
	Wetland ID # for newly impacted wetlands:			
	h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes		No
	If no, please explain why:			
7	**ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)*	*Sandra Gigovic*		
	a) Will the route variation require the relocation of a pump station?	Yes		No X
	b) Will route variation impact hydraulics?	Yes		No X
	c) Are additional valves required at HCA's or water crossing?	Yes		No X
	d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	X	No
	If no, please explain why:			
8	**STAKEHOLDER RELATIONS / TCPL** *(if applicable)*	*Bud Andersen*		
	a) Does the variation result in any new stakeholders?	Yes		No X
	b) Does the variation require follow-up with specific stakeholder groups?	Yes		No X
	c) Was the variation proposed to satisfy stakeholder request?	Yes		No X
	-If yes, please specify issue type (as it aligns to stakeholder database):			
	d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	X	No
	If no, please explain why:			

9 Originator: Land Date: 5/20/2013	10 Received by: Date: 5/20/2013 *Fax to: ?*
11 Assigned Tracking Number: 0439-SD-P4-534.1-534.1-I	12 Filed by: Date: *Fax to: ?*

0439-SD-P4-534.1-534.1-I

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0439-SD-P4-534.1-534.1-I

Date: 5/20/2013

Description: The primary reason for this footprint change is to shift Valve Access Road VAR-22 ~ 9 ft. south to avoid VAR easement impact to ML-SD-LY-10160 (Thomas Lands, Inc.).

Tracking Number: 0439-SD-P4-534.1-534.1-I

MP: 534.1 to 534.1

Originated By: Land

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	
Comments:		Date: 5/22/13	
		If Rejected Why?	
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected	
Comments:		Date: 5-23-13	
		If Rejected Why?	
Exp - Engineering	Kevin McGlynn	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada- Environmental	Sandra Barnett	Variation: Approved ✓ Rejected	
Comments:		Date: 5/29/13	
		If Rejected Why?	Approved
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved Rejected	
Comments:	N/A.	Date:	
		If Rejected Why?	
TransCanada - Facilities	Sandra Gigovic	Variation: Approved Rejected	
Comments:	N/A. Does not affect facilities	Date:	
		If Rejected Why?	SLL 6/4/2
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved ✓ Rejected	
Comments:		Date: 10 June-13	
		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - Area Manager	Steve Marr	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	

Forward to:

Tina Hall	Sandra Barnett	James Odom
Meera Kothari	Heidi Tillquist	Robert Bradley
Kevin McGlynn	Sandra Gigovic	Steve Marr
	Alan Lietz	

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0439-SD-P4-534.1-534.1-I

Date: 5/20/2013

Description: The primary reason for this footprint change is to shift Valve Access Road VAR-22 - 9 ft south to avoid VAR easement impact to ML-SD-LV-10160 (Thomas Lands, Inc.)

Tracking Number: 0439-SD-P4-534.1-534.1-I

MP: 534.1 to 534.1

Originated By: Land

Variation Form Attached: Yes X No

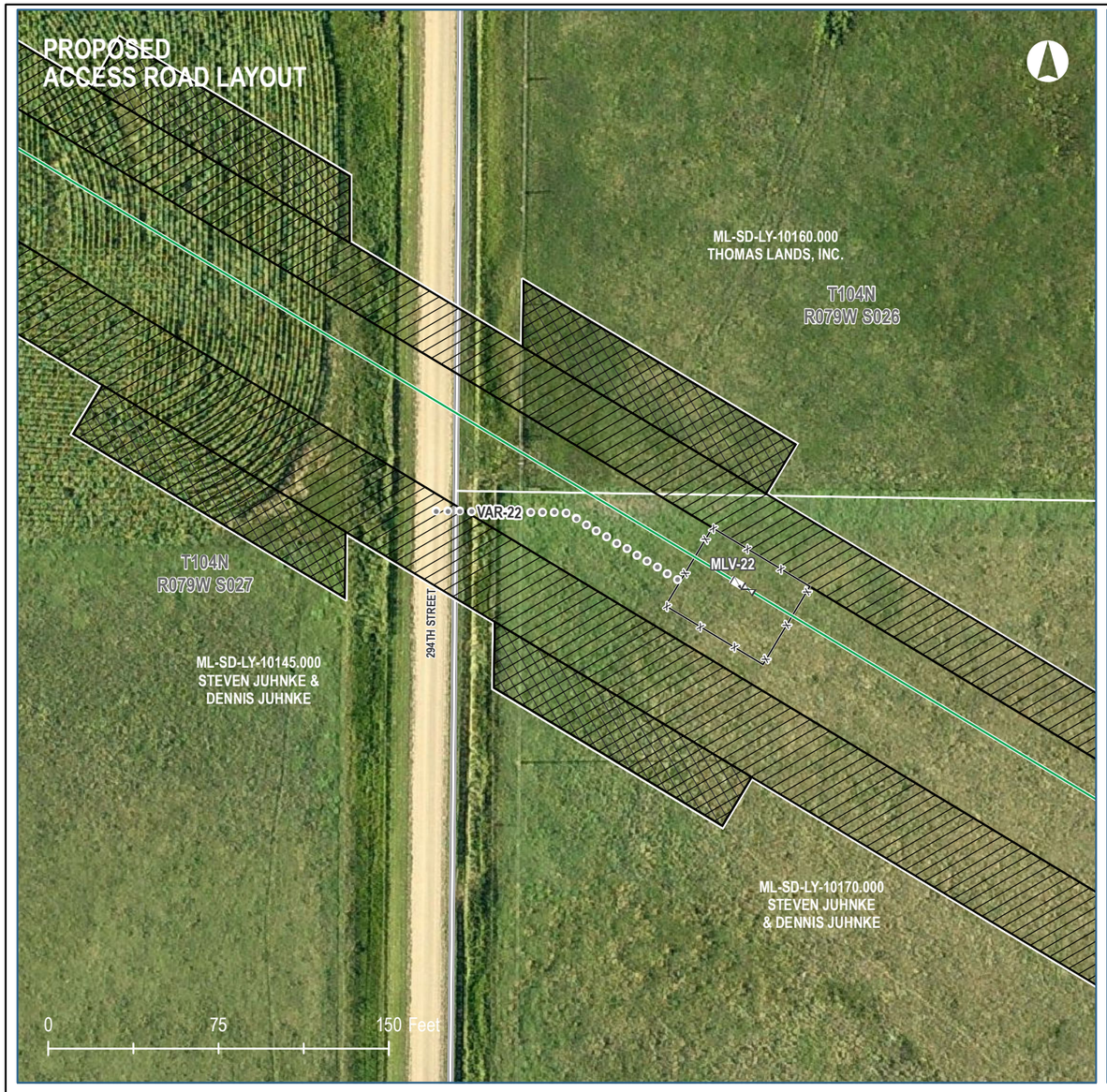
TransCanada - Land	Tina Hall	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada- Engineering	Meera Kothari	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Exp - Engineering	Kevin McGlynn	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada- Environmental	Sandra Barnett	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
Stantec - Risk Assesment	Heidi Tilquist	Comments: N/A	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada - Facilities	Sandra Gigovic	Comments: N/A. Does not affect facilities	Variation: Approved ✓ Rejected ____ Gigovic SA Date: May 28, 2013 If Rejected Why?
TransCanada - PM (Montana)	Alan Lietz	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada - PM (South Dakota)	James Odom	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada - PM (Nebraska)	Robert Bradley	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?
TransCanada - Area Manager	Steve Marr	Comments:	Variation: Approved ____ Rejected ____ Date: ____ If Rejected Why?

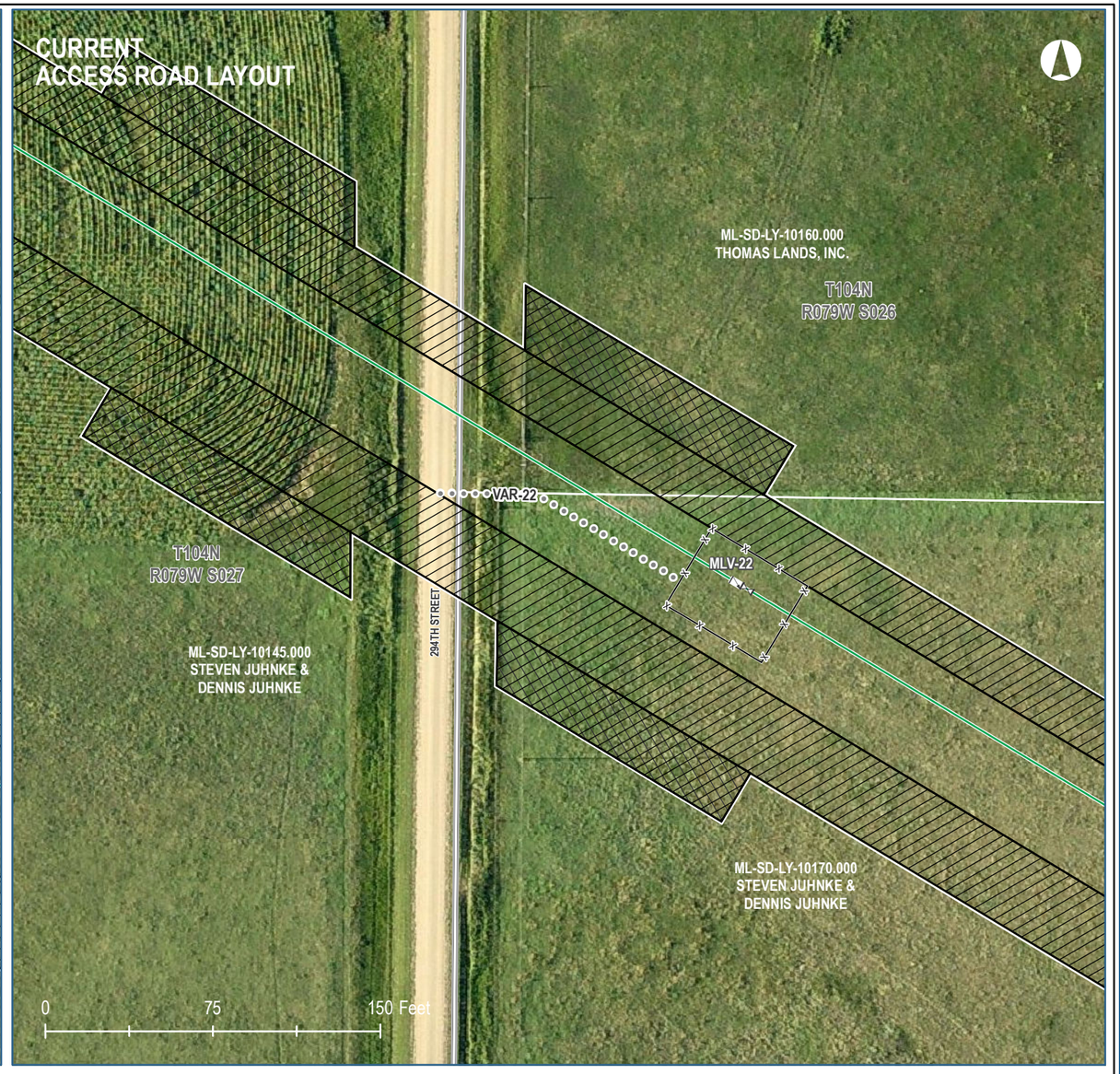
Forward to:

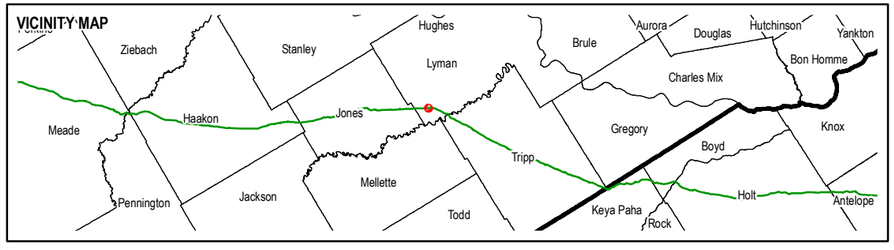
Tina Hall	____	Sandra Barnett	____	James Odom	____
Meera Kothari	____	Heidi Tilquist	____	Robert Bradley	____
Kevin McGlynn	____	Sandra Gigovic	____	Steve Marr	____
		Alan Lietz	____		

RV-0439-01 (VAR-22 MODIFICATION)

TransCanada
In business to deliver







LEGEND

- MILEPOST
- KEYSTONE XL PROJECT
- VALVE
- VALVE SITE AREA (FENCED)
- ACCESS ROAD
- PROPERTY PARCEL
- SECTION LINE

KEYSTONE XL PROJECT

RV-0439-01 (VAR-22 MODIFICATION)

COUNTY:	LYMAN	DRAWN BY:	PD
STATE:	SOUTH DAKOTA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
A	ISSUED FOR REVIEW.	2013-05-08

PRELIMINARY

DATE:	2013-05-08	PROJECTION:	NAD83 | UTM14 N

PREPARED BY:

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Tallahassee, FL 32308
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DWG:	XL-30-P-9200	SHEET:	1

Keystone XL Project

016567

0499-SD-P4-419.7-421.1-S

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: | Footprint: X | Design:

Centerline: | Pump Station: | Valve Site: X | CAR: X

2

LOCATION: Sketch: | Pictures: N/A

State: SD | County: Meade | Quad Map: N/A

Township: 008N, (007N) | Range: 016E | Aerial Map: See attached map sheet

Section: 035, (002, 001) | Centerline: 6/11/2013 | MP: 419.68 to 421.09

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

The primary reason for this footprint change is to relocate mainline valve MLV-18 due to compliance requirement of being less than 10 miles away from the Cheyenne River (MP 429.8). Currently, MLV-18 is ~ 10.1 miles away from River, so the MLV-18 is being shifted 1.4 miles south.

This proposed footprint changes are requested by Engineering and were field verified by civil survey.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

Also see "Supplemental Info" for Valve Details.

CAR-148 (Near MP 419.7, Temporary): Due to the relocation of MLV-18, CAR will now be temporary access road. Original Length: 684 ft. New Length: 624 ft.
1 Tract Impacted by modification: ML-SD-ME-11040 (Freda Wilson, LE; Linda Grenz, Jennifer Silbaugh).

CAR-166 (Near MP 419.7, Permanent): Due to the relocation of MLV-18, CAR-166 will now be a permanent access road. It was also extended based on civil survey data to the new MLV-18 location. Original Length: 654 ft. New Length: 8,297 ft.
1 Tract Impacted by modification: ML-SD-ME-11040 (Freda Wilson, LE; Linda Grenz, Jennifer Silbaugh); ML-SD-ME-11050 (Hugh G. Hudson & Beverly J. Hudson, Trustees of the Hugh G. & Beverly J. Hudson Family Trust); ML-SD-ME-11060 (Edward C. Hawks & Gloria Hawks).

ADDITIONAL IMPACTS (Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

PHMSA Spacing requirements are not impacted by this check and manual valve relocation.

A small portion of CAR-166 will require environmental survey.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment		ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
	35 - 65' +	0 EA	$ -	$ 185,000/EA
	10' - 19'	0 EA	$ -	$ 77,250/EA
	Less than 10'	0 EA	$ -	$ 32,500/EA
Additional survey required:				
	Civil:	0.00 mile	$ -	$ 5,000/mile
	Cultural:	0.34 mile	$ 858.35	$ 2,500/mile
	Biological:	0.34 mile	$ 961.35	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the route variation: $ 1,819.69 **(See "Additional Impacts" above)**

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

4 **LAND / TransCanada** *Tina Hall*

a) Is a new landowner affected by the proposed variation?	Yes	No X
b) Is the affected landowner/tract a possible condemnation?	Yes	No
c) Does proposed route variation impact Tribal Lands?	Yes	No X
d) Does proposed route variation impact any Federal/State Lands?	Yes	No X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?	Yes	No X
f) Is realignment proposed to satisfy landowner request?	Yes	No X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment:	N/A ft.	
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	Yes N/A	No
c) Has the centerline been staked for construction?	Yes	No X
d) Does route variation affect HDD crossing alignment?	Yes	No X
e) Is realignment proposed for engineering/construction reasons?	Yes X	No
f) Will the route variation require the relocation of a pump station?	Yes	No X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No

If no, please explain why:

6 **ENVIRONMENTAL / TransCanada** *Sandra Barnett*

a) Has the corridor been environmentally surveyed?	Yes X	No
b) Has the proposed variation been environmentally surveyed?	Yes X	No
c) Does proposed route variation impact Sage Grouse areas?	Yes	No X
d) Does route variation impact ABB areas?	Yes	No X
e) Was variation proposed to satisfy environmental issues?	Yes	No X
f) Was realignment proposed to satisfy agency request?	Yes	No X

-If yes, name of agency(s):

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

h) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes	No

If no, please explain why:

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

a) Will the route variation require the relocation of a pump station?	Yes	No X
b) Will route variation impact hydraulics?	Yes X	No
c) Are additional valves required at HCA's or water crossing?	Yes	No X
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No

If no, please explain why:

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

a) Does the variation result in any new stakeholders?	Yes	No X
b) Does the variation require follow-up with specific stakeholder groups?	Yes	No X
c) Was the variation proposed to satisfy stakeholder request?	Yes	No X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	Yes X	No

If no, please explain why:

9 Originator: Engineering
Date: 8/8/2013

10 Received by:
Date: 8/8/2013
Fax to: ?

11 Assigned Tracking Number: 0499-SD-P4-419.7-421.1-S

12 Filed by:
Date:
Fax to: ?

0499-SD-P4-419.7-421.1-S

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3 FORM 1

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

Keystone XL Pipeline - Supplemental Information for Route Variation Report 0499

Prepared: 2013-08-08

RV-ID	Status	Previous Scenario		New Scenario		Relocated Distance (miles)	Upstream distance to next motorised valve or PS (miles)	Downstream distance to next motorised valve or PS (miles)	Spread	Previous Scenario	New Scenario	County	State	Previous Scenario			New Scenario			Tag (Motor operated valve)	Tag (Check valve)	Tag (Manual valve)
		Milepost	Valve ID	Milepost	Valve ID					Type	Type			Legal	Latitude	Longitude	Legal	Latitude	Longitude			
0499-01		419.68	MLV-18	421.09	MLV-18	1.41	12.2	15.0	6	MOV	MOV	Meade	South Dakota	035-08N-16E	44° 36' 17.272" N	102° 8' 38.222" W	028-29N-040E	44° 35' 22.597" N	102° 7' 31.382" W	260-FAITH-01A-B0-MLV-01		

RV-ID	New Scenario		Closest Road	Side	Previous Scenario		New Scenario		Required building setback	Distance from Road ROW/FENCE to valve (whichever greater) (ft)	Distance from CL of Road to valve (ft)
	Milepost	Valve ID			Tract Number	Owner	Tract Number	Owner			
0499-01	72.6	MLV-18	CAR-166	Upstream	ML-SD-ME-11040.000	Freda Wilson, LE; Linda Grenz, Jennifer Silbaugh	ML-SD-ME-11060.000	Edward C. Hawks & Gloria Hawks	NONE	60	46

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0499-SD-P4-419.7-421.1-S

Date: 8/8/2013

Description: The primary reason for this footprint change is to relocate mainline valve MLV-18 due to compliance issues with being less than 10 miles away from the Cheyenne River (MP 429.8). Currently, MLV-18 is ~ 10.1 miles away from River, so the MLV-18 is being shifted 1.4 miles south.

