LIMITED APPLICATION REVIEW REPORT

Applicants Filings for the Construction and Operation of a Crude Oil Pipeline Proposed by

TransCanada Keystone Pipeline, LP
Eastern South Dakota

October 31, 2007

Application Review Completed by:

Bay West, Inc.

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1.0 OVERVIEW OF BAY WEST AND CONTRACTED SERVICES

Bay West, Inc. (Bay West), a Small Business Enterprise under NAICS 562910, is a leading environmental remediation and engineering company in the Upper Midwest. Founded in 1974, Bay West entered the environmental marketplace as an emergency response contractor, responding to emergency calls regarding hazardous materials spills. Over the years, Bay West gained a reputation as one of the few companies with the capability to rapidly mobilize and implement cost-effective solutions for its customers. Now in its 33rd year of service, Bay West provides environmental consulting, industrial cleaning, and emergency services to state and federal agencies and commercial customers throughout the US. Bay West's corporate headquarters is located in St. Paul, MN.

Bay West has built a reputation of providing premier emergency response services and annually answers 150+ spill response calls of varying complexity and size. Bay West team members include engineers, hydro-geologists, safety professionals, hazardous material managers, and field technicians. Bay West possesses one of the largest caches of on-water spill response equipment in the region and is registered with the US Coast Guard as an Oil Spill Removal Organization (OSRO).

The South Dakota Public Utilities Commission (PUC) contracted Bay West to review application documents for the proposed construction, operation and maintenance of the proposed crude oil pipeline. The proposed pipeline would be completed by TransCanada under the name of Keystone Pipeline, LP, (herein after referred to as either Keystone or TransCanada). During construction and operation of a crude oil pipeline, there exists a potential for oil releases which could pose an immediate or latent threat to the public's safety, the public's health, and the environment. It is the intent of the PUC to ensure that these threats have been adequately addressed. Bay West has provided professional opinion as to the accuracy and adequacy of certain related documents prepared by Keystone for this project.

Specifically, Bay West has prepared this document to address the following assigned PUC tasks for Keystone's pipeline operation in South Dakota:

Task 1 Assess spill risk based on the spill frequency volume study.

Task 2 Evaluate the pipeline risk assessment and environmental consequences filings.

Task 3 Identify High Consequence Areas (HCAs) and Unusually Sensitive Areas (USAs) and determine the adequacy of the mitigation measures for all such areas.

Task 4 Determine the adequacy of the emergency response plan.

Task 5 Determine the adequacy of the proposed construction, mitigation, and reclamation plan to restore affected areas back to full productivity in a reasonable timeframe.

Task 6 Determine the adequacy of the proposed remediation efforts related to spills.

Task 7 Identify hydrogeologic and geologic sensitive areas vulnerable to crude oil spills and

evaluate proposed mitigation measures.

Task 8 Review the application, the draft environmental impact statement and associated docket filings for compliance with the applicable sections of ARSD 20:10:22 and all applicable environmental regulations in regard to all environmental issues.

Task 9 The contractor shall search for any other environmental impact issues of consequence not previously identified and shall propose mitigation measure for any found.

Task 10 The contractor shall make a determination as to whether the proposed project will pose a safety risk, particularly for spill damage, above the norm for a crude oil pipeline due to both pipeline risk factors and environmental vulnerability of the land crossed.

In completing the evaluation of the tasks described above, the overall objectives identified by the PUC included a determination of whether the project will

- pose a threat of serious injury to the environment or the inhabitants within the siting area;
- substantially impair the health, safety or welfare of the inhabitants in the siting area;
- comply with all applicable laws and rules; interfere with the orderly development of the region with due consideration being given the views of governing bodies of affected local units of government.

Evaluation of the above aspects of the project was completed chiefly by desktop review of the application, draft environmental impact statement, and associated docket filings. Upon review of the docket filings, a series of data requests were submitted to the PUC and forwarded on to TransCanada to address. The purpose of the data requests was to obtain additional information on specific issues in order to complete an appropriate evaluation of their prepared documents.

2.0 SUMMARY OF BAY WEST RECOMMENDATIONS AND CONCLUSIONS

TASK 1 ASSESS SPILL RISK BASED ON THE SPILL FREQUENCY VOLUME STUDY

The study should be revised to better account for the likelihood of damage to the pipeline caused by the following excavation activities:

- *Agricultural activity where practices include plowing, tiling, etc. over the line.*
- *Land development, both commercial and residential, where sub-grade activities would be necessary.*
- *Utility maintenance—necessary repairs to utilities near or adjoining the pipeline right-of-way (ROW).*
- *Emergency conditions requiring immediate excavation activities, such as following a hazardous material spill incident.*

TASK 2 EVALUATE PIPELINE RISK ASSESSMENT & ENVIRONMENTAL CONSEQUENCE FILINGS

- *With respect to Section 4.2.2.1, Soil Impacts, the statement regarding the accumulation of oil in the backfill of the pipeline trench. In several notable cases the presence of farm field drain tile systems or judicial ditches have allowed surface oil to flow some distance from the release site—impacting surface water. The report should be amended to reflect this potential and in those cases where such structures exist in HCA or USA locations, strategies should be developed to address that eventuality.*