Tracking Number: 0499-SD-P4-419.7-421.1-S

MP: 419.7 to 421.1

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved X Rejected	
Comments:		Date: 8-19-13	
		If Rejected Why?	will need to change CAR-166 to a perm. road
TransCanada- Engineering	Meera Kothari	Variation: Approved ✓ Rejected	
Comments:		Date: 8/16/13	
		If Rejected Why?	
Exp - Engineering	Kevin McGlynn	Variation: Approved ✓ Rejected	
Comments:		Date: 8.20.13	
		If Rejected Why?	
TransCanada - Environmental	Sandra Barnett	Variation: Approved ✓ Rejected	
Comments:		Date: 8/15/13	
		If Rejected Why?	Pending Survey
Stantec - Risk Assesment	Heidi Tillquist	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - Facilities	Sandra Gigovic	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - PM (South Dakota)	James Odom	Variation: Approved X Rejected	
Comments:		Date: 20-Aug-13	
		If Rejected Why?	
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	
TransCanada - Area Manager	Steve Marr	Variation: Approved Rejected	
Comments:		Date:	
		If Rejected Why?	

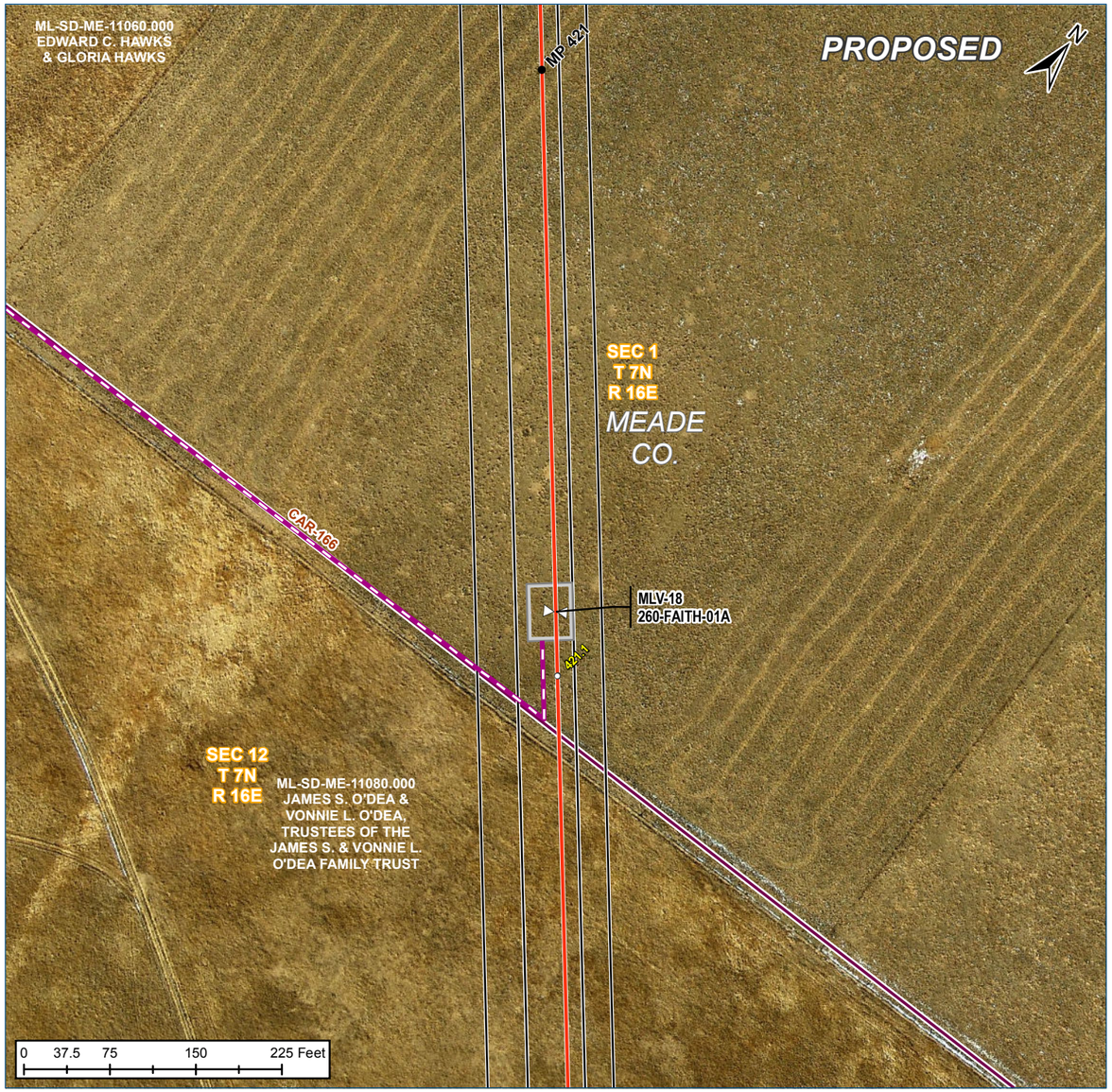
Forward to:

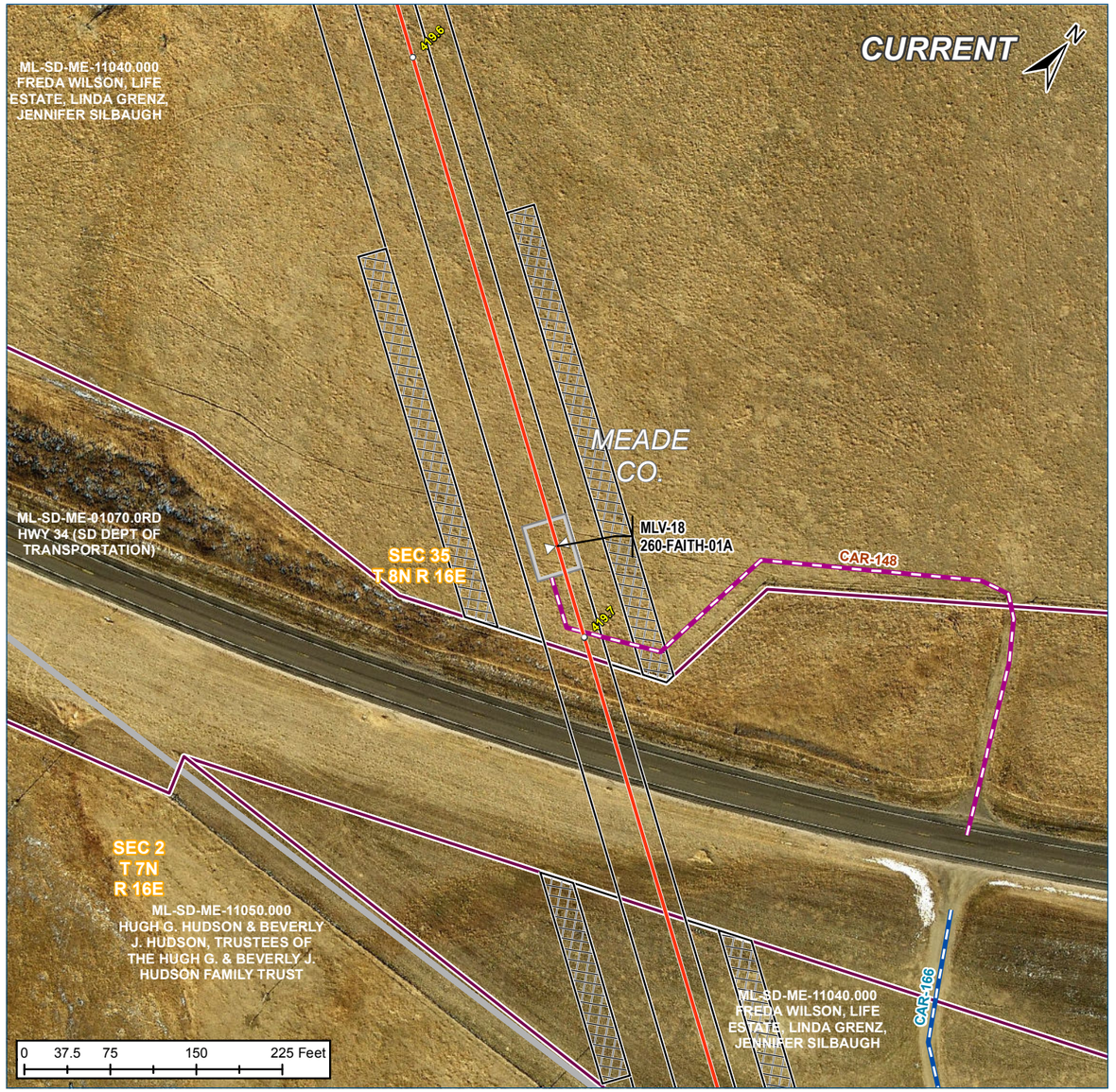
Tina Hall		Sandra Barnett		James Odom	
Meera Kothari		Heidi Tillquist		Robert Bradley	
Kevin McGlynn		Sandra Gigovic		Steve Marr	
		Alan Lietz			

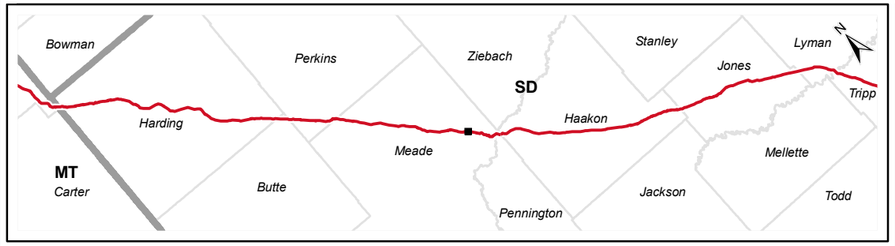
RV-0499-01 PROPOSED MLV RELOCATION

2009-2011 PICTOMETRY/2011 NAIP IMAGERY

TransCanada
In business to deliver







Keystone XL Project

LEGEND

- 1/10 Mile Post
- Centerline Mile Post (2013-06-11)
- Valve
- Valve Site
- Power Pole
- Keystone XL Centerline (2013-06-11)
- Access Road - Permanent
- Access Road - Temporary
- Transmission Line
- Workspace
- Pump Station
- Property Parcel
- Section Line
- County Line
- Waterbody
- Wetland

KEYSTONE XL PROJECT

RV-0499-01 MLV-18 RELOCATION

COUNTY:	MEADE	**DRAWN BY:**	CC
STATE:	SOUTH DAKOTA	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
A	ISSUED FOR REVIEW	2013-08-08

PRELIMINARY

DATE:	2013-08-08	**PROJECTION:**	NAD83 | UTM13 N

PREPARED BY:

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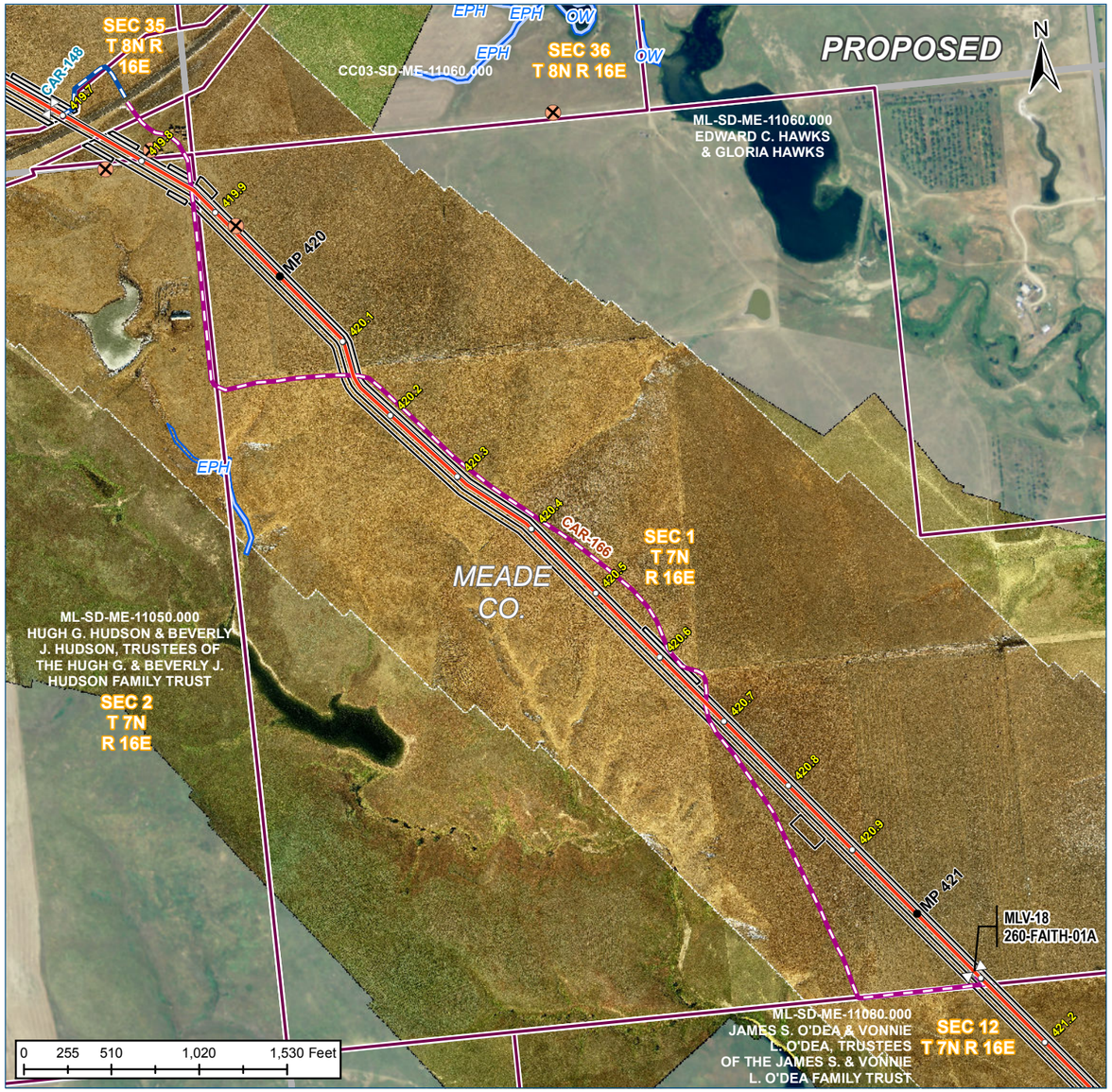
DWG:	XL-46-P-9299-RV-499-01_MLV18	**SHEET:**	1

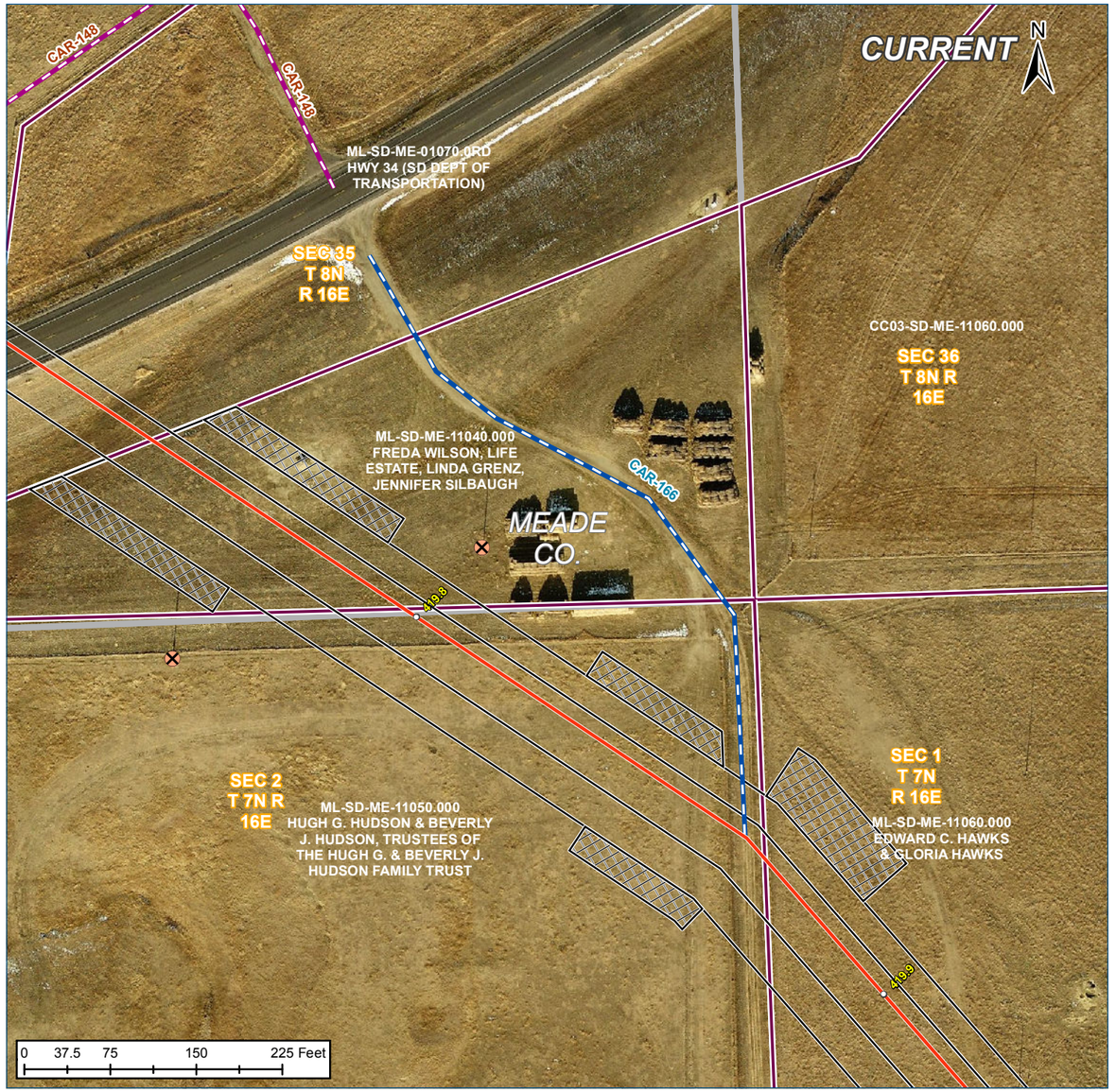
016572

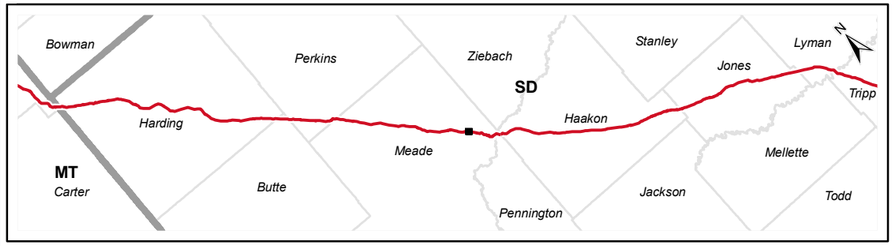
RV-0499-01 PROPOSED CAR RELOCATION

2009-2011 PICTOMETRY/2011 NAIP IMAGERY

TransCanada
In business to deliver







Keystone XL Project

LEGEND

- 1/10 Mile Post
- Centerline Mile Post (2013-06-11)
- Valve
- Valve Site
- Power Pole
- Keystone XL Centerline (2013-06-11)
- Access Road - Permanent
- Access Road - Temporary
- Transmission Line
- Workspace
- Pump Station
- Property Parcel
- Section Line
- County Line
- Waterbody
- Wetland

KEYSTONE XL PROJECT

RV-0499-01 CAR-166 RELOCATION

COUNTY:	MEADE	**DRAWN BY:**	CC
STATE:	SOUTH DAKOTA	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
A	ISSUED FOR REVIEW	2013-08-08

PRELIMINARY

DATE:	2013-08-08	**PROJECTION:**	NAD83 | UTM13 N

PREPARED BY:

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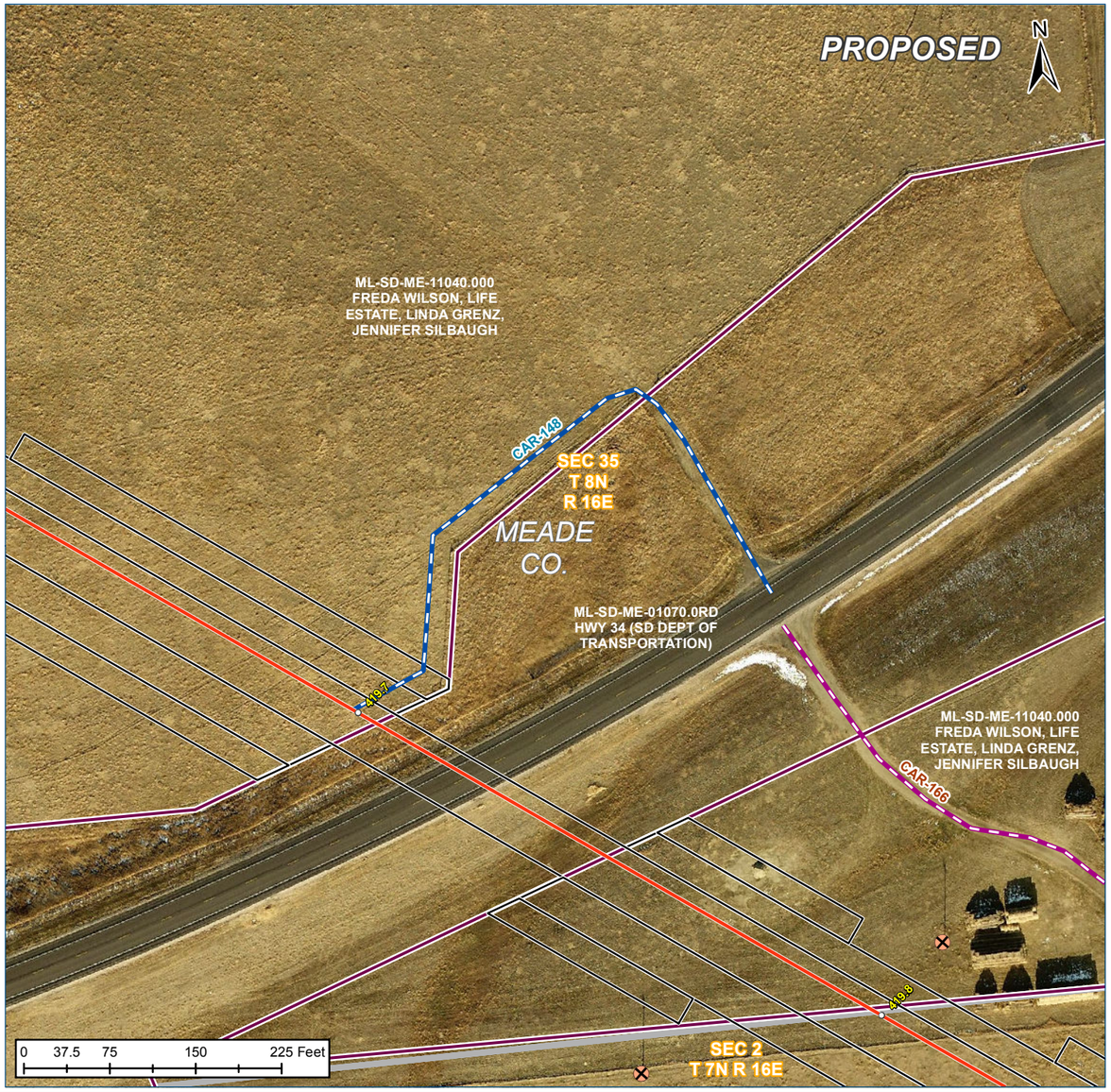
DWG:	XL-46-P-9299-RV-499-01_CAR166	**SHEET:**	1

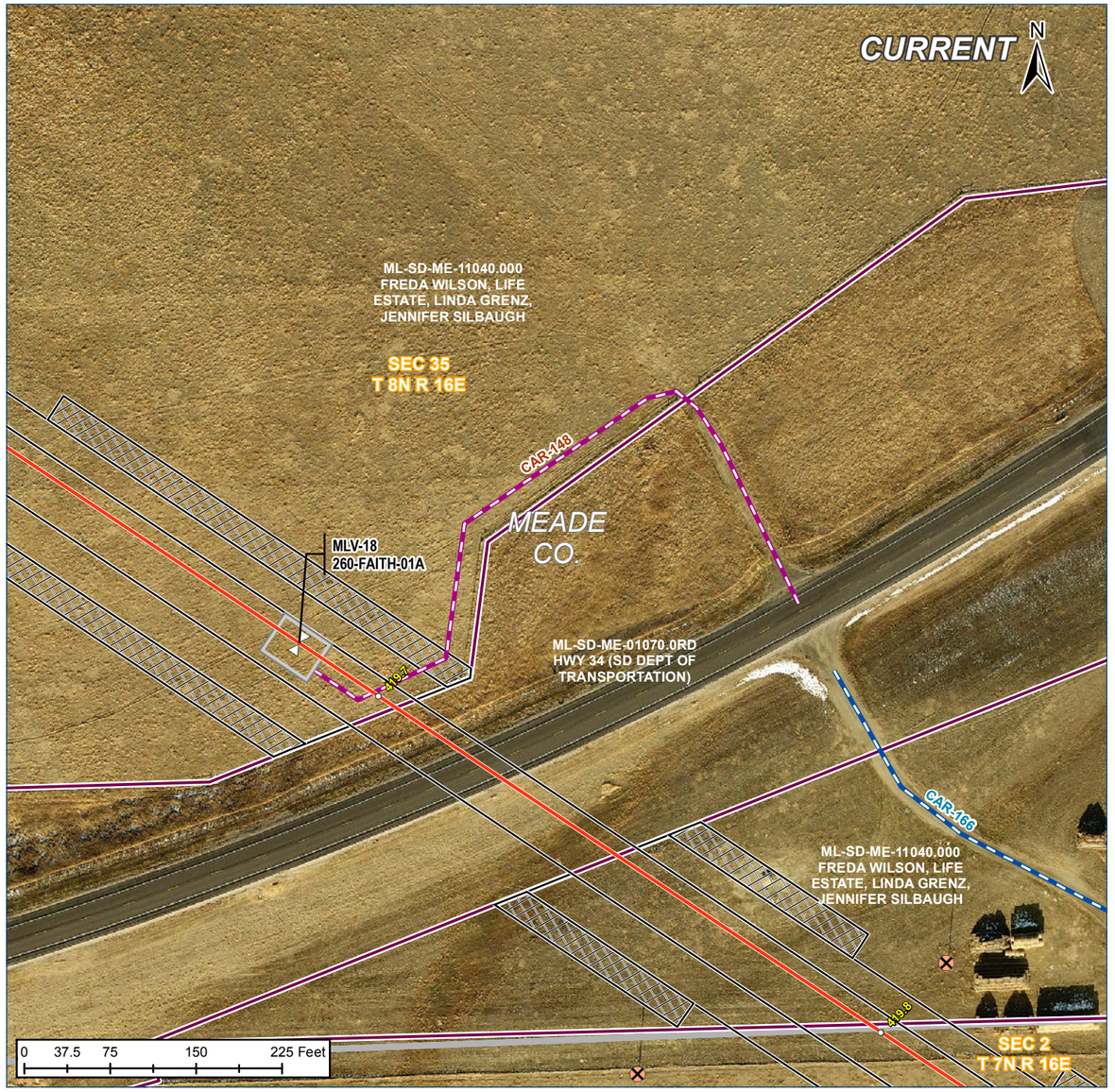
016573

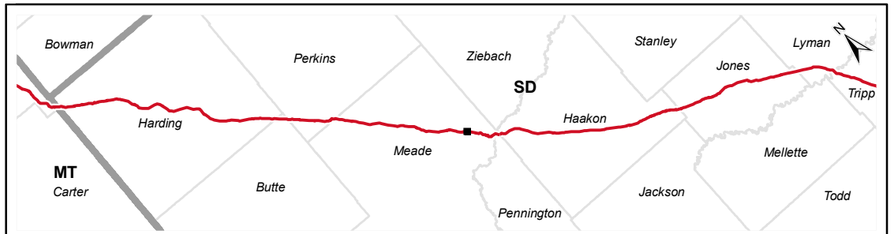
RV-0499-01 PROPOSED CAR RELOCATION

2009-2011 PICTOMETRY/2011 NAIP IMAGERY

TransCanada
In business to deliver







Keystone XL Project

LEGEND

- 1/10 Mile Post
- Centerline Mile Post (2013-06-11)
- Valve
- Valve Site
- Power Pole
- Keystone XL Centerline (2013-06-11)
- Access Road - Permanent
- Access Road - Temporary
- Transmission Line
- Workspace
- Pump Station
- Property Parcel
- Section Line
- County Line
- Waterbody
- Wetland

KEYSTONE XL PROJECT

RV-0499-01 CAR-148 RELOCATION

COUNTY:	MEADE	**DRAWN BY:**	CC
STATE:	SOUTH DAKOTA	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
A	ISSUED FOR REVIEW	2013-08-08

PRELIMINARY

DATE:	2013-08-08	**PROJECTION:**	NAD83 | UTM13 N

PREPARED BY:

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DWG:	XL-46-P-9299-RV-499-01_CAR148	**SHEET:**	1

016574

0521-SD-P4-XXX.X-XXX.X-I

KEYSTONE XL PIPELINE PROJECT
PIPELINE ROUTE VARIATION FORM

1

VARIATION TYPE: Refinement: | Reroute: | Footprint: X | Design:
Centerline: | Pump Station: | Valve Site: X | CAR:

2

LOCATION: Sketch: N/A | Pictures: N/A

State: SD | County: Harding and Haakon | Quad Map: N/A
Township: 21N, (006N) | Range: 003E, (018E) | Aerial Map: See attached map sheet
Section: 20, (14) | Centerline: 11/18/2012 | MP: XXX.X to XXX.X

3

REASON FOR ROUTE VARIATION (Please include reason for route variation):

The primary reason for these footprint changes is to increase the dimension of CK-MLV valve sites to 40'x60' to accomodate new equipment layout/space requirements due to the actuation of previous manual valves (RV-0315-01 for CK-MLV-19) to comply with PHMSA conditions.

These footprint change is requested by Engineering.

DETAIL ROUTE VARIATION (Please describe route variation in detail):

Current Valve Site dimensions for CK-MLV locations are 40 ft. by 50 ft. To accommodate equipment layout, these sites will now be 40 ft. by 60 ft. The additional 10 ft. will be added measured from the side closest to the Road for both CK-MLV-16 and CK-MLV-19. The locations impacted are listed under the supplemental section (next page).

The Valve access roads (VARs) (VAR-16 and VAR-19) will be shortened 10 ft.

ADDITIONAL IMPACTS(Please include any additional impacts which may affect cost; crossings, induction bends, etc.):

No additional cost associated to Environmental and Civil Surveys.

Is there an increase/decrease in the number of crossings? Yes | No X

If yes, please list:

COST ANALYSIS (costs incurred or saved from the route variation)

Additional length of route realignment:	0	ft.	$ -	$ 360/ft
Additional length of side-hill construction:		ft.	$ -	$ 19/ft
Additional length of wetland construction:		ft.	$ -	$ 195/ft
Additional bore length (Road, RR):		ft.	$ -	$ 540/ft
Additional foreign line/pipeline crossings:		EA	$ -	$ 30,000/EA
Additional water body crossing (streams, ponds, etc.):				
35 - 65' +	0	EA	$ -	$ 185,000/EA
10' - 19'	0	EA	$ -	$ 77,250/EA
Less than 10'	0	EA	$ -	$ 32,500/EA
Additional survey required:				
Civil:	0.00	mile	$ -	$ 5,000/mile
Cultural:	0.00	mile	$ -	$ 2,500/mile
Biological:	0.00	mile	$ -	$ 2,800/mile

Miscellaneous costs saved or added due to route variation from **ADDITIONAL IMPACTS** listed above:

Overall estimated costs of the route variation: $ - **(See "Additional Impacts" above)**

4 **LAND / TransCanada** *Tina Hall*

	Yes	No
a) Is a new landowner affected by the proposed variation?		X
b) Is the affected landowner/tract a possible condemnation?		
c) Does proposed route variation impact Tribal Lands?		X
d) Does proposed route variation impact any Federal/State Lands?		X
-If yes, name type (i.e. USFWS, BLM, etc.):		
e) Is proposed realignment outside the easement/workspace?		X
f) Is realignment proposed to satisfy landowner request?		X
-If yes, name of landowner(s)/track number(s):		
g) Has all the evaluation criteria been examined/provided for this specific discipline?	X	

If no, please explain why:

5 **ENGINEERING/CONSTRUCTION - TransCanada** *Meera Kothari*

a) Maximum deviation perpendicular to proposed alignment: N/A ft.

	Yes	No
b) Does variation (CL) (including workspaces) falls within 500 ft. MDEQ Corridor?	N/A	
c) Has the centerline been staked for construction?		X
d) Does route variation affect HDD crossing alignment?		X
e) Is realignment proposed for engineering/construction reasons?	X	
f) Will the route variation require the relocation of a pump station?		X
g) Has all the evaluation criteria been examined/provided for this specific discipline?	X	

If no, please explain why:

6 **ENVIRONMENTAL - TransCanada** *Sandra Barnett*

	Yes	No
a) Has the corridor been environmentally surveyed?	X	
b) Has the proposed variation been environmentally surveyed?	X	
c) Does proposed route variation impact Sage Grouse areas?		X
d) Does route variation impact ABB areas?		X
e) Was variation proposed to satisfy environmental issues?		X
f) Was realignment proposed to satisfy agency request?		X

-If yes, name of agency(s):

g) Environmental features:

Added (+): Subtracted (-):

Wetland ID # for newly impacted wetlands:

	Yes	No
h) Has all the evaluation criteria been examined/provided for this specific discipline?		

If no, please explain why:

7 **ENGINEERING / FACILITIES AND HYDRAULICS** *(if applicable)* *Sandra Gigovic*

	Yes	No
a) Will the route variation require the relocation of a pump station?		X
b) Will route variation impact hydraulics?		X
c) Are additional valves required at HCA's or water crossing?		X
d) Has all the evaluation criteria been examined/provided for this specific discipline?	X	

If no, please explain why:

8 **STAKEHOLDER RELATIONS / TCPL** *(if applicable)* *Bud Andersen*

	Yes	No
a) Does the variation result in any new stakeholders?		X
b) Does the variation require follow-up with specific stakeholder groups?		X
c) Was the variation proposed to satisfy stakeholder request?		X
-If yes, please specify issue type (as it aligns to stakeholder database):		
d) Has all the evaluation criteria been examined/provided for this specific discipline?	X	

If no, please explain why:

9 Originator: Engineering
Date: 6/28/2013

10 Received by:
Date: 6/28/2013
Fax to: ?

11 Assigned Tracking Number: 0521-SD-P4-XXX.X-XXX.X-I

12 Verified by:
Date:
Fax to: ?

0521-SD-P4-XXX.X-XXX.X-I

* Evaluation Criteria is located in Route Refinement and Reroute Process, Section 3

Document Control Number:
KXL10-00006-01-AA-180 (Form 1)

Keystone XL Pipeline - Supplemental Information for Route Variation Report 0521

Prepared: 2013-06-28

RV-ID	Previous Scenario (RV-0315-01)		New Scenario		Relocated Distance (miles)	Spread	Type	County	Tract Number	Owner	Closest Rd.	Side	New Scenario			Tag (Motor operated valve)	Tag (Check valve)
	Milepost	Valve ID	Milepost	Valve ID									Legal	Latitude	Longitude		
0521-01	301.7	CK-MLV-16	**301.7**	**CK-MLV-16**	0.0	8	**CHECK AND MOV**	Harding	**ML-SD-HA-00790.000**	**PAINTERS, INC.**	**VAR-17/ BULLOCK ROAD/ROAD-733**	Upstream	S020 T021N R003E	45° 46' 5.087" N 45° 46' 5.107" N	103° 46' 11.570" W 103° 46' 11.794" W	**260-HRDNG-02A-B0-MLV-01**	**260-HRDNG-02A-B0-CKV-01**
0521-01	436.1	CK-MLV-19	**436.1**	**CK-MLV-19**	0.0	10	**CHECK AND MOV**	Haakon	**ML-SD-HK-00170.000**	**KELLY BLAIR**	**VAR-19 / 202ND STREET**	Upstream	S014 T006N R018E	44° 28' 26.082" N 44° 28' 25.926" N	101° 54' 20.526" W 101° 54' 20.491" W	**260-FAITH-02A-B0-MLV-01**	**260-FAITH-02A-B0-CKV-01**

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0521-SD-P4-XXX.X-XXX.X-I

Date: 6/28/2013

Description: The primary reason for these footprint changes is to increase the dimension of CK-MLV valve sites to 40'x60' to accomodate new equipment layout/space requirements due to the actuation of manual valves.