- *With respect to Section 4.2.2.2, Water Resources, the statement made regarding the notification of municipal drinking water supplies where surface water supplies the water. The risk assessment filings indicate that notification of downstream users is essential upon discovery of a contamination event. The assessment mentions that such a notification would enable the closure of water intakes to allow floating or dissolved phases of the oil to bypass. However, such action may only be sustained for a short duration, several hours to days depending upon the design of the municipal system, as reserves of water may be limited. A large oil release event may sustain the fouling of a drinking water source for an extended period of time up to several days.*

TASK 3 IDENTIFY HCAs and USAs and DETERMINE THE ADEQUACY OF THE MITIGATION MEASURES FOR ALL SUCH AREAS

- *Variance in the SWPAs provided by the SD DENR and the drinking water HCAs identified by TransCanada create a concern that TransCanada may not have all of the relevant data needed to identify drinking water HCAs. TransCanada and the SD DENR need to collaborate and review the SWPA data that is not presented in TransCanada's HCA maps and make a determination if additional drinking water SWPA data should be incorporated.*

- *TransCanada does not appear to give sufficient consideration to how the presence of field drain tile systems could affect subsurface transport. Due to the ability of field drain tile systems to be direct conduits for transport away from the spill site, the presence of these drain tile systems should be specifically accounted for in the development of the Integrity Management Plan.*

- *TransCanada states that CPSs were identified through the review of topographic maps and information. Maps provided by TransCanada indicate that the pipeline is located in areas that are relatively flat and sometimes atop topographic peaks or divides between watershed areas. Ground-truthing of topographic changes near the pipeline should be performed to more accurately identify CPS and adequately protect HCAs.*

- *TransCanada provides the following text regarding downstream transport; "the assumption is made that transport is to be constant and a spill would be intercepted within five miles downstream of the release location." That assumption does not appear be considerate of a catastrophic release or a release that occurs during a simultaneous event that significantly complicates the release interception/response. The description of a worst case discharge, contained within the pending Pipeline Oil Spill Response Plan, calls for planning for a very large release, probably near or into a very sensitive area (HCA) during inclement weather conditions. With stream/river flow velocities of five miles per hour or more during rain storm events; it is very unlikely that all or even some of the oil would be contained within five miles down stream of the release point. As a point of reference, planning requirements for fixed facilities under the Oil Pollution Act of 1990 (OPA 90), must calculate down stream planning distances for worst case discharges. In most instances, these distances are 15-20 miles or more. This calculation formula takes into account the dynamics of water body, travel time, properties of the oil product and others. The staging of limited response resources, finite access and recovery locations and other logistical issues make complete containment (interception) to a moving water release within five miles downstream an unlikely occurrence. To improve upon response success, the development of HCA-specific response strategies, including planning for more significant downstream transport is highly recommended. This topic is also discussed as part of Task 4.*

TASK 4 DETERMINE THE ADEQUACY OF THE EMERGENCY RESPONSE PLAN [AND OTHER ASPECTS OF EMERGENCY RESPONSE PLANNING AND PREPAREDNESS]

- *An SPCC plan is required to be completed and then approved by a professional engineer prior to tank facility operation. Submittal to the federal EPA or the state for approval is not required. At this time TransCanada has not prepared such plans pending determination of the exact location of the contractor yards. It is recommended that all such prepared plans be submitted for review 30 days prior to operation.*

- *The Oil Spill Response Plan referenced in Appendix C of the draft EIS has been submitted in template form and is incomplete at this time. The Oil Spill Response Plan, when completed, is required to be submitted to the federal DOT (Pipeline and Hazardous Material Safety Administration) prior to operation for review and comment. Approval of the plan is not required to allow pipeline operation but noted deficiencies must be addressed within a specific time frame. It is recommended that this plan be reviewed for adequacy 30 days prior to operation of the pipeline.*

- *An Integrity Management Plan is required to be submitted to the federal DOT within one year following the start of operation of the pipeline. Certain plan content regarding emergency response planning is believed to be vital to for preparing for effective response to a release incident. It is recommended that the following information be collected prior to pipeline operation and contained in detail in the Oil Spill Response Plan. This information should be reviewed 30 days prior to pipeline operation. With respect to identified HCA and USA locations, at a minimum, the following should be completed:*

    - *Identify access locations for water and land based emergency response equipment. Detailed site-specific access information should include: land ownership and agreements, after-hour access requirements and other pertinent logistical information.*
    - *The following site-specific information should be required to be collected and contained in the Oil Spill Response Plan and otherwise be readily available during and emergency.*
        - *Terrain surrounding the pipeline segment, including drainage systems such as small streams and other smaller waterways that could act as a conduit to the high consequence area*
        - *Elevation profile*
        - *Characteristics of the product transported*
        - *Amount of product that could be released*
        - *Possibility of a spillage in a farm field following the drain tile into a waterway*
        - *Ditches along side a roadway the pipeline crosses*
    - *For releases potentially entering moving water bodies, identify downstream at-risk resource(s), pre-determine booming locations and response resources and pre-plan to evaluate priorities and objectives. Based upon available response equipment location(s), mobilization time, river current and other factors, the assumption of a 5 mile downstream planning distance does not appear be considerate of a catastrophic release or a release that occurs during a simultaneous event that significantly complicates the release interception/response. Bay West recommends that downstream planning distances on the order of 20 miles be evaluated. This information should be contained in the Oil Spill Response Plan.*
    - *Identification of site-specific acceptable and unacceptable response tactics/countermeasures and techniques based upon effectiveness, intrusiveness (subsequent damage caused by the cleanup effort) and other considerations as determined relevant. It is recommended that such activity be completed with input from the South Dakota DENR and other local environmental trustees. This information should be contained in the Oil Spill Response Plan.*
    - *A model for response planning activity has been completed for the Minneapolis/St. Paul Sub-Area through the efforts of state and federal agencies and industry. Coordination of response strategy planning activities on the Mississippi River can be found at the following link: http://www.umrba.org/isa.htm. It is recommended that such sources be reviewed when preparing response planning activities.*