Tracking Number: 0521-SD-P4-XXX.X-XXX.X-I

MP: XXX.X to XXX.X

Originated By: Engineering

Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Comments:	Variation: Approved ✓ Rejected	Date: 7-8-13
TransCanada- Engineering	Meera Kothari	Comments:	Variation: Approved ✓ Rejected	Date: 7-8-13
Exp - Engineering	Kevin McGlynn	Comments:	Variation: Approved ✓ Rejected	Date: 8.12.13
TransCanada - Environmental	Sandra Barnett	Comments:	Variation: Approved X Rejected	Date: 7/10/13
Stantec - Risk Assessment	Heidi Tillquist	Comments: N/A.	Variation: Approved Rejected	Date:
TransCanada - Facilities	Sandra Gigovic	Comments:	Variation: Approved Rejected	Date:
TransCanada - PM (Montana)	Alan Lietz	Comments:	Variation: Approved Rejected	Date:
TransCanada - PM (South Dakota)	James Odom	Comments:	Variation: Approved ✓ Rejected	Date: 05-July-13
TransCanada - PM (Nebraska)	Robert Bradley	Comments:	Variation: Approved Rejected	Date:
TransCanada - Area Manager	Steve Marr	Comments:	Variation: Approved Rejected	Date:

If Rejected Why? call PH 2

Forward to:
- Tina Hall
- Meera Kothari
- Kevin McGlynn
- Sandra Barnett
- Heidi Tillquist
- Sandra Gigovic
- Alan Lietz
- James Odom
- Robert Bradley
- Steve Marr

KEYSTONE XL PIPELINE PROJECT
ROUTE VARIATION AUTHORIZATION FORM

0521-SD-P4-XXXX-XXX.X-I

Date: 6/28/2013	Tracking Number: 0521-SD-P4-XXXX-XXX.X-I
Description: The primary reason for these footprint changes is to increase the dimension of CK-MLV valve sites to 40'x60' to accomodate new equipment layout/space requirements due to the adoption of manual valves.	MP: XXXX to XXXX
	Originated By: Engineering
	Variation Form Attached: Yes X No

TransCanada - Land	Tina Hall	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
TransCanada - Engineering	Meera Kothari	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
Exp - Engineering	Kevin McGlynn	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
TransCanada - Environmental	Sandra Barnett	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
Stantec - Risk Assessment	Heidi Tilquist	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments: N/A.		
TransCanada - Facilities	Sandra Gigovic	Variation: Approved ✓ / Rejected / Date: July 3, 2013 / If Rejected Why?
Comments:		
TransCanada - PM (Montana)	Alan Lietz	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
TransCanada - PM (South Dakota)	James Odom	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
TransCanada - PM (Nebraska)	Robert Bradley	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		
TransCanada - Area Manager	Steve Marr	Variation: Approved / Rejected / Date: / If Rejected Why?
Comments:		

Forward to: Tina Hall ☐ Meera Kothari ☐ Kevin McGlynn ☐ Sandra Barnett ☐ Heidi Tilquist ☐ Sandra Gigovic ☐ Alan Lietz ☐ James Odom ☐ Robert Bradley ☐ Steve Marr ☐

Environmental OS

MOC #	Mile Post	Tracks	Approved	Rejected	Comments	Recommendations
0520-01						
	27.9	CK-MLV-02	X			
	72.6	CK-MLV-04	X			
	85.6	CK-MLV-06	X			
	90.6	CK-MLV-06B	X			
	91.7	CK-MLV-07	X			
	198.3	CK-MLV-11	X			
0519-MT-P4						
		ML-MT-FA-00060	X			
		ML-MT-FA-00475	X			
		ML-MT-FA-00670	X			
		ML-MT-FA-00330	X			
		ML-MT-DA-00150	X			
		ML-MT-DA-00270	X			
		ML-MT-DA-00415	X			
		ML-MT-DA-20025	X			
		ML-MT-VA-00830	X			
		ML-MT-VA-00015	X			
		ML-MT-VA-30500	X			
		ML-MT-PR-00035	X			
		ML-MT-MC-00245	X			
		ML-MT-MC-20800	X			
0453-MT-P4						
	7.14	CAR-001A	X			
	14.39	CAR-002A	X			
	19.44	CAR-004A	X			
	54.34	CAR-016	X		Pending survey	
	56.87	CAR-084	X			
	212.39	CAR-032	X			
	224.6	CAR-034	X			
		CAR-327	X		Pending survey	
0526-MT-P4						
	86	Kasa Point	X			
	205.2	Bluffport	X		Pending Survey	
	178.8	Fisher Gravel	X		Pending Survey	
	87.7	Frazer	X		Pending Survey	
0521-SD-P4						
	301.7	CK-MLV-16	X			
	436.1	CK-MLV-19	X			
0464-SD-P4						
		ML-SD-HA-00530	X			
		ML-SD-HA-11425	X			
		ML-SD-PN-10040	X			
		ML-SD-TR-10320	X			
		ML-SD-TR-11820	X			
		ML-SD-JO-10840	X			
0524-SD-P4						
	522	Reliance	X			
	430.8	Harrold	X			
	471	Box Elder	X		Pending Full Survey of Site	
	538	Kimbal Spur	X		Pending Site	

TRANSMISSION LINES NEAR PS-15 NAIP 2012

TransCanada
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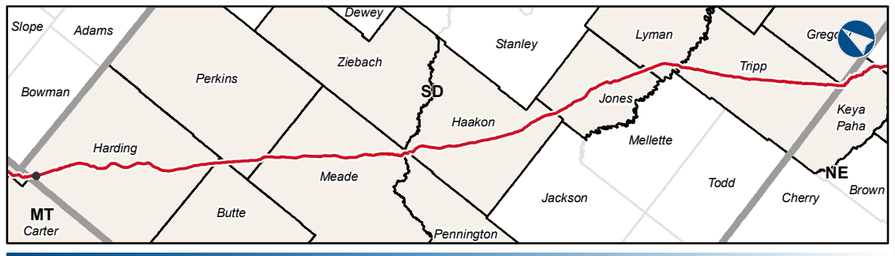

Keystone XL Project

LEGEND

- 1/10 Mile Post
- Mile Post (2013-06-11)
- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	HARDING	**DRAWN BY:**	CC
STATE:	SD	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW	2013-09-03

PRELIMINARY

DATE:	2013-09-03	**PROJECTION:**	NAD83 | UTM13 N

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DWG:	XL-46-P-9317-T-PS15-17	**SHEET:**	1

016581

TRANSMISSION LINES NEAR PS-16 NAIP 2012

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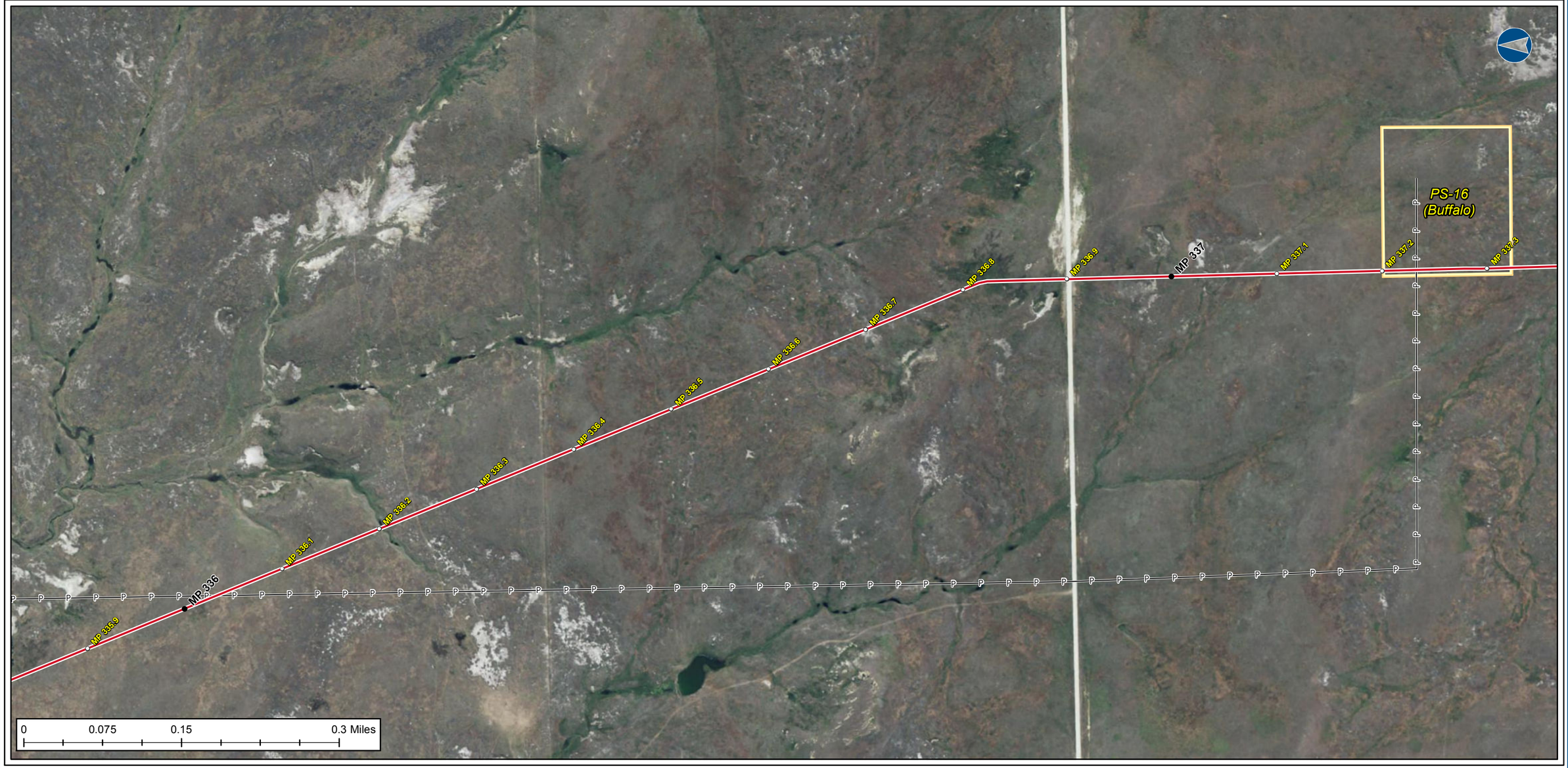

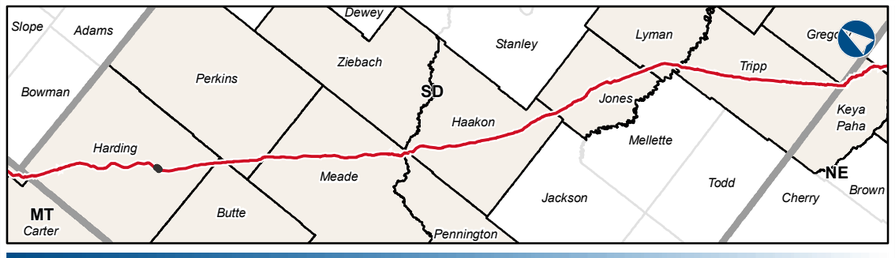

Keystone XL Project

LEGEND

- 1/10 Mile Post
- Mile Post (2013-06-11)
- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	HARDING	**DRAWN BY:**	CC
STATE:	SD	**CHECKED BY:**	PD

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DWG:	XL-46-P-9317-T-PS15-17	**SHEET:**	2

016582

TRANSMISSION LINES NEAR PS-16

NAIP 2012

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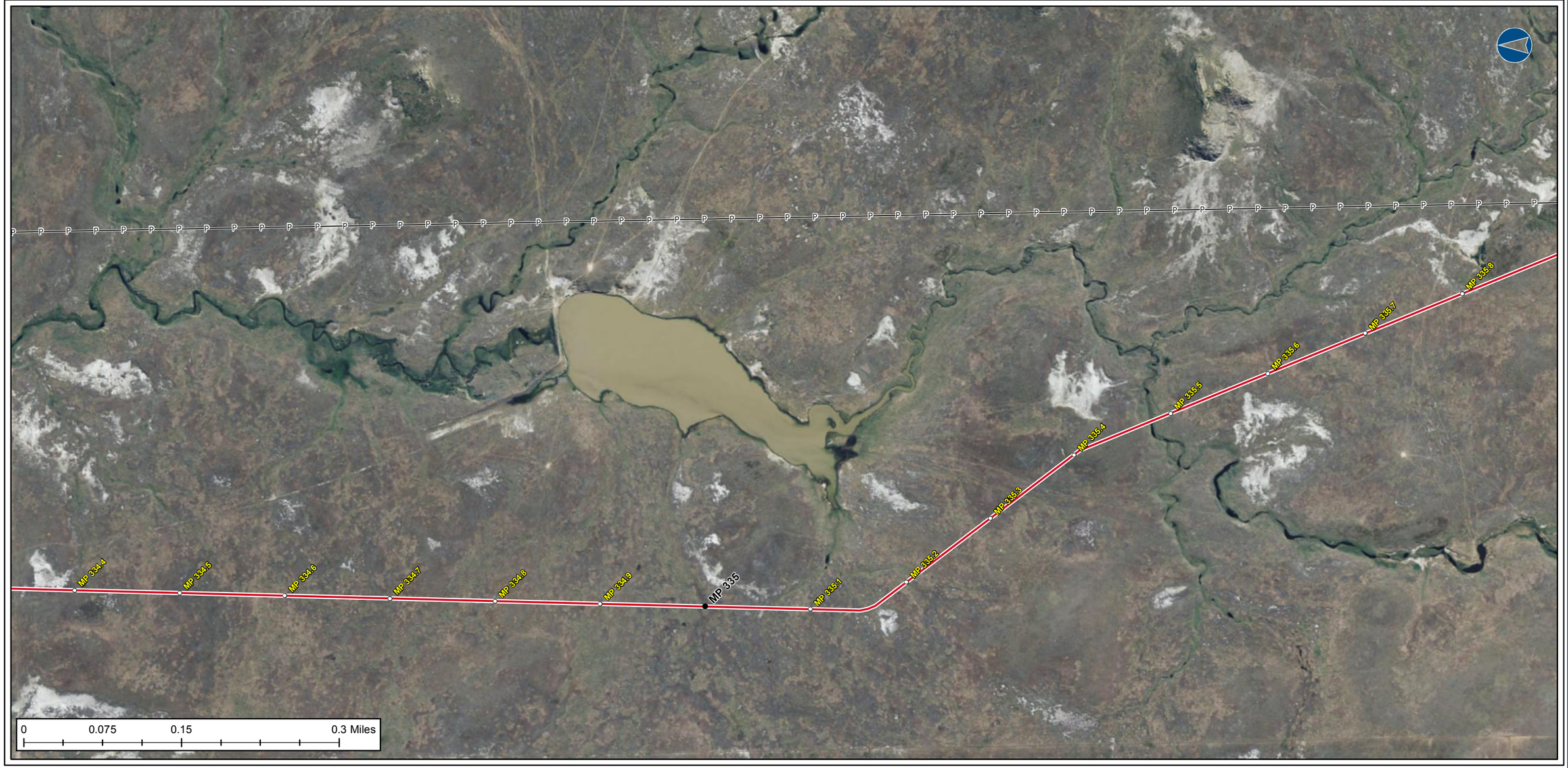

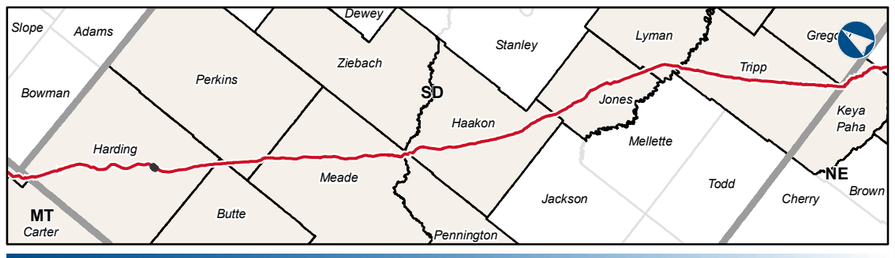

Keystone XL Project

LEGEND

- 1/10 Mile Post
- Mile Post (2013-06-11)
- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	HARDING	**DRAWN BY:**	CC
STATE:	SD	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
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TRANSMISSION LINES NEAR PS-16 NAIP 2012

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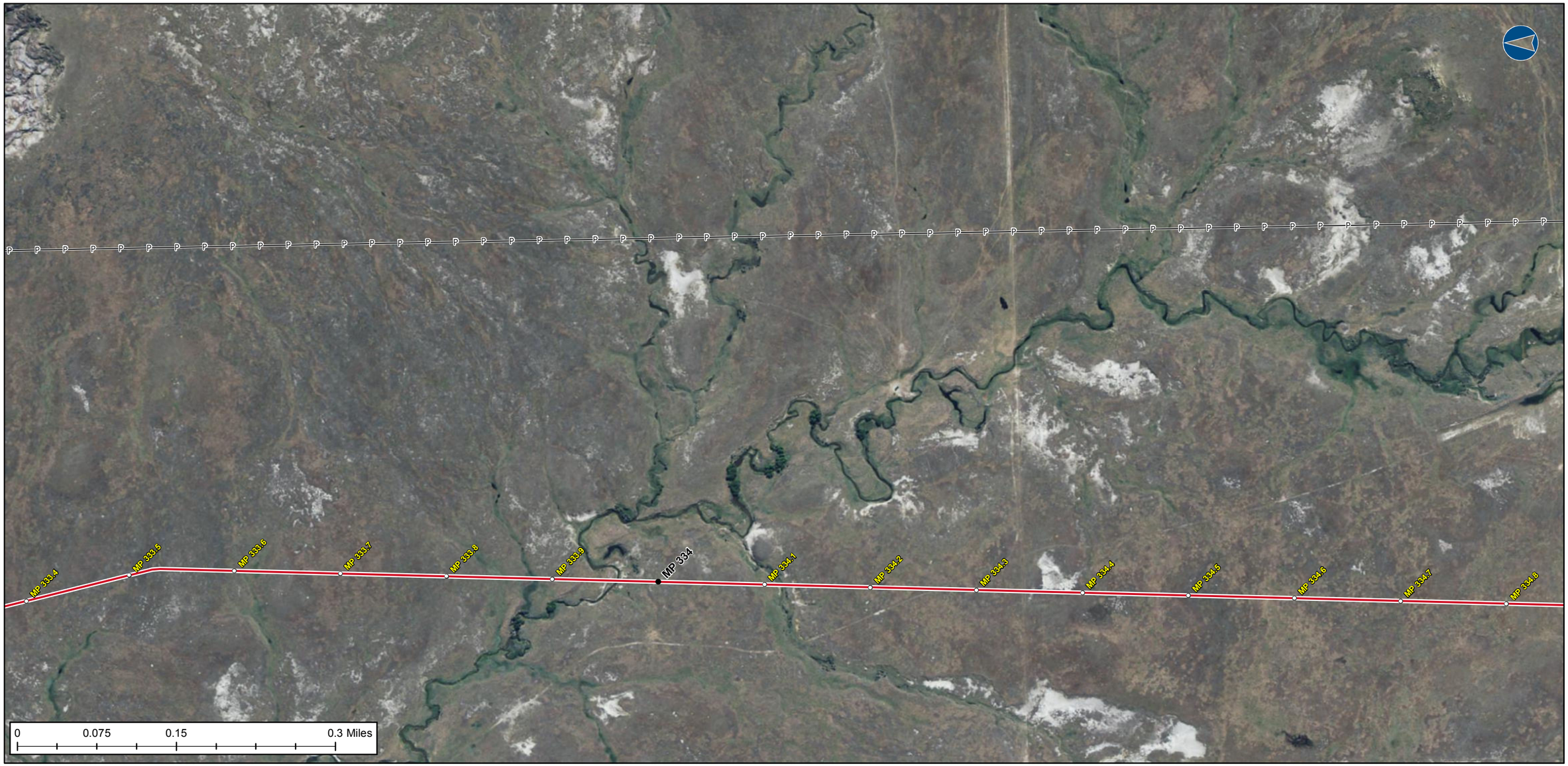