- *Page 24 of the Keystone Pipeline Response Plan references that response actions will be directed by the responding FOSC. It is recommended that this statement be modified to indicate that during the public safety phase of an incident, the most senior public safety official (usually the local fire chief), is in charge and has full authority over the hazardous material incident and scene. As cleanup operations are undertaken the role of the responding FOSC (typically on scene several hours into the incident) is to monitor cleanup progress. The pipeline operator, as the responsible party, is ultimately responsible for the cleanup outcome and will likely be collaborating (via a unified command structure) with SD DENR staff to establish cleanup priorities and objectives. The intent of the FOSC is not direct or takeover a response, unless requested or if it is necessary.*
- *For state agency staff responding to pipeline releases, it is recommended that at a minimum the following training be obtained:*
  - *OSHA compliance training (40 hour HAZWOPER)—safety requirement for field personnel involved in emergency response operations.*
  - *Incident Command System (ICS)—organizational scheme required at all hazardous material incidents*
  - *Tabletop/functional exercises developed with representation from pipeline officials. These activities allow for the testing of response plan, organizational function and the use of response resources.*
  - *Inland and on-water oil spill control tactics (including containment boom deployment). Such training allows a better understanding of logistical obstacles and limitations of response equipment.*

TASK 5 DETERMINE THE ADEQUACY OF THE PROPOSED CONSTRUCTION, MITIGATION, AND RECLAMATION PLAN TO RESTORE AFFECTED AREAS BACK TO FULL PRODUCTIVITY IN A REASONABLE TIMEFRAME

SECTION 2.0 - GENERAL CONDITIONS

Environmental Inspection

At least one environmental inspector is required for each construction spread during construction and restoration to help ensure compliance with the PUC's permit, other environmental agency permit conditions, and landowner requirements. Environmental inspectors shall have peer status with all other activity inspectors and shall have the authority to order appropriate corrective actions or to stop activities that violate the environmental requirements.

The environmental inspector shall keep records of compliance with regard to environmental conditions of the SD PUC Permit, and the mitigation measures proposed by TransCanada, and other Federal or state environmental permits during the construction and restoration phases of the project.

Noise Control

Keystone shall perform a noise assessment survey during operation to confirm the level of noise at each listed noise-sensitive area. If the noise attributable to operation of any pump station exceeds 55 dBA Ldn at any noise-sensitive area, Keystone shall implement noise mitigation measures to ensure that regulation levels are not exceeded.

The criterion of L_{dn} of 55 dBA shall be adopted for horizontal directional drilling operations near residences, or Keystone shall develop a plan for South Dakota Public Utilities Commission review and approval that includes specific measures to mitigate for noise impacts from drilling operations during non-daytime hours. Measures may include the installation of a temporary noise barrier system at the directional drill site.

Weed Control

Keystone shall obtain landowner consent in writing prior to herbicide application.

Keystone shall inform landowners of the brand name/active ingredient, the application method, and application rate for each herbicide planned for use on this project.

Keystone shall make available a copy of the herbicide's MSDS information.

Dust Control

Keystone shall cover all open-bodied trucks while in motion to minimize fugitive dust emissions.

Road and Railroad Crossings

Keystone shall coordinate with emergency responders where project-related activities occur near road and railroads and where road closures are necessary.

SECTION 4.0 UPLANDS (AGRICULTURAL, FOREST, PASTURE, RANGE / GRASSLANDS)

Topsoil Removal and Storage

Unless the landowner specifically approves otherwise, topsoil shall be segregated either along the full right-of-way or from the trench and subsoil storage area in actively cultivated or rotated crop lands and pastures, residential areas, hayfields, and other areas at landowner request.

In deep soils (more than 12 inches of topsoil), segregate at least 12 inches of topsoil unless otherwise specified by the landowner. In soils with less than 12 inches of topsoil make every effort to segregate the entire topsoil layer. Where topsoil segregation is required, maintain separation of salvaged topsoil and subsoil throughout all construction activities. Segregated topsoil may not be used for padding the pipe.

Temporary Erosion and Sediment Control

Install temporary slope breakers on slopes greater than 5 percent on non-cultivated lands where the base of the slope is less than 50 feet from a waterbody, wetland and road crossings at the following spacing (closer spacing may be used if necessary):

Slope (%)	Spacing (feet)
5 – 15	300
>15 – 30	200
>30	100

The gradient of each slope breaker shall be 2 to 4 percent.

Trenching

In addition to provisions provided in the Construction and Mitigation and Reclamation Plan, Keystone shall install exclusion fencing around the perimeter of the pipe trench or pit excavations in residential areas if the trench/pit would remain open during non-working hours.

Keystone shall also comply with the following to further minimize the effects of blasting and to better ensure safety during blasting operations:

1) *post warning signs, flags, and barricades;*
2) *sound warning horns or sirens;*
3) *follow procedures for safe storage, handling, loading, firing, and disposal of explosive materials;*
4) *coordinate with emergency responders as necessary; and*
5) *blasting shall be conducted by registered blasters.*

If blasting will occur within 150 feet of structures, Keystone shall use an independent contractor to inspect structures before blasting and other locations if requested by the landowner. Post-blast inspections would be performed as warranted. During blasting, the independent contractor shall monitor ground vibrations at the nearest structure within 150 feet.