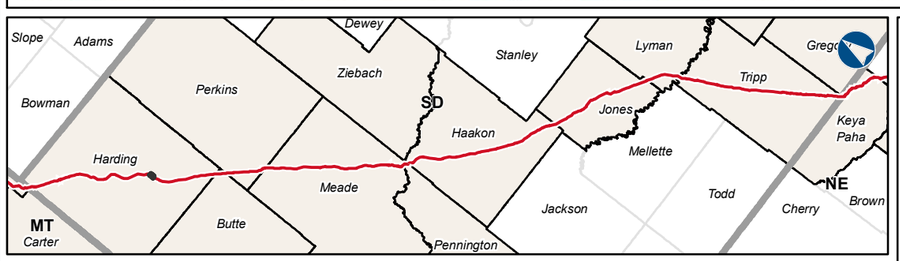

Keystone XL Project

LEGEND

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- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	HARDING	**DRAWN BY:**	CC
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TRANSMISSION LINES NEAR PS-16 NAIP 2012

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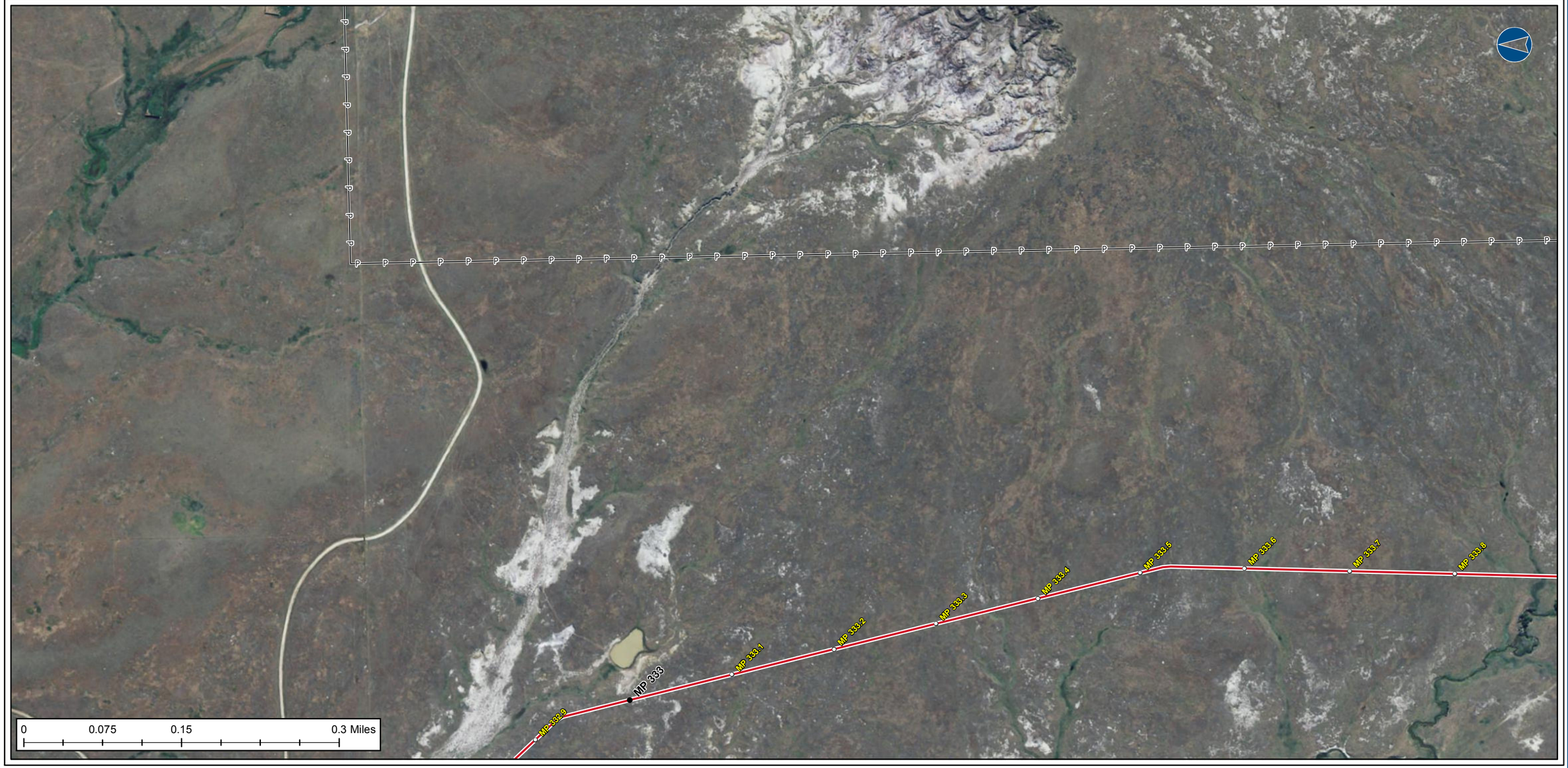

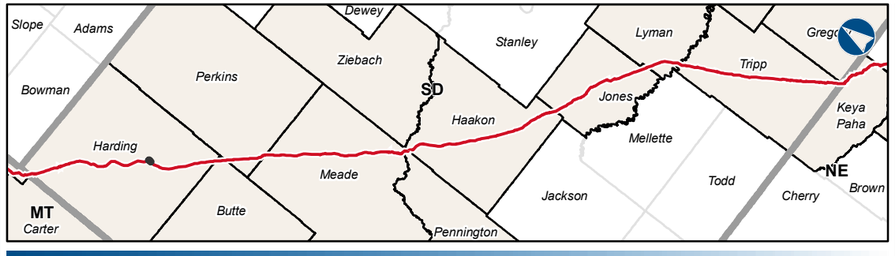

Keystone XL Project

LEGEND

- 1/10 Mile Post
- Mile Post (2013-06-11)
- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	HARDING	**DRAWN BY:**	CC
STATE:	SD	**CHECKED BY:**	PD

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW	2013-09-03

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TRANSMISSION LINES NEAR PS-17 NAIP 2012

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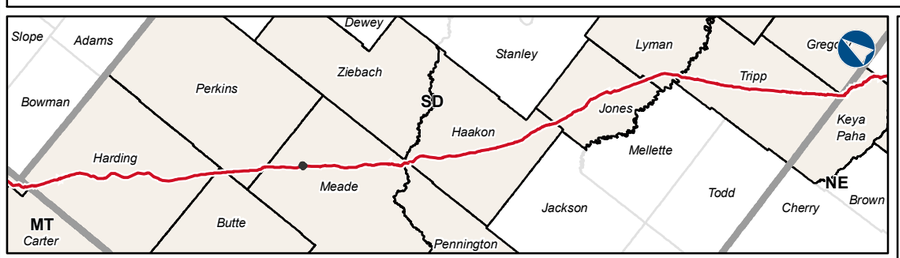

Keystone XL Project

LEGEND

- 1/10 Mile Post
- Mile Post (2013-06-11)
- Keystone XL Centerline (2013-06-11)
- Transmission Line
- Pump Station

KEYSTONE XL PROJECT

PUMP STATION / TRANSMISSION LINES

COUNTY:	MEADE	**DRAWN BY:**	CC
STATE:	SD	**CHECKED BY:**	PD

REV. NO.	REVISION	DATE
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DATE:	2013-09-03	**PROJECTION:**	NAD83 | UTM13 N

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DWG:	XL-46-P-9317-T-PS15-17	**SHEET:**	6

016586

PS-15 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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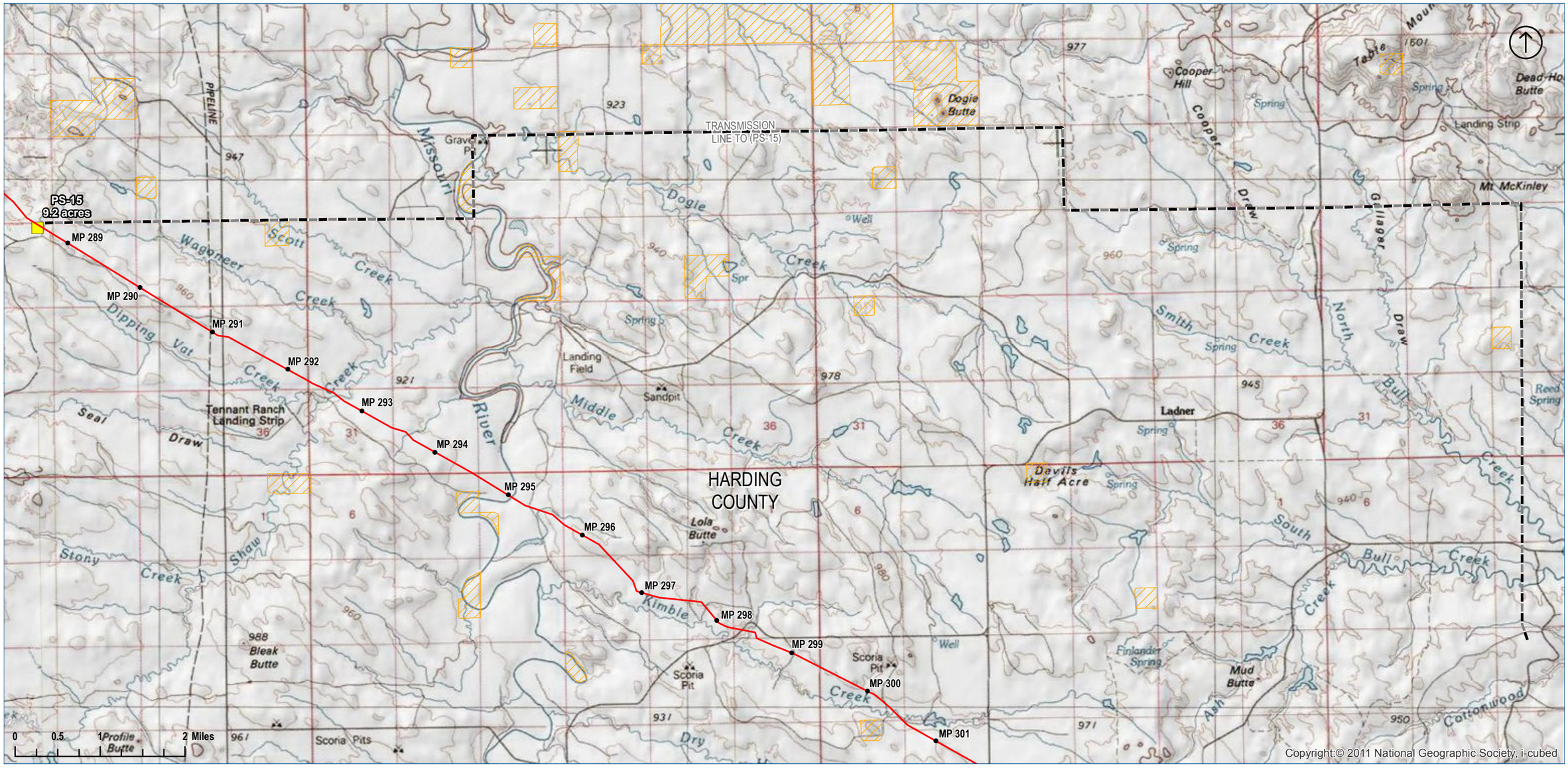
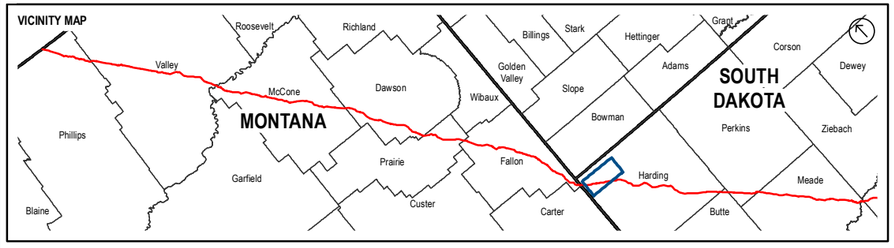


VICINITY MAP



Keystone XL Project

LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-15 Transmission Line
(Project Location on Federal Lands)

COUNTY:	HARDING	DRAWN BY:	GS
STATE:	SOUTH DAKOTA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
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DATE:	2012-09-19	PROJECTION:	NAD83 | UTM13 N

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PS-16 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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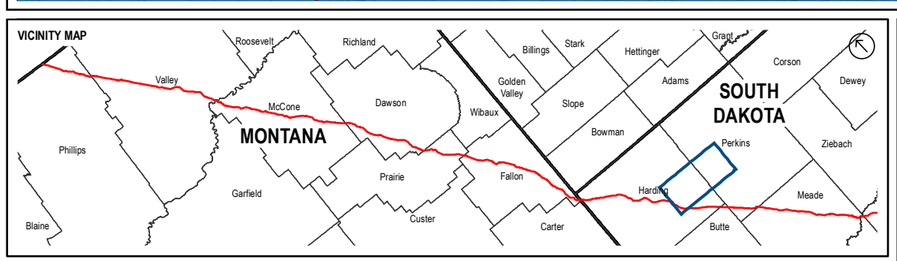
VICINITY MAP



Keystone XL Project

LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-16 Transmission Line (Project Location on Federal Lands)

COUNTY:	HARDING	**DRAWN BY:**	GS
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

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DATE:	2012-09-19	**PROJECTION:**	NAD83 | UTM13 N

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PS-17 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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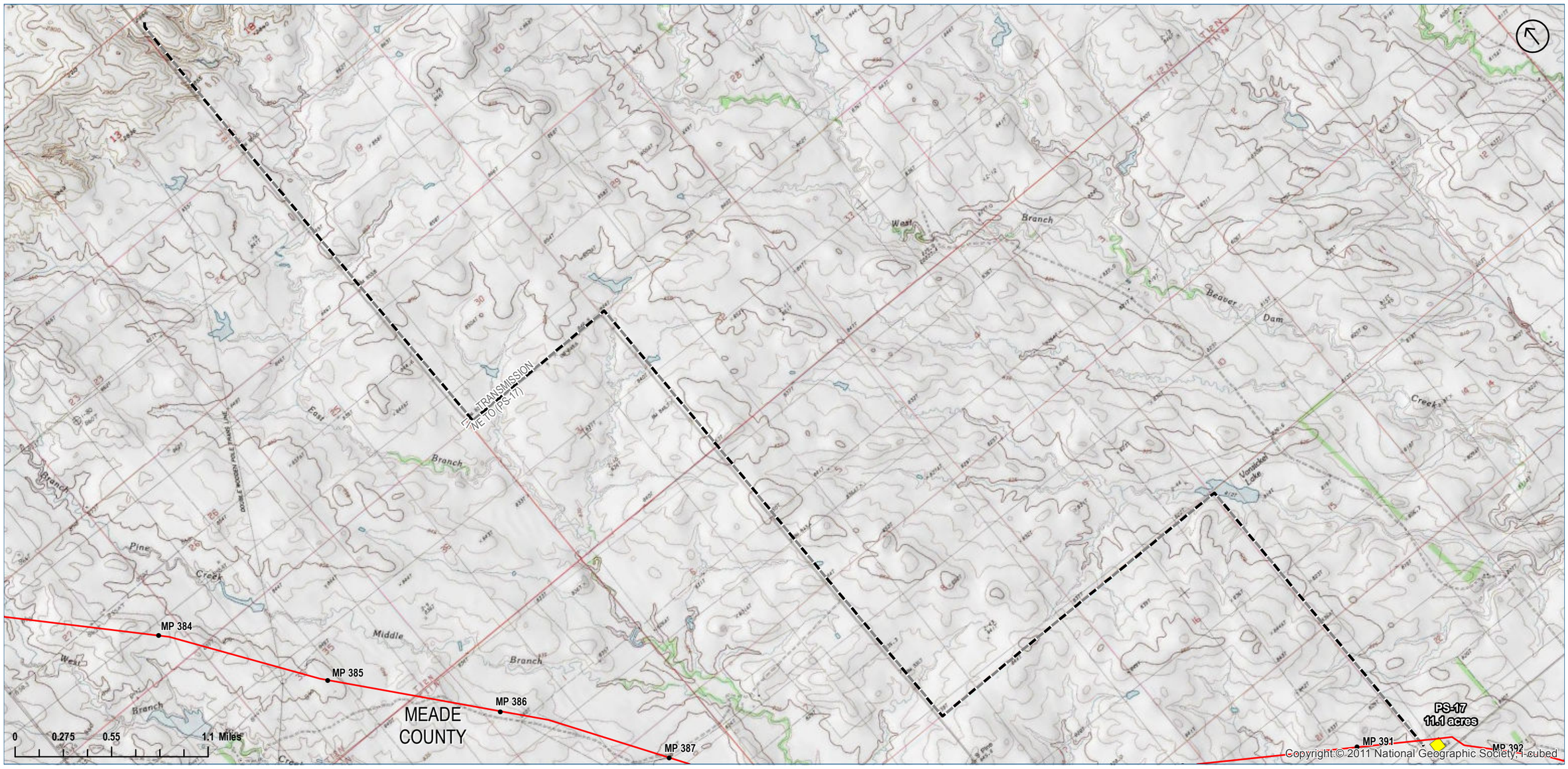
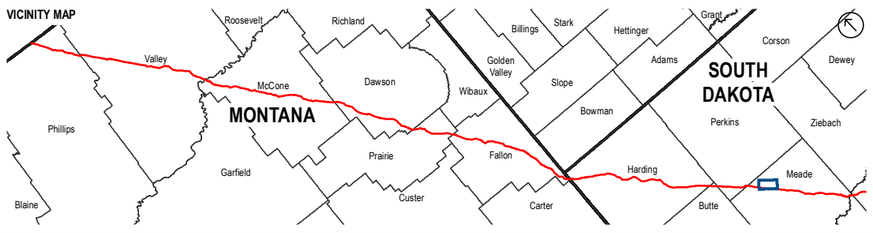