Keystone shall evaluate any damage complaints associated with blasting activities. In the unlikely event that blasting would affect nearby water wells, Keystone shall provide alternative sources of water or otherwise compensate affected landowners. Keystone shall also compensate landowners if buildings or structures are damaged as a result of the blasting activities.

Padding and Backfilling

If it is impossible to avoid water-related damages, Keystone shall reasonably compensate the landowners for the damages and shall correct the damages so as to restore the land, crops pasture, water courses, etc. to their preconstruction condition.

Clean Up

Keystone shall commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (temporary slope breakers and sediment barriers) until conditions allow completion of cleanup.

Reclamation and Revegetation

In addition to provisions provided in the Construction and Mitigation and Reclamation Plan, Keystone shall comply with the following provisions when implementing measures included in Section 4.11, Reclamation and Revegetation*:*

1) *Relieving compaction: submit and obtain written approval from the SD PUC on a winterization plan if construction will continue into the winter season when conditions could delay successful de-compaction, topsoil replacement, or seeding until the following spring.*
2) *Rock removal: rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench should be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner.*
3) *Mulching: Apply mulch on all slopes (except in actively cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. If anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies. Mulch before seeding if:*
    a. *final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas); or*
    b. *construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.*
4) *Erosion Control Matting: Install erosion control fabric on waterbody banks at the time of final bank re-contouring as shown in Detail 4 in the Plan, unless riprap or other bank stabilization are employed in accordance with federal, state, and local permits and approvals.*

Forested Lands

If trees need to be removed that have commercial or other value to affected landowners, Keystone shall compensate the landowners fair market value of the trees to be cleared and/or allow the landowner the right to retain ownership of the felled trees.

Operation and Maintenance

Conduct follow-up inspections of all disturbed areas after the first and second growing seasons to determine the success of revegetation. If after the first growing season, revegetation is successful, no additional monitoring would be required.

In cultivated areas, Keystone shall monitor for at least two years the yield of land impacted by construction using agricultural specialists in all cases, unless specifically declined by specific landowners.

SECTION 5.0 DRAIN TILE SYSTEMS

Location information of drain tiles exposed during the project shall be collected by a craft inspector, environmental inspector, or its equivalent, using a sub-meter accuracy Global Positioning System, or at a minimum, by accurately documenting the pipeline station numbers of

each exposed drain tile. Keystone shall maintain on file the drain tile location information and tile specifications (e.g., diameter, type, depth, etc.). Future availability of this information would be essential to relocate drain tiles in the event a pipeline leak/spill occurs during the operation of the facility and would help in a spill recovery effort to contain transport of pipeline liquids via drain tiles.

SECTION 6.0 WETLAND CROSSINGS

Easement and Workspace

Unless a wetland is actively cultivated or rotated cropland, limit the width of the construction right-of-way to 75 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width.

Unless a wetland is actively cultivated or rotated cropland, locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries. Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

Operation and Maintenance

Do not conduct vegetation maintenance over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 15 feet wide may be maintained in an herbaceous state. In addition, trees within 15 feet of the pipeline that are greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way.

SECTION 7.0 WATERBODIES AND RIPARIAN LANDS

Easement and Workspace

Locate all extra work areas (e.g., staging areas, additional spoil storage areas, etc.) at least 50 feet away from water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way. Work area boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas.

Operation and Maintenance

Limit vegetation maintenance adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with

native plant species across the entire construction right-of-way. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be maintained in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that are greater than 15 feet in height may be cut and removed from the permanent right-of-way.

Pesticides and herbicides should be used in accordance with their label instructions and should be used in or within 100 feet of a waterbody except as allowed by the riparian landowner, and appropriate land management or state agency.

TASK 6 DETERMINE THE ADEQUACY OF THE PROPOSED REMEDIATION EFFORTS RELATED TO SPILLS

Bay West find that the proposed remediation efforts related to spills to be adequate and consistent with industry practice. To allow for a more expedient decision process and a more favorable cleanup outcome, it is encouraged that specific cleanup techniques be evaluated in advance for at least all identified HCA and USA locations, to be consistent with the findings outlined in Task 4 of this report. No other recommendations are offered.

TASK 7 HYDROGEOLOGIC AND GEOLOGIC VULNERABILITY

In concurrence with the DEIS, Bay West recommends that additional measures be performed to assess the thickness of overburden and distribution of bedrock outcrops in the karst areas. Additionally, a detailed review of depth to bedrock maps, boring logs, and well logs should be completed to confirm the thickness of overburden and bedrock type along the pipeline ROW. This review could be supplemented through meetings with the SDGS and a field walking survey in areas where available information is limited and areas that have a potential for landslides, sinkholes, and/or flooding where topography can change rapidly. Also, it is recommended that the karst features in Miner County, northern Hanson County, southern Hutchinson County, in the DEIS be further described and an analysis of their potential impacts to the study area be completed.

We recommend that TransCanada report each identified karst outcropping and areas of shallow overburden (less than 50 feet in depth) that they are aware of or identify in the future that exist within 0.5 miles of the pipeline ROW to the SDGS, SD PUC and United States Department of Transportation (USDOT). In addition to the karst areas, the Environmental Analysis section of the DEIS summarized other potential impacts and mitigation measures which in some instances included recommendations for further evaluation in the study area. These recommendations could best be addressed as conditions of the PUC issuing a construction permit for the project. Findings associated with this more detailed review should be provided to the USDOT, the SD PUC and the Geological Survey. The USDOT may use the findings to assess if this new information would cause some areas to be defined as geologically sensitive High Consequence Areas.

TASK 8 DOCUMENT REVIEW AND COMPLIANCE

No recommendations were provided for this section.

TASK 9 UNIDENTIFIED IMPACT ISSUES OF CONSEQUENCE

No recommendations were provided for this section.

TASK 10 SAFETY RISK DETERMINATION

No recommendations were provided for this section.

CONCLUSION

The construction of the proposed Keystone Pipeline presents both significant and insignificant risk to the environment and inhabitants of South Dakota. The proper implementation of the regulatory design requirements, construction and operational requirements, TransCanada's proposed mitigation measures, and the recommendations provided within this document, reduces, to currently recognized industry standards, the:

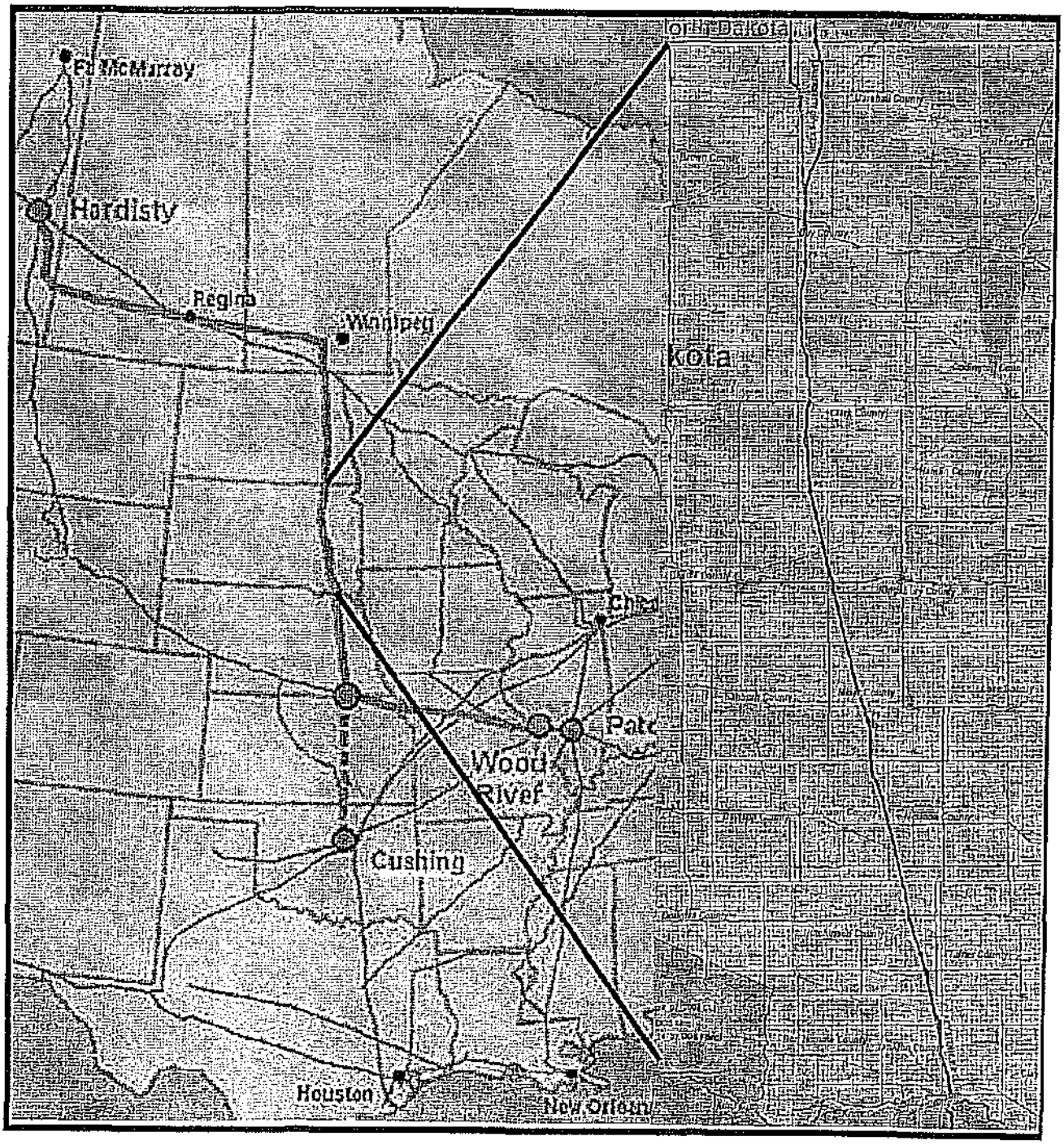
- threat (risk) of serious injury to the environment or the inhabitants within the siting area;
- impairment of the health, safety or welfare of the inhabitants in the siting area; and,
- complies with all applicable laws and rules (as they pertain to the Tasks 1 through 6 of this document);
- interference with the orderly development of the region with due consideration being given the views of governing bodies of affected local units of government.