VICINITY MAP



LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-17 Transmission Line
(Project Location on Federal Lands)

COUNTY:	MEADE	DRAWN BY:	GS
STATE:	SOUTH DAKOTA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
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DATE:	2012-09-19	PROJECTION:	NAD83 | UTM13 N

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DWG:	XL-30-P-2002-L-TL-T	SHEET:	OVERVIEW

Keystone XL Project

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PS-18 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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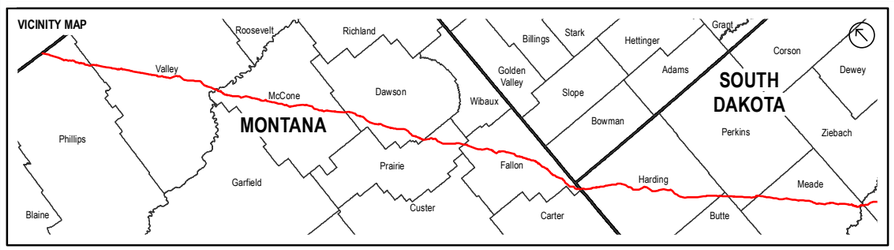

LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-18 Transmission Line (Project Location on Federal Lands)

COUNTY:	HAAKON	DRAWN BY:	GS
STATE:	SOUTH DAKOTA	CHECKED BY:	JP

REV. NO.	REVISION	DATE
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PRELIMINARY

DATE:	2012-09-19	PROJECTION:	NAD83 | UTM13 N

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DWG:	XL-30-P-2002-L-TL-T	SHEET:	OVERVIEW

Keystone XL Project

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PS-19 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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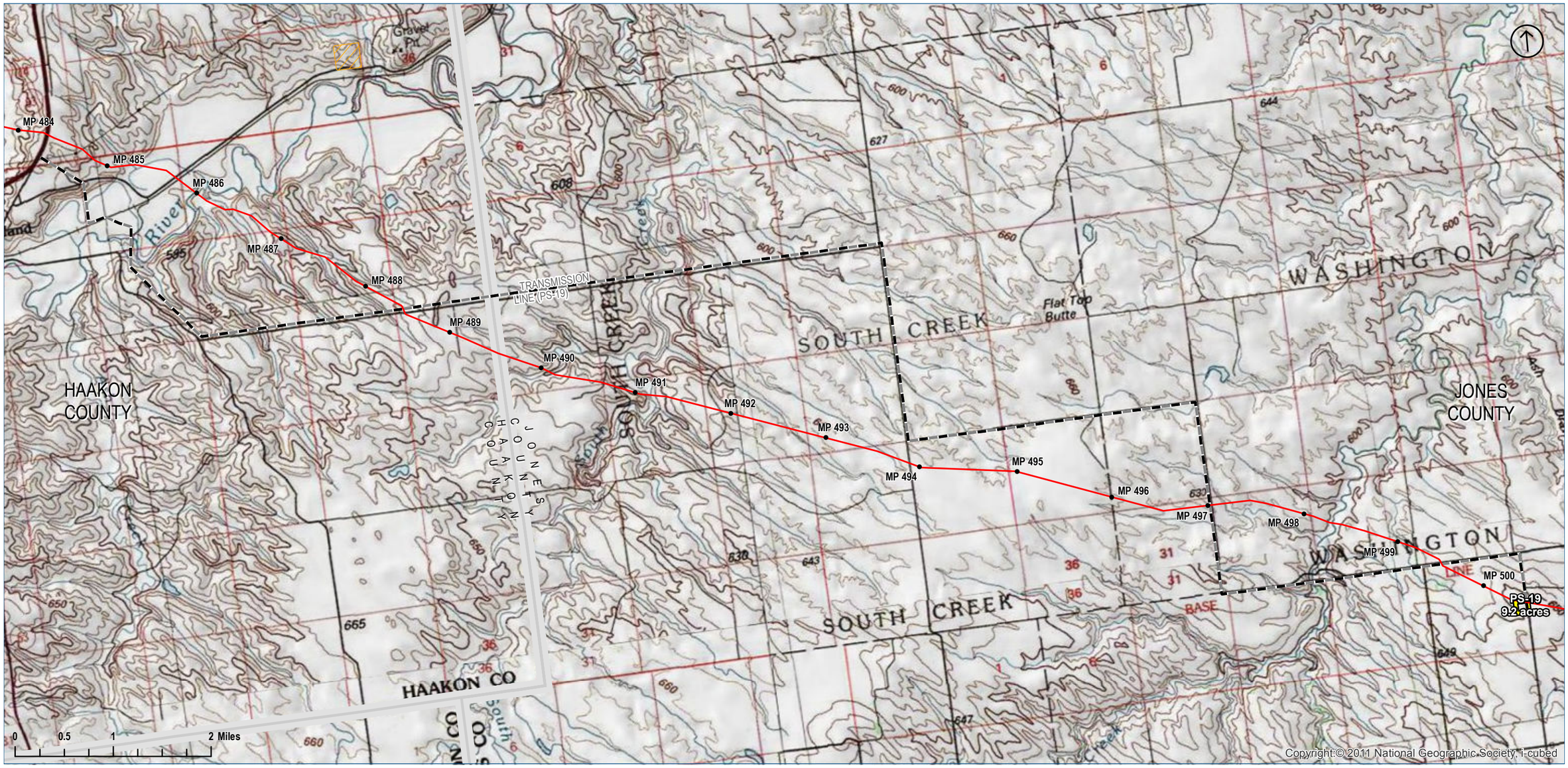
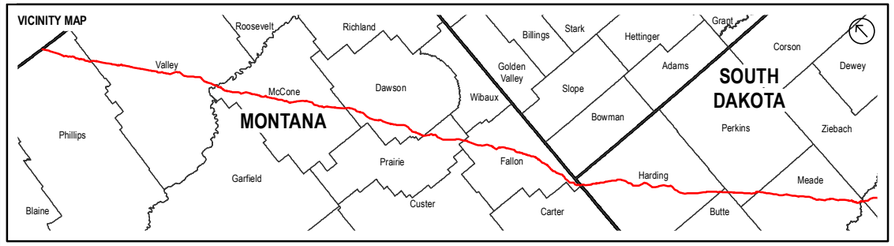


VICINITY MAP



LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-19 Transmission Line
(Project Location on Federal Lands)

COUNTY:	JONES	**DRAWN BY:**	GS
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
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PRELIMINARY

DATE:	2012-09-19	**PROJECTION:**	NAD83 | UTM13 N

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DWG:	XL-30-P-2002-L-TL-T	**SHEET:**	OVERVIEW

Keystone XL Project

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PS-20 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

TransCanada
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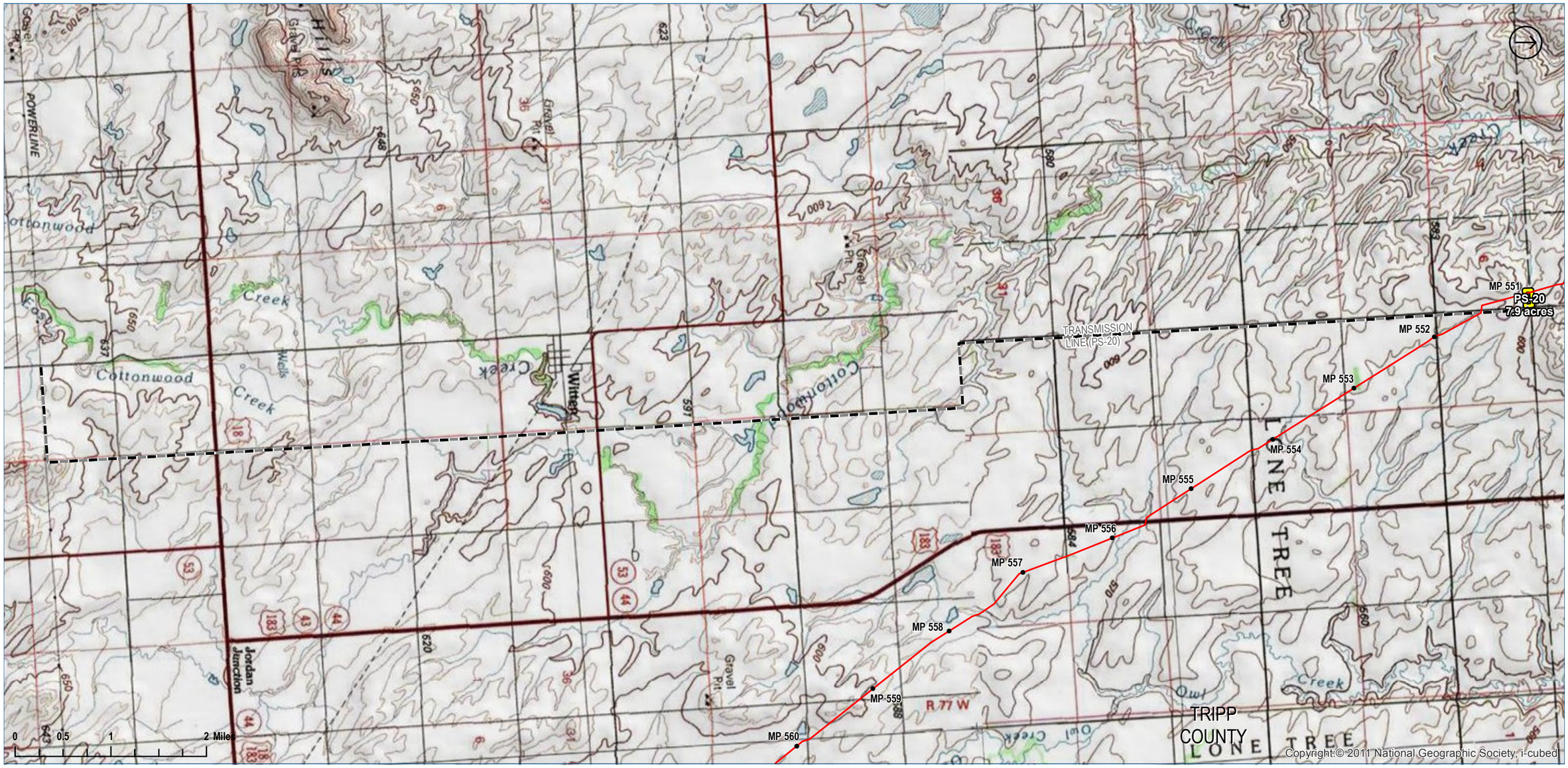
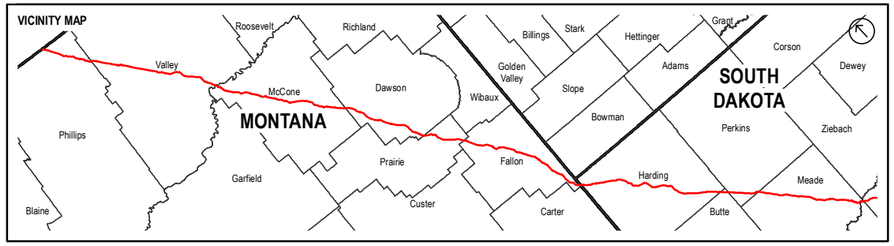


VICINITY MAP



Keystone XL Project

LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-20 Transmission Line
(Project Location on Federal Lands)

COUNTY:	TRIPP	DRAWN BY:	GS
STATE:	SOUTH DAKOTA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
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	PRELIMINARY	

DATE:	2012-09-19	PROJECTION:	NAD83 | UTM13 N
DWG:	XL-30-P-2002-L-TL-T	SHEET:	OVERVIEW

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PS-21 TRANSMISSION LINE (PROJECT LOCATION ON FEDERAL LANDS)

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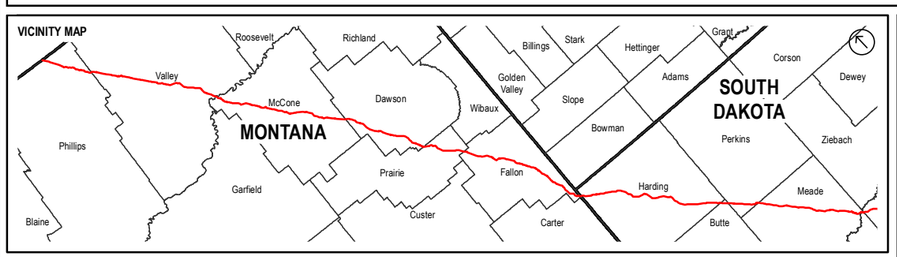
VICINITY MAP



Keystone XL Project

LEGEND

- Milepost
- Proposed Pipeline
- Transmission Line
- Pump Station
- County Line
- Federal Lands

PS-21 Transmission Line
(Project Location on Federal Lands)

COUNTY:	TRIPP	**DRAWN BY:**	GS
STATE:	SOUTH DAKOTA	**CHECKED BY:**	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR DOS ER	2012-09-19

PRELIMINARY

DATE:	2012-09-19	**PROJECTION:**	NAD83 | UTM13 N

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DWG:	XL-30-P-2002-L-TL-T	**SHEET:**	OVERVIEW

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Final PHMSA Recommended Conditions for Keystone XL State Dept. Presidential Permit

Document version February 10, 2011

The Pipeline and Hazardous Materials Safety Administration (PHMSA) recommends that the U.S. Department of State impose the following conditions if a Presidential Permit will be granted to TransCanada Keystone Pipeline, LP ("Keystone") to construct and operate the Keystone XL Pipeline ("Keystone XL" or the "pipeline"). Specifically, the State Department should require Keystone to include all of the following in its written design, construction, and operating and maintenance plans and procedures:

I. Material Requirements

1) Steel Properties: The skelp/plate must be micro-alloyed, fine grain, fully killed steel with calcium treatment and continuous casting.

2) Manufacturing Standards: Pipe must be manufactured according to American Petroleum Institute Specification 5L, Specification for Line Pipe (API 5L 44th Edition), product specification level 2 (PSL 2), supplementary requirements (SR) for maximum operating pressures and minimum operating temperatures. Pipe carbon equivalents must be at or below 0.23% based on the material chemistry parameter, carbon equivalent (CE) (Pcm) formula (Ito-Bessyo formula) or 0.40% based on the C-IIW formula (International Institute of Welding formula).

3) Fracture Control: API 5L and other specifications and standards addressing the steel pipe toughness properties needed to resist crack initiation, crack propagation and to ensure crack arrest during a pipeline failure caused by a fracture must be followed. Keystone must prepare and implement a fracture control plan addressing the steel pipe properties necessary to resist crack initiation and crack propagation. The plan must include acceptable Charpy Impact and Drop Weight Tear Test values, which are measures of a steel pipeline's toughness and resistance to fracture. The fracture control plan must be in accordance with API 5L (44th Edition) and include the following tests:

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a) Fracture Toughness Testing for Shear Area: Test results must indicate at least 85% minimum average shear area per test for all X- 70 heats and 85% minimum shear area for all X- 80 heats with a minimum result of 80% shear area for any single test. The test results must also ensure a ductile fracture and arrest;

b) Fracture Toughness Testing for Absorbed Energy in accordance with Annex G and a minimum of 50 ft-lbs per heat on a full sized specimen at -5 degrees C/23 degrees F; and

c) Fracture Toughness Testing by Drop Weight Tear Test for All New Pipeline Segments or Pipe Replacements: Test results must be at least 85% of the average shear area for all heats with a minimum result of 60% of the shear area for any single test. The test results must also ensure a ductile fracture and arrest.

The above fracture control plan must account for the entire range of pipeline operating temperatures, pressures and product compositions planned for the pipeline diameter, grade and operating stress levels, including maximum pressures and minimum temperatures for shut-in conditions. Where the use of stress factors, pipe grade, operating temperatures and product composition make fracture toughness calculations non-conservative, correction factors must be used.

4) Steel – Plate, Coil or Skelp Quality Control and Assurance: Keystone must prepare and implement an internal quality management program at all mills involved in producing steel plate, coil, skelp, and pipe to be operated in the pipeline. These programs must be structured to detect and eliminate defects, inclusions, non-specification yield strength, and tensile strength properties, and chemistry as affecting pipe quality.

a) A mill inspection program or internal quality management program must include the following:

(i) Non-destructive test of the ends and at least 35 percent of the surface of the plate, coil or pipe shall be performed to identify imperfections such as laminations, cracks, and inclusions that may impair serviceability. 100 percent of the pipe sections must be tested. Surface ultrasonic shall be done in accordance with American Society of Testing and Materials (ASTM) A578/A578M Level B or

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equivalent, to acceptance Level B. Pipe ends shall be inspected by ultrasonic, magnetic particle or liquid penetrant methods, with acceptance criteria as outlined in Clause 9.10.4 or API 5L (44th Edition).

(ii) A macro etch test or other equivalent method to identify inclusions that may form centerline segregation during the continuous casting process shall be performed. Use of sulfur prints is not an equivalent method. The test must be carried out on a slab from the first heat of each sequence, and graded with an acceptance criteria of one or two on the Mannesmann scale or equivalent;

(iii) A quality assurance monitoring program implemented by the operator shall include evaluations of:

a. all steelmaking and casting facilities;
b. quality control plans and manufacturing procedure specifications;
c. equipment maintenance and records of conformance;
d. procedures for controls on superheat and casting speeds, steel rolling temperatures and cooling temperatures;
e. additional mechanical and chemical properties tests based upon steel grade, plate or coil, and must be selected based upon knowledge of patterns of property variability in the coils and plate based upon the steel making process and rolling and cooling temperatures to assure that steel properties are not variable;
f. A verification program to ensure the pipe mill is taking into account all yield and tensile strength losses that may occur in the coiling and pipe rolling processes to ensure that the finished pipe has yield and tensile strengths that meet API 5L specifications;
g. Coils and plate with casting and rolling process deviations that may affect steel properties must have a re-verification of

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mechanical and chemical properties on the pipe heat conducted at pipe location to ensure there are no variability in the pipe;

h. The pipe supplier must notify Keystone of all instances that do not meet the above items prior to supplying the pipe to Keystone; and

i. Procedures for centerline segregation monitoring to ensure mitigation of centerline segregation during the continuous casting process.

(iv) Pipe end tolerances must be applied so that there are no flat spots on the pipe that could affect welding quality. From each pipe mill, the end tolerances on pipe diameter must not exceed the range given in API 5L, Forty-Fourth (44th) Edition, Table 10, for any given pipe wall thickness. Keystone must demonstrate compliance with API 5L 44th Edition Table 10 by providing to the appropriate PHMSA Region Director(s), Central, Western, and Southwest Region, a histogram of end tolerance and wall thickness data representing physical evidence of compliance for a minimum of 10% of the pipe manufactured by each pipe mill facility.

(v) During construction, if pipe supplied from varying pipe mills cannot be preferentially strung, histograms and field weldability tests should be conducted to ensure that excessive high low is not in production/field welds.