TransCanada would be required to comply with all applicable laws and rules during construction

3.0 PROPOSED PIPELINE CONSTRUCTION BACKGROUND

Due to the increased demand for crude oil in the United States, uncertain supply of crude oil from other world supplies, availability of Canadian crude oil, and lack of existing pipeline capacity in the United States, TransCanada is proposing to construct the Keystone Pipeline Project. The Keystone Pipeline Project would extend from an existing oil supply hub in Alberta, Canada to terminals in the Midwestern United States. In total, the Keystone Pipeline Project would consist of a single 30 inch pipeline, about 2,148 miles long with 38 pump stations, and numerous mainline valves and other aboveground facilities constructed in Canada and the United States (see Figure 1). The proposed facilities would have the capacity to deliver approximately 435,000 barrels of heavy crude oil per day.

Figure 1: Keystone Pipeline Project Overview Map

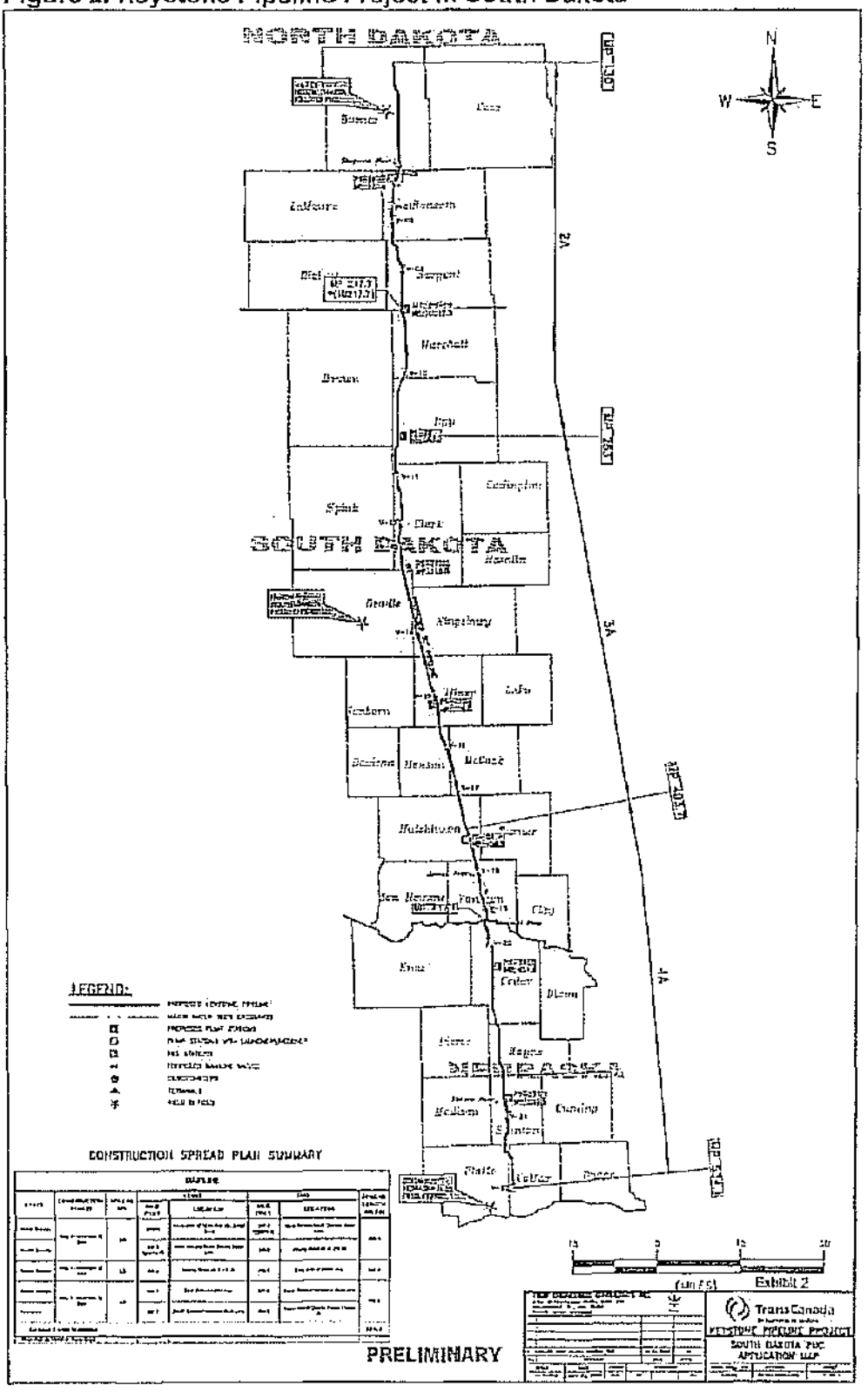


The United States portion of the project would cross North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Missouri, and Illinois. The project would consist of about 1,379 miles of pipeline, 23 pump stations, 52 mainline valves, and other various other aboveground facilities.

In South Dakota, the Keystone Project would consist of about 219 miles of pipeline, four pump stations, and 10 mainline valves (see Figure 2). Keystone proposes to begin construction in January 2008. Construction is expected to last 18 months and be completed in September 2009. The in-service date of the proposed facilities is November 30, 2009.

In addition to pipeline facilities, Keystone estimates that 21 new electric transmission lines would be required to provide electrical power to the proposed pump stations. According to Keystone, approximately 149 miles of new electric transmission lines would be constructed in the United States, including about 63 miles in South Dakota. Electric transmission lines would be either 69-kilovolt, or 115-kilovolt and would be constructed by local utilities.