5) Pipe Seam Quality Control: Keystone must prepare and implement a quality assurance program for pipe weld seams. The pipe weld seam tests must meet the minimum requirements for tensile strength in API 5L for the appropriate pipe grade properties. A pipe weld seam hardness test using the Vickers hardness testing of a cross-section from the weld seam must be performed on one length of pipe from each heat. The maximum weld seam and heat affected zone hardness must be a maximum of 280 Vickers hardness (Hv10). The hardness tests must include a minimum of three (3) readings for each heat

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affected zone, three (3) readings in the weld metal and two (2) readings in each section of pipe base metal for a total of thirteen (13) readings. The pipe weld seam must be 100% UT inspected after expansion and hydrostatic testing per APL 5L.

6) Monitoring for Seam Fatigue from Transportation: Keystone must inspect the double submerged arc welded seams of the delivered pipe using properly calibrated manual or automatic ultrasonic testing techniques. For each lay down area, a minimum of one (1) pipe section from the bottom layer of pipes of the first five (5) rail car shipments from each pipe mill must be inspected. For longitudinal weld seams, the entire seam must be tested. For helical seam submerged arc welded pipe, the weld seam in the area along the transportation bearing surfaces and all other exposed welded areas during the test must be tested. All the results must be appropriately documented. Each pipe section test record must be traceable to the pipe section tested.

7) Puncture Resistance: Steel pipe must be puncture resistant to an excavator weighing up to 65 tons with a general purpose tooth size of 3.54 inches by 0.137 inches. Puncture resistance will be calculated based on industry established calculations such as the Pipeline Research Council International's *Reliability Based Prevention of Mechanical Damage to Pipelines* calculation method.

8) Mill Hydrostatic Test: The pipe must be subjected to a mill hydrostatic test pressure of 95% SMYS or greater for 10 seconds. The 95% stress level may be achieved using a combination of internal test pressure and the application of end loads imposed by the hydrostatic testing equipment as allowed by API 5L, Clause 10.2.6.6.

9) Pipe Coating: The application of a corrosion resistant coating to the steel pipe must be performed according to a coating application quality control program. The program must address pipe surface cleanliness standards, blast cleaning, application temperature control, adhesion, cathodic disbondment, moisture permeation, bending, minimum coating thickness, coating imperfections and coating repair. All pipe must be protected against external corrosion by non-shielding: coatings, repair coatings and protective

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material used to protect the pipe from rock damage. Holiday detection must include appropriate calibration of jeeping equipment on a holiday that extends through the coating to the metal of the pipe to be jeeped prior to use each working day. Jeeping voltages must be set at a minimum of twenty-five hundred Volts (2500 V) for fusion bond epoxy (FBE), with higher voltages to be considered based on the coating type, thickness (maximum and minimum), grounding and field conditions that day. For other coatings, minimum voltage settings need to be established by determining the nominal coating thicknesses and coating type. The pipe should be free of any excess debris prior to running the jeeping equipment over the area. Visual inspection for holidays and coating damage should complement the use of jeeping equipment.

All pipe coating must be checked by usage of holiday detection equipment prior to backfill and FBE coated pipe must be checked with holiday detection equipment set at a minimum of twenty-five hundred Volts (2500 V) prior to backfill. All coating defects must be repaired and re-checked prior to backfill. To the extent practicable, Keystone shall jeep the coating at the same voltage in the coating mill as in the field.

II. Construction Requirements

10) Field Coating: Keystone must implement field girth weld joint coating application specification and quality standards to ensure pipe surface cleanliness, application temperature control, adhesion quality, cathodic disbondment, moisture permeation, bending, minimum coating thickness, holiday detection and repair quality. Field joint coatings must be non-shielding to cathodic protection (CP). Field coating applicators must use valid qualified coating procedures and be trained to use these procedures. Holiday detection must include appropriate calibration of jeeping equipment on a holiday that extends through the coating to the metal of the pipe to be jeeped prior to use each working day. Jeeping voltages must be set at a minimum of twenty-five hundred Volts (2500 V) for FBE, with higher voltages to be considered based on the grounding and field conditions that day. For other coatings such as for girth weld coatings, minimum voltage settings need to be established by determining the nominal coating thicknesses (maximum and minimum) and type coating used for application. The pipe should be free

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of any excess debris prior to running the jeeping equipment over the area. Visual inspection for holidays and coating damage should complement the use of jeeping equipment.

11) Coatings for Trenchless Installation: Coatings used for directional bore, slick bore and other trenchless installation methods must be capable of resisting abrasion and other damage that may occur due to rocks and other obstructions encountered in this installation technique.

12) Bends Quality: Keystone must obtain and retain certification records of factory induction bends and factory weld bends. All bends, flanges and fittings must have carbon equivalents (CE) equal to or below 0.42 or a pre-heat procedure must be applied prior to welding for CE above 0.42 on the CE-II W Formula (International Institute of Welding formula).

13) Fittings: All pressure rated fittings and components (including flanges, valves, gaskets, pressure vessels and pumps) must be rated for a pressure rating commensurate with the Maximum Operating Pressure (MOP) of the pipeline.

14) Pipeline Design Factor - Pipelines: Pipe installed must comply with the 0.72 design factor in 49 CFR § 195.106.

    a) At least six (6) months prior to beginning construction of the Keystone XL pipeline, Keystone must review with the appropriate PHMSA Regional Directors in Central, Western, and Southwest Regions how High Consequence Areas (HCAs) which could be affected, as defined in 49 CFR § 195.450, were determined (including commercial navigable waterways, high population areas, other populated areas, and unusually sensitive areas, including aquifers as defined in 49 CFR §195.6) were determined, and the design of the pipeline associated with those segments. Keystone must identify piping and the design of piping located within pump stations, mainline valve assemblies, pigging facilities, measurement facilities, road crossings, railroad crossings, and

segments operating immediately downstream and at lower elevations than a pump station. Keystone must also provide any overland spread analyses in accordance with § 195.452(f) to support could affect determinations for water bodies more than 100 feet wide from high-water mark to high-water mark.

b) Post construction, Keystone must conduct a yearly survey, not to exceed fifteen (15) months, to identify any changes on the pipeline system that would impact its designation or design.

15) Temperature Control: Normal pump discharge temperatures should remain at or below 120° Fahrenheit (°F). If the temperature exceeds 120° F, Keystone must prepare and implement a coating monitoring program in these areas, using ongoing Direct Current Voltage Gradient (DCVG) surveys or Alternating Current Voltage Gradient (ACVG) surveys, or other testing to demonstrate the integrity of the coating. Non-continuous discharge temperature "spikes" above 120 °F for less than ½ day duration will not be a cause for implementing the procedure, but Keystone must inform the appropriate PHMSA Regional Director if regular operation above 120 °F at pump station discharges will occur. Under no circumstances may the pump station discharge temperatures exceed 150° Fahrenheit (°F) without sufficient justification that Keystone's long-term operating tests show that the pipe coating will withstand the higher operating temperature for long-term operations, and approval from the appropriate PHMSA region(s).

Pump Station Discharge Temperature – operating above 120° F and up to 150° F maximum, fusion bond epoxy (FBE) coating:

a) Keystone must monitor coating performance in areas where operating temperatures have exceeded or will exceed 120° F to provide additional data on the long-term durability and integrity of FBE coatings at these temperatures. Cathodic protection (CP) current requirements and coating surveys with DCVG (soil cover) and ACVG (pavement cover) will indicate if there is deterioration in the coating at the higher temperatures.

b) For DCVG and ACVG coating evaluation survey results will be addressed as follows:

The threshold survey indication values are thirty-five percent (35%) IR for DCVG and 50dBµV for ACVG. These values represent the mid range of the "Minor" category in the severity classification used to characterize survey indications in an ECDA program.

c) Keystone shall excavate and remediate all indications found above the threshold values – Minor, Moderate and Severe categories.

d) Keystone shall conduct a calibration dig on at least two anomalies of each classification that are classified as minor, moderate and severe to ensure findings that are not in the remediation plan are not detrimental to the pipeline.

e) Keystone shall perform Holiday voltage tests (jeep), coating adhesion and coating cure tests at excavations.

f) Keystone shall remove disbonded or blistered coating (with cracking and other damage that will compromise cathodic protection) found during excavations and shall apply new coating.

g) Keystone shall perform baseline DCVG two and a half (2-1/2) years and five (5) years after operating above 120° F, and in concert with future in-line inspection (ILI) and close-interval (CIS) surveys, both initial and second ILI tool runs, not to exceed 90 days before or past the schedule interval.

h) Keystone shall monitor surface temperatures of the pipe during winter and summer operating conditions at '0' miles and at a downstream mileage to assure that the surface temperatures do not exceed 120° F. If it is determined that the temperature at this point exceeds 120° F, the survey distance will be increased to the point where the temperature is below 120° F. Keystone must survey based upon temperature measurements or a minimum of twenty (20) miles downstream of each pump station operating above 120° F.

i) Keystone shall make repairs to FBE coatings with a compatible coating system that will bond together, be resistant to soil stresses, and not shield cathodic protection.

16) Overpressure Protection Control: Keystone must limit mainline pipeline overpressure protection to a maximum of 110% maximum operating pressure (MOP) during surge events consistent with 49 CFR § 195.406(b). Before commencing operation, Keystone

must perform a surge analysis showing how the pipeline will be operated to be consistent with these overpressure protection conditions. Keystone shall equip the pipeline with field devices to prevent overpressure conditions. Remotely actuated valves should be fitted with devices that will stop the transit (intentional or uncommanded) of the mainline valve should an overpressure condition occur or an impending overpressure condition is expected. Sufficient pressure sensors, on both the upstream and downside side of valves, must be installed to ensure that an overpressure situation does not occur. Sufficient pressure sensors shall be installed along the pipeline to conduct real time hydraulic modeling, and which can be used to conduct a surge analysis to determine whether pipeline segments have experienced an overpressure condition.

17) Construction Plans and Schedule: At least ninety (90) days prior to the anticipated construction start date, Keystone must submit its construction plans and schedule to the appropriate PHMSA Directors in Central, Western, and Southwest Regions for review. Subsequent plans and schedule revisions must also be submitted to the appropriate Directors, PHMSA Central, Western, and Southwest Regions on a monthly basis.

18) Welding Procedures for All New Pipeline Segments or Pipe Replacements: For automatic or mechanized welding, Keystone shall use the 20th Edition of American Petroleum Institute 1104 (API 1104), *"Welding of Pipelines and Related Facilities"* for welding procedure qualification, welder qualification and weld acceptance criteria. Keystone shall use the 20th Edition of API 1104 for all other welding processes. At least twenty-one (21) days prior to the beginning of any welding procedure qualification activities, Keystone shall notify the appropriate PHMSA Directors in Central, Western, and Southwest Regions. Keystone shall submit automated or manual welding procedure documentation to the same PHMSA regional office.

a) Should non-destructive testing of field girth welds be conducted by usage of automated ultrasonic testing (AUT) API 1104, Appendix A, Keystone must conduct stress analysis for the welding procedures as required in API 1104, Appendix A, Paragraph A.2.

b) Should API 1104, Appendix A, be used for welding, Keystone must conduct

individual procedure tests for each steel supplier and for each girth weld with mixed steel suppliers.

c) All welding procedures, AUT procedures and pipe lifting procedures for field construction crews must be documented in construction procedures and field construction crews must be trained in the procedure requirements prior to conducting welding and girth weld AUT in accordance with API 1104, Appendix A.

d) Keystone shall nondestructively test all girth welds in accordance with 49 CFR §§ 195.228, 195.230 and 195.234.

19) Depth of Cover: Keystone shall construct the pipeline with soil cover at a minimum depth of forty-eight (48) inches in all areas, except in consolidated rock. The minimum depth in consolidated rock areas is thirty-six (36) inches. Keystone shall maintain a depth of cover of 48 inches in cultivated areas and a depth of 42 inches in all other areas. In cultivated areas where conditions prevent the maintenance of forty-eight (48) inches of cover, Keystone must employ additional protective measures to alert the public and excavators to the presence of the pipeline. The additional measures shall include:

a) Placing warning tape and additional line-of-sight pipeline markers along the affected pipeline segment,

b) In areas where threats from chisel plowing or other activities are threats to the pipeline, the top of the pipeline must be installed and maintained at least one foot below the deepest penetration above the pipeline, not to be less than 42-inches of cover.

If a routine patrol (ground and/or aerial) or other observed conditions during maintenance, where farming, excavation, or construction activities are ongoing, or after weather events occur, indicate the possible loss of cover over the pipeline, Keystone must perform a depth of cover study and replace cover as soon as practicable, not to exceed six (6) months, to meet the minimum depth of cover requirements specified herein.

In addition to any depth of cover maintenance activities that may take place as a result of routine patrols, Keystone must perform a detailed depth of cover survey along the entire Keystone XL pipeline as frequently as practicable, not to exceed once every ten (10) years, and replace cover as soon as practicable, not to exceed six (6) months, to meet the minimum depth of cover requirements specified herein.

20) Construction Tasks: Keystone must prepare and follow an Operator Qualification (OQ) Program for construction tasks that can affect pipeline integrity. The Construction OQ program must comply with 49 CFR § 195.501 and must be followed throughout the construction process for the qualification of individuals performing tasks on the pipeline.

If the performance of a construction task can affect the integrity of the pipeline segment, the operator must treat that task as a "covered task," notwithstanding the definition in 49 CFR § 195.501(b), and must implement the requirements of Subpart G. Keystone shall retain qualification records for each individual performing covered tasks during and after the construction of the pipeline, whether company or contract employee.

Keystone must prepare and follow a construction quality assurance plan, to ensure quality standards and controls of the pipeline, throughout the construction phase. Such a plan shall include, at a minimum, provisions for the following: pipe inspection (at the last pipe shipping or storage location prior to stringing on the construction right of way, whether rail yard or pipe storage yard), hauling and stringing, field bending, welding, non-destructive examination of girth welds, applying and testing field applied coating, lowering of the pipeline into the ditch, padding and backfilling, and hydrostatic testing. These tasks can affect the integrity of the pipeline segment and must be treated as covered tasks. The individuals driving the pipe stringing trucks to the pipeline ROW would not need to be OQ qualified, unless they are responsible for the pipe unloading.

Other tasks that can affect pipeline integrity which must be treated as covered tasks include, but are not limited to, surveying, locating foreign lines, one call notifications, ditching, alternating current (AC) interference mitigation and mitigation, cathodic protection (CP) system surveys, mitigation and installation, conducting directional drills,

anomaly evaluations and repairs, right of way clean up (including installation of line markers), and quality assurance monitoring.

Keystone must provide its construction OQ plan to the appropriate PHMSA Regional Director for review prior to beginning construction.

All girth welds must be inspected, repaired and non-destructively examined in accordance with 49 CFR §§ 195.228, 195.230 and 195.234. The NDE examiner must have all required and current certifications.

21) Interference Currents Control: Control of induced AC from parallel electric transmission lines and other interference issues that may affect the pipeline must be incorporated into the design of the pipeline and addressed during the construction phase. Issues identified and not originally addressed in the design phase must be brought to the attention of the applicable PHMSA Director(s) in Central, Western, and Southwest Regions. Within six (6) months after placing the pipeline in service, Keystone must develop and implement an induced AC program to protect the pipeline from corrosion caused by stray currents.

22) Pressure Test Level: The pre-in service hydrostatic test must be to a pressure producing a hoop stress of a minimum 100% SMYS for mainline pipe and 1.39 times MOP for pump stations for eight (8) continuous hours. The hydrostatic test results from each test must be submitted in electronic format to the applicable PHMSA Director(s) in PHMSA Central, Western and Southwest Regions after completion of each pipeline.

23) Assessment of Test Failures: Any pipe failure occurring during the pre-in service hydrostatic test must undergo a root cause failure analysis to include a metallurgical examination of the failed pipe. The results of this examination must preclude a systemic pipeline material issue and the results must be reported to PHMSA headquarters and the applicable PHMSA Director(s) in Central, Western, and Southwest Regions within 60 days of the failure.

III. Operations and Maintenance

24) Supervisory Control and Data Acquisition (SCADA) System: Keystone must develop and install a SCADA system to provide remote monitoring and control of the entire pipeline system.

25) SCADA System – General:

a) Scan rate shall be fast enough to minimize overpressure conditions (overpressure control system), provide very responsive abnormal operation indications to controllers and detect small leaks within technology limitations.

b) Must meet the requirements of regulations developed as a result of the findings of the National Transportation Safety Board (NTSB), *Supervisory Control and Data Acquisition (SCADA) in Liquid Pipelines,* Safety Study, NTSB/SS-05/02 specifically including:

i) Operator displays shall adhere to guidance provided in American Petroleum Institute Recommended Practice 1165 (API 1165 - *First Edition)*, *Recommended Practice for Pipeline SCADA Displays.* This shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual is assigned the responsibility to monitor and respond to SCADA information (tanks terminals or facilities also).

ii) Operators must have a policy for the review and audit of alarms for false alarm reduction and near miss or lessons learned criteria. This alarm review shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (tanks terminals or facilities also).

iii) SCADA controller training shall include simulator for controller recognition of abnormal operating conditions, in particular leak events. A generic simulator or simulation shall not be allowed by itself as a means to meet this requirement. A full simulator (console screens respond and react as actual console screens) shall be required and used for training of abnormal operating conditions (AOC's) wherever possible.

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iv) See item 29(b) below on fatigue management.

v) Install computer-based leak detection system on all lines unless an engineering analysis determines that such a system is not necessary.

c) Develop and implement shift change procedures for controllers that are scientifically based, sets appropriate work and rest schedules, and consider circadian rhythms and human sleep and rest requirements in-line with guidance provided by NTSB recommendation P-99-12 issued June 1, 1999.

d) Verify point-to-point display screens and SCADA system inputs before placing the line in service. This shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (tanks terminals or facilities also).

e) Implement individual controller log-in provisions.

f) Establish and maintain a secure operating control room environment.

g) Establish and maintain the ability to make modifications and test these modifications in an off-line mode. The pipeline must have controls in-place and be functionally tested in an off-line mode prior to any changes being implemented after the line is in service and prior to beginning the line fill stage.

h) Provide SCADA computer process load information tracking.

26) SCADA – Alarm Management: Alarm Management Policy and Procedures shall address:

a) Alarm priorities determination.

b) Controllers' authority and responsibility.

c) Clear alarm and event descriptors that are understood by controllers.

d) Number of alarms.

e) Potential systemic system issues.

f) Unnecessary alarms.

g) Controller's performance regarding alarm or event response.

h) Alarm indication of abnormal operating conditions (AOCs).

i) Combination AOCs or sequential alarms and events.

j) Workload concerns.

k) This alarm management policy and procedure review shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (such as for tanks, terminals, or other associated facilities).