Figure 2: Keystone Pipeline Project in South Dakota



4.0 PUBLIC UTILITIES COMMISSION REVIEW TASKS

TASK 1 ASSESS SPILL RISK BASED ON THE SPILL FREQUENCY VOLUME STUDY

Source Document Reviewed: Frequency-Volume Study of Keystone Pipeline, DNV Consulting.

Introduction

This task addresses the evaluation of the document entitled *Appendix A—Frequency / Volume Study of Keystone Pipeline*. The document was prepared by DNV Consulting, a risk management company, and is dated May 2006. The study evaluates the risk of a release (spill) from the pipeline in terms of frequency and volume. Data from nationally gathered pipeline statistics, mainly the DOT Pipeline and Hazardous Materials Safety Administration, were used to derive a base frequency of occurrence (spill) by cause type. Modifiers, reducing or increasing the base frequency, were then applied depending upon the type of maintenance and operation programs, engineering design, construction materials, detection technologies, etc. that will be utilized to construct and operate the pipeline. Six different causes of a pipeline release were considered including natural and man-made events. The study document is not intended to evaluate consequence and threat to public safety, public health or the environment.

In reviewing the study document for accuracy, the following aspects were assessed:

- The correct use of national statistics for comparison purposes and derived base frequency values for adjusted probability calculations
- Validation of the assumptions made including the use of the term "engineering judgment"
- The appropriateness of assigned modifier values
- Validation of referenced "industry accepted practice"
- Validation of construction materials and operation technologies

Findings and Recommendations

Bay West find that the spill frequency-volume study, prepared by DNV Consulting for this project, fairly calculates release occurrences and is generally adequate and complies with pipeline industry standards. The following discussion provides information supporting this conclusion and presents elements where the study could be improved including recommendations for specific conditions to be included in the South Dakota Public Utilities Commission (SD PUC) permit.

The additional requirements of operating at 80% of the SMYS offer greater preventative and protective measures compared to the standard operating allowance of 72% SMYS. Those measures include the following:

- *An increased depth of cover to four feet. This feature makes the pipe harder to reach and decreases the likelihood of a strike during excavation.*
- *A fracture control plan for pipe steel that must demonstrate the ability to resist crack initiation and propagation through toughness testing. The steel quality must be demonstrated and is monitored at the steel mill before shipment to the pipe mill. Quality checks include ultrasonic*

testing for laminations and macro-etch testing to detect centerline segregation in the steel slabs prior to reducing the slab thickness by rolling. These practices are above and beyond those typically required or performed when purchasing API 5L PSL 2 pipe. This feature makes the pipe more difficult to puncture due to the metallurgical specifications of the pipe.

- *Keystone has assumed that a pipeline response crew could be dispatched to plug small- and medium- sized holes in a reasonable amount of time. No timeframe was provided and such repair work would require considerable coordination and time to shut the line down, locate the release, uncover the line and then make the repair. The statement implies a fairly quick fix to such an occurrence. This assumption underestimates the level of effort and time necessary to make the required repairs to the pipeline.*

The study should be revised to better account for the likelihood of damage to the pipeline caused by the following excavation activities:

- *Agricultural activity where practices include plowing, tiling, etc. over the line.*
- *Land development, both commercial and residential, where sub-grade activities would be necessary.*
- *Utility maintenance—necessary repairs to utilities near or adjoining the pipeline right-of-way (ROW).*
- *Emergency conditions requiring immediate excavation activities, such as following a hazardous material spill incident.*

TASK 2 EVALUATE PIPELINE RISK ASSESSMENT & ENVIRONMENTAL CONSEQUENCE FILINGS

Source Document Reviewed: Pipeline Risk Assessment and Environmental Consequence Filings, ENSR.

Introduction

This task involves the evaluation of the document entitled *Pipeline Risk Assessment and Environmental Consequence Analysis* (ENSR, June 2006). Note that Appendix A of that document is addressed in Task 1 and Appendix B of that document is addressed in Task 3 of this analysis. The purpose of the document is to evaluate the risk resulting from a pipeline release event and the associated consequences to public safety, public health or the environment. The document references data cited in the Spill Volume-Frequency Study completed by DNV, LLC.

Section 4 of the document evaluates the consequences of a release or spill from the pipeline. A release event can range from a slow rate of loss occurring over an extended period of time or a large catastrophic "blow-out" event resulting in a large volume lost in a very short period of time. Both can create conditions that can cause immediate threats to public safety, health and the environment.

Where emergency conditions exist, the accepted hierarchy of protection referenced by the first-responder community is commonly life/safety, public health, personal property and environmental protection. Discussion following the Findings and Recommendations section provides information on possible threats for each of those elements with respect to a crude oil pipeline release. The environmental narrative section was supported by conversation with wildlife specialists of the Minnesota Department of Natural Resources and the US Fish and Wildlife Service having direct experience with crude oil spills.

Findings and Recommendations

Bay West find that the Pipeline Risk Assessment and Environmental Consequence Filings, prepared by ENSR for this project, adequately calculates and accounts for the risk and consequences associated with pipeline operations and release occurrences. The following discussion provides information supporting this conclusion and presents elements where the study could be improved including recommendations for specific conditions to be included in the South Dakota Public Utilities Commission (SD PUC) permit.

- *With respect to Section 4.2.2.1, Soil Impacts, the statement regarding the accumulation of oil in the backfill of the pipeline trench. In several notable cases the presence of farm field drain tile systems or judicial ditches have allowed surface oil to flow some distance from the release site—impacting surface water. The report should be amended to reflect this potential and in those cases where such structures exist in HCA or USA locations, strategies should be developed to address that eventuality.*

- *With respect to Section 4.2.2.2, Water Resources, the statement made regarding the notification of municipal drinking water supplies where surface water supplies the water. The risk*

assessment filings indicate that notification of downstream users is essential upon discovery of a contamination event. The assessment mentions that such a notification would enable the closure of water intakes to allow floating or dissolved phases of the oil to bypass. However, such action may only be sustained for a short duration, several hours to days depending upon the design of the municipal system, as reserves of water may be limited. A large oil release event may sustain the fouling of a drinking water source for an extended period of time up to several days.

Background

Life/Safety

National statistics indicate that the operation of crude oil pipeline is a relatively safe activity in terms of lives lost per unit of hazardous material transported. Crude oil, pumped directly from the earth, is refined to produce many refined petroleum products including gasoline, diesel fuel, jet fuel and others. Crude oil contains certain gases and vapors such as benzene and hydrogen sulfide. The composition of crude oil (percentage of individual compounds) determines its chemical properties and varies according to the type (i.e. "sweet or sour") of oil transported. The type of crude therefore establishes the limits of the oil's ability to burn, cause immediate inhalation hazards and other life-safety concerns. A release may present an immediate fire control concern depending upon the quantity involved and circumstances of the incident (i.e. contained, geography, air temperature, etc.). The placement or location of the pipeline relative to populated areas in large establishes the threat to the general public. Crude oil and refined product pipelines can occasionally be found running through the back yards of homes or through school yards. In most of these cases the pipeline pre-existed the development of the land above it. Where people and hazardous material pipelines co-exist there will always be an immediate life-safety threat.

With respect to incidents involving hazardous materials, the Occupational Health and Safety (OSHA) regulations specify that the most senior public safety official is in charge where a life/safety hazard exists. Organization of personnel and equipment, and life/safety response actions, are carried-out by this official—typically the local fire department fire chief. As long as life/safety threats exist, actions deemed necessary to mitigate the imminent hazard will be carried-out by the senior safety official. In theory, the principles of the incident command system (ICS) would be used to organize resources and develop priorities and objectives related to life/safety, public health and environmental protection. Given the response hierarchy described above, actions taken by local first-responders may have a bearing on the impacts to public health, property or the environment. It is therefore of great importance that pipeline officials provide sufficient training to local first-responders to prepare them for a pipeline emergency event.

Public Health

To realize an effect to human health as a result of exposure a contaminant must enter the body and then cause some harm. The route of entry, concentration of the contaminant and the resulting effect on the human body, as well as many other chemical and physiological aspects, are all considered when risk from exposure is evaluated. It is not the intent of this evaluation to form a toxicological exposure opinion for proposed hypothetical release scenarios.

Immediate and latent public health effects can arise from a small volume/slow release event or sudden large volume release. These immediate effects can include:

- Air quality—breathing/inhalation of vapors or gases (primarily volatile organic chemicals [VOC's] and hydrogen sulfide) can cause immediate health effects. Evacuation of nearby downwind populated areas often occurs with large releases due to the presence of such gases. This hazard is mitigated when source material (pooled crude oil) is recovered. In rare instances, underground releases of flammable liquids can cause liquid and vapor hazards that can migrate through the soil into sewer systems and homes. In very rare instances such a situation can create an immediate risk of explosion.

- Ingestion of drinking water laden with dissolved oil compounds is possible. Private and municipal drinking water systems can be impacted due to surface and/or ground water supply sources becoming contaminated. A survey of historical crude oil pipeline releases from the State of Minnesota Pollution Control Agency has indicated no impact to municipal drinking water supplies for known release sites. The same pipeline survey information noted several release instances where contamination to private wells resulted from refined petroleum pipeline incidents. In most of those cases the determining factor was whether the release was promptly detected and the rate at which the ensuing investigation and cleanup were preformed. In many cases the remote location of the pipeline kept chronic or acute releases from impacting nearby surface or ground water drinking resources.

- Consumption of contaminated food following the uptake of contaminants by plants and animals. For plants this threat is considered minimal due to the demonstrated fact that the organic nature of crude oil makes it very amenable to the microbial degredation process. To be absorbed by a plant the oil must be in a usable "broken-down" organic state. The controlled application of petroleum contaminated soil to agricultural farm land, and subsequent planting of crops, is readily accepted as a form of treatment by many state environmental regulatory agencies.

- The consumption of dead fish or animals by humans, as a result of succumbing to the effects of a crude oil spill, is possible but unlikely. It is possible that affected land-based wildlife coated with oil could leave the area and then be captured or killed and consumed by a human. It is unlikely however, that upon examination of a killed animal a person would eat it based upon its physical appearance (oil coated). It is possible that a person could consume a fish that has been exposed to dissolved portions of oil compounds. If there is a concern for consumption of fish following a crude oil pipeline release, the state environmental agency or health department could issue a consumption advisory and/or collect a sample of fish to perform toxicological necropsies for evaluation of consumption exposure. It is also possible that a person could consume and animal that has consumed an oiled animal. This likelihood is remote but possible.

- Direct contact exposure is considered to be negligible due primarily to the ability to recognize and control contact with the proper use of personal protective clothing.

Personal Property

For catastrophic pipeline events where a geyser of oil is created, the spraying or coating of objects in the immediate area will occur. In instances