27) SCADA – Leak Detection System (LDS): The LDS Plan shall include provisions for:

a) Implementing applicable provisions in American Petroleum Institute Recommended Practice 1130, *Computational Pipeline Monitoring for Liquid Pipelines,* (API RP 1130, 1st Edition 2007).

b) Addressing the following leak detection system testing and validation issues:

(1) Routine testing to ensure degradation has not affected functionality

(2) Validation of the ability of the LDS to detect small leaks and modification of the LDS as necessary to enhance its accuracy to detect small leaks.

(3) Conduct a risk analysis of pipeline segments to identify additional actions that would enhance public safety or environmental protection.

c) Developing data validation plan (ensure input data to SCADA is valid)

d) Defining leak detection criteria in the following areas:

(1) Minimum size of leak to be detected regardless of pipeline conditions (slack, transient, etc., as related to the Keystone XL pipeline configuration.

(2) Leak location accuracy for various pipeline conditions.

(3) Response time for various pipeline conditions.

e) Providing redundancy plans for hardware and software and a periodic test requirement for equipment to be used live (also applies to SCADA equipment).

28) SCADA – Pipeline Model and Simulator: The Thermal-Hydraulic Pipeline Model/ Simulator including pressure control system shall include a Model Validation/Verification Plan.

29) SCADA – Training: The training and qualification plan (including simulator training) for controllers shall:

a) Emphasize procedures for detecting and mitigating leaks.

b) Include a fatigue management plan and implementation of a shift rotation schedule that minimizes possible fatigue concerns and is scientifically based, sets appropriate work and rest schedules, and consider circadian rhythms and human sleep and rest requirements in-line with NTSB recommendation P-99-12 issued June 1, 1999.

c) Define controller maximum hours of service limitations.

d) Meet the requirements of regulations developed as a result of the guidance provided in the American Society of Mechanical Engineers Standard B31Q, *Pipeline Personnel Qualification Standard* (ASME B31Q), September 2006, for developing qualification program plans.

e) Include and implement a full training simulator capable of replaying for training purposes near miss or lesson learned scenarios.

f) Implement tabletop and field exercises no less than five (5) times per year that allow controllers to provide feedback to the exercises, participate in exercise scenario development and be active participants in the exercise.

g) Include field visits for controllers accompanied by field personnel who will respond to call outs for that specific facility location.

h) Provide facility specifics in regard to the position certain equipment devices will default to upon power loss.

i) Include color blind and hearing provisions and testing if these are required to identify alarm priority or equipment status. This review shall be implemented and performed at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (such as for tanks, terminals, or other associated facilities).

j) Task specific abnormal operating conditions and generic abnormal operating conditions training components.

k) If controllers are required to respond to “800” calls, include a training program conveying proper procedures for responding to emergency calls, notification of other pipeline operators in the area when affecting a common pipeline corridor

and education on the types of communications supplied to emergency responders and the public using API Recommended Practice 1162, *Public Awareness Programs for Pipeline Operators,* (API RP 1162 (1st edition, December 2003) or the most recent version incorporated in 49 CFR § 195.3).

l) Implement on-the-job training component intervals established by performance review to include thorough documentation of all items covered during oral communication instruction.

m) Implement a substantiated qualification program for re-qualification intervals addressing program requirements for what circumstances will result in qualifications being revoked; implementing procedure documentation regarding how long a controller can be absent before a period of review; shadowing, retraining, or re-qualification is required, and addressing interim performance verification measures between re-qualification intervals.

30) SCADA – Calibration and Maintenance: The calibration and maintenance plan for the instrumentation and SCADA system shall be developed using guidance provided in American Petroleum Institute Recommended Practice 1130, *Computational Pipeline Monitoring for Liquid Pipelines,* (API RP 1130, 1st Edition 2007). Instrumentation repairs shall be tracked and documentation provided regarding prioritization of these repairs. Controller log notes shall periodically be reviewed for concerns regarding mechanical problems. This information shall be tracked and prioritized. Maintenance of field related instrumentation repairs affecting SCADA data (local or remote) shall also be tracked, prioritized and documented at any location on the Keystone XL system where a SCADA system is used and where an individual(s) is assigned the responsibility to monitor and respond to alarm information (such as for tanks, terminals, or other associated facilities).

31) SCADA – Leak Detection Manual: The Leak Detection Manual shall be prepared using guidance provided in Canadian Standards Association (CSA), *Oil and Gas Pipeline Systems*, CSA Z662-03, Annex E, Section E.5.2, Leak Detection Manual.

32) Mainline and Check Valve Control: Keystone must design and install mainline block valves and check valves on the Keystone XL system based on the worst case discharge as calculated by 49 CFR § 194.105. Keystone shall locate valves in accordance with 49 CFR § 195.260 and by taking into consideration elevation, population, and environmentally sensitive locations, to minimize the consequences of a release from the pipeline. Mainline valves must be placed based on the analysis above or no more than twenty (20) miles apart, whichever is smaller. Mainline valves must contain transit inhibit switches that prevent the valves from shutting at a rate (and in conjunction with pumps being shutdown) so that no pressure surges can occur, or other damage caused by unintended valve closures or too fast of a closure.

Valves must be remotely controlled and actuated, and the SCADA system must be capable of closing the valve and monitoring the valve position, upstream pressure and downstream pressure so as to minimize the response time in the case of a failure. Remote power backup is required to ensure communications are maintained during inclement weather. Mainline valves must be capable of closure at all times. If it is impracticable to install a remote controlled valve, Keystone must submit a valve design and installation plan to the appropriate PHMSA Region Director(s), Central, Western, and Southwest Region to confirm the alternative approach provides an equivalent level of safety. For any valves that cannot be remotely actuated, Keystone must document on a yearly basis, not to exceed fifteen (15) months that personnel response time to these valves will not take over one hour.

33) Pipeline Inspection: The entire Keystone XL pipeline (not including pump stations and tank farms) must be capable of passing In-line Inspection (ILI) tools. Keystone shall prepare and implement a corrosion mitigation and integrity management plan for segments that do not allow the passage of an ILI device.

34) Internal Corrosion: Keystone shall limit basic sediment and water (BS&W) to 0.5% by volume and report BS&W testing results to PHMSA in the annual report. Keystone shall also report upset conditions causing BS&W level excursions above the limit.

a) Keystone must run cleaning pigs twice in the first year and as necessary in succeeding years based on the analysis of oil constituents, liquid test results, weight loss coupons located in areas with the greatest internal corrosion threat and other internal corrosion threats. At a minimum in the succeeding years following the first year Keystone must run cleaning pigs once a year, with intervals not to exceed 15 months.

b) Liquids collected during cleaning pig runs, such as BS&W, must be sampled, analyzed and internal corrosion mitigation plans developed based upon lab test results.

c) Keystone shall review the program at least quarterly based upon the crude oil quality and implement adjustments to monitor for, and mitigate the presence of, deleterious crude oil stream constituents.

35) Cathodic Protection: The initial CP system must be operational within six (6) months of placing a pipeline segment in service.

36) Interference Current Surveys: Keystone must perform interference surveys over the entire Keystone XL pipeline within six months of placing the pipeline in service to ensure compliance with applicable NACE International Recommended Practices 0169 (2002 or the latest version incorporated by reference in § 195.3) and 0177 (2007 or the latest version referenced through the appropriate NACE standard incorporated by reference in 49 CFR § 195.3) (NACE RP 0169 and NACE RP 0177) for interference current levels. If interference currents are found, Keystone shall determine if there have been any adverse effects on the pipeline and mitigate such effects as necessary. Keystone shall report the results of any finding of adverse effects and the associated mitigative efforts to the applicable Director(s), PHMSA Central, Western, and Southwest Regions within 60 days of the finding.

37) Corrosion Surveys: Keystone must complete corrosion surveys within six (6) months of placing the respective CP system(s) in operation to ensure adequate external corrosion protection per NACE RP 0169. The survey shall also address the proper number and

location of CP test stations as well as alternating current (AC) interference mitigation and AC grounding programs per NACE RP 0177. At least one (1) CP test station must be located within each HCA with a maximum spacing between test stations of one-half mile. If placement of a test station is not practical within an HCA, the test station must be placed at the nearest practical location. If any annual test station reading fails to meet 49 CFR 195, Subpart H requirements, remedial actions must occur within six (6) months. Remedial actions must include a CIS on each side of the affected test station to the next test station and all modifications to the CP system necessary to ensure adequate external corrosion control.

38) Initial Close Interval Survey (CIS): A CIS must be performed on the pipeline within one year of the pipeline in-service date. The CIS results must be integrated with the baseline ILI to determine whether further action is needed. Keystone must remediate any anomalies indicated by the CIS data including improvements to CP systems and coating remediation within six (6) months of completing the CIS surveys. CIS along the pipeline must be conducted with current interrupted to confirm voltage drops in association with periodic ILI assessments under 49 CFR § 195.452(j)(3).

39) Coating Condition Survey: Keystone must perform a Direct Current Voltage Gradient (DCVG) survey or an Alternating Current Voltage Gradient (ACVG) survey within six (6) months after operation to verify the pipeline coating conditions and to remediate any integrity issues. Keystone must remediate any damaged coating indications found during these assessments that are classified as minor (i.e. 35% IR and above for DCVG or 50 dBμV and above for ACVG), moderate or severe based on NACE International Recommended Practice 0502-2002 (NACE RP 0502-2002) Pipeline External Corrosion Direct Assessment Methodology, or the latest version incorporated by reference in § 195.3. A minimum of two (2) coating survey assessment classifications must be excavated, classified and/or remediated per each survey crew and pump station discharge section.

40) Pipeline Markers: Keystone must install and maintain line-of-sight markings on the

pipeline except in agricultural areas or large water crossings such as lakes where line of sight signage is not practical. The marking of pipelines may also be subject to environmental permits and local restrictions. Additional markers must be placed along the pipeline in areas where the pipeline is buried less than forty-eight (48) inches. Keystone must replace removed or damaged line-of-sight markers, during pipeline patrols and maintenance on the right-of-way. Keystone, at a minimum, must identify and replace any missing or damaged line-of-sight markers during pipeline patrols (Condition 41). If pipeline patrolling for Condition 41 is performed via aerial patrolling and cannot consistently identify areas with missing or damaged line-of-sight markers, then Keystone must on a calendar year basis, not to exceed fifteen (15) months, conduct ground patrols.

41) Pipeline Patrolling: Patrol the right-of-way at intervals not exceeding three (3) weeks, but at least twenty-Six (26) times each calendar year, to inspect for excavation activities, ground movement, unstable soil, wash outs, leakage, or other activities or conditions affecting the safety operation of the pipeline.

42) Initial ILI: Within three (3) years of placing a pipeline segment in service, Keystone must perform a baseline ILI using a high-resolution Magnetic Flux Leakage (MFL) tool. Keystone must perform a baseline geometry tool run after completion of the hydrostatic strength test and backfill of the pipeline but no later than six (6) months after placing the pipeline in service.

43) Deformation Tool: Keystone must run a deformation tool through all mainline piping prior to putting the product in the pipeline and remediate all expanded pipe in accordance with PHMSA's "Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength for Liquid Pipeline" dated October 6, 2009 or any subsequent PHMSA update to this guideline.

44) Future ILI: Future ILI inspection must be performed on the entire pipeline on a frequency consistent with 49 CFR § 195.452(j)(3) assessment intervals or on a frequency determined by fatigue studies of actual operating conditions.

a) Conduct periodic close interval surveys (CIS) along the entire pipeline with current interrupted to confirm voltage drops in association with periodic ILI assessments under § 195.452(j)(3).
b) CIS must be conducted within three (3) months of running ILI surveys when using a five (5) year ILI frequency, not to exceed sixty-eight (68) months, in accordance with 49 CFR § 195.452 (j) (3) assessment intervals.
c) CIS findings must be integrated into ILI Tool findings.

45) Verification of Reassessment Interval: Keystone must submit a new fatigue analysis to validate the pipeline reassessment interval annually for the first five (5) years after placing the pipeline into service. The analysis must be performed on the segment experiencing the most severe historical pressure cycling conditions using actual pipeline pressure data. The fatigue analysis must be submitted to the appropriate PHMSA Director(s) in Central, Western, and Southwest Regions.

46) Flaw Growth Assessment: Two (2) years after the pipeline in-service date, Keystone shall use all data gathered on pipeline section experiencing the most severe historical pressure cycling conditions to determine effect on flaw growth that passed manufacturing standards and installation specifications. This study shall be performed by an independent party agreed to upon by Keystone and PHMSA. Furthermore, Keystone shall share this study with PHMSA and the appropriate Director(s), PHMSA Central, Western, and Southwest Regions within sixty (60) days of its completion, and before baseline assessment is begun. These findings shall determine if an ultrasonic crack detection tool must be launched in that pipeline section to confirm crack growth. The study must also define when follow-up review and analysis will occur, not to exceed five (5) years, or sooner as determined by the study.

47) Direct Assessment Plan: Headers, mainline valve bypasses and other sections that cannot accommodate ILI tools must be part of a Direct Assessment (DA) plan or other acceptable integrity monitoring method using External and Internal Corrosion Direct Assessment criteria.

48) Damage Prevention Program: Keystone must incorporate the Common Ground Alliance's damage prevention best practices applicable to pipelines into its damage prevention program.

49) Anomaly Evaluation and Repair: Anomaly evaluations and repairs must be performed based upon the following:

a) Immediate Repair Conditions: Follow 49 CFR § 195.452(h)(4)(i) except designate the calculated remaining strength failure pressure ratio (FPR) ≤ 1.16 for anomaly repairs;

b) 60-Day Conditions: Follow 49 CFR §195.452(h)(4)(ii) except designate a FPR ≤ 1.25 for anomaly repairs;

c) 180-Day Conditions: Follow 49 CFR §195.452(h)(4)(iii) with exceptions for the following conditions which must be scheduled for repair within 180 days:

(1) Calculated FPR = < 1.39;

(2) Areas of corrosion with predicted metal loss greater than 40%;

(3) Predicted metal loss is greater than 40% of nominal wall that is located at a crossing of another pipeline; and

(4) Gouge or groove greater than 8% of nominal wall.

d) Each anomaly not repaired under the immediate repair requirements must have a corrosion growth rate and ILI tool tolerance assigned per the Integrity Management Program (IMP) to determine the maximum re-inspection interval.

e) Anomaly Assessment Methods: Keystone must confirm the remaining strength (R-STRENG) effective area method, R-STRENG - 0.85dL, and ASME B31G assessment methods are valid for the pipe diameter, wall thickness, grade, operating pressure, operating stress level and operating temperature. Keystone must also use the most conservative method until confirmation of the proper method is made to PHMSA headquarters.

f) Flow Stress: Remaining strength calculations for X-80 pipe must use a flow stress equal to the average of the ultimate (tensile) strength and SMYS.

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g) Dents: For initial construction and the initial geometry tool run, Keystone must remove any dent with a depth greater than two percent (2%) of the nominal pipe diameter unless the dent is repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe. For the purposes of this condition, a "dent" is a depression that produces a gross disturbance in the curvature of the pipe wall without reducing the pipe wall thickness. The depth of the dent is measured as the gap between the lowest point of the dent and the prolongation of the original contour of the pipe.

IV. Reporting, Records Retention, and Senior Level Certification Requirements

50) Reporting - Immediate: Keystone must provide immediate notification of all reportable incidents in accordance with 49 CFR Part 195, and shall notify the appropriate PHMSA regional office within twenty-four (24) hours of any non-reportable leaks occurring on the pipeline.

51) Reporting – 180 Day: Within 180 days of the pipeline in-service date, Keystone shall report on its compliance with all of these conditions to the PHMSA Associate Administrator and the appropriate PHMSA Directors in Central, Western, and Southwest Regions.

52) Annual Reporting: Keystone must annually report by February 15th each year the following to the PHMSA Associate Administrator and the appropriate Directors, PHMSA Central, Western, and Southwest Regions:

a) The results of any ILI run or direct assessment results performed on the pipeline during the previous year;

b) The results of all internal corrosion management programs including the results of:

(1) BS&W analyses

(2) Report of plant upset conditions where elevated levels of BS&W are introduced into the pipeline

(3) Corrosion inhibitor and biocide injection

(4) Internal cleaning program

(5) Wall loss coupon tests

c) Any new integrity threats identified during the previous year;

d) Any encroachment in the right-of-way, including the number of new residences or public gathering areas;

e) Any HCA changes during the previous year;

f) Any reportable incidents that occurred during the previous year;

g) Any leaks on the pipeline that occurred during the previous year;

h) A list of all repairs on the pipeline made during the previous year;

i) On-going damage prevention initiatives on the pipeline and an evaluation of their success or failure;

j) Any changes in procedures used to assess and monitor the pipeline; and

k) Any company mergers, acquisitions, transfers of assets, or other events affecting the regulatory responsibility of the company operating the pipeline.

53) Threat Identification and Evaluation: Keystone must develop a threat matrix consistent with 49 CFR § 195.452 to accomplish the following:

a) Identify and compare any increased risks of operating the pipeline; and

b) Describe and implement procedures used to mitigate the risk.

c) Where geotechnical threats exist that may impact operational safety, Keystone must run a geospatial tool and assess procedures to implement for conducting mitigative measures along the affected pipeline.

54) Right-of-Way Management Plan: Keystone must develop and implement a right-of-way management plan to protect the Keystone pipeline from damage due to excavation, third party and other activities. In any areas where increased activities or natural forces could lead to increased threats to the pipeline beyond the initial threat conditions, the management plan must include increased inspections. The management plan must also include right-of-way inspection activities to complement the following:

a) Depth of Cover (Condition 19);

b) Pipeline Markers (Condition 40);

c) Pipeline Patrolling (Condition 41) ;
d) Damage Prevention Program (Condition 48); and
e) Threat Identification and Evaluation (Condition 53)

The Right-of-Way Management Plan and all of the above listed right-of-way inspection activities, Conditions 19, 40, 41, 48, and 53, must be reviewed for effectiveness and procedures updated as required on a periodic basis as conditions change, but not longer than once per calendar year not to exceed 15 months.

55) Records: Keystone must maintain all records demonstrating compliance with all conditions herein for the useful life of the pipeline.

56) Certification: A senior executive officer of Keystone must certify in writing the following:
a) That Keystone has met all of the conditions described herein;
b) That the written design, construction, and operating and maintenance (O&M) plans and procedures for the Keystone pipeline have been updated to include all additional requirements herein;
c) That Keystone has reviewed and modified its damage prevention program relative to the Keystone pipeline to include any additional elements required herein.

Keystone must send a copy of the certification with the required senior executive signature and date of signature to the PHMSA Associate Administrator and the Directors, PHMSA Central, Western, and Southwest Regions at least 90 days prior to operating the Keystone pipeline.

57) Within one (1) year of the in-service date, Keystone shall provide a detailed technical briefing, in person, to the appropriate PHMSA Directors in Central, Western, and Southwest Regions. The briefing shall cover the implementation of the requirements of all conditions herein, including all information required by Condition 52. On the basis of

PHMSA's review of the Condition 52 Annual Report and any additional information provided at the briefing, PHMSA may require additional information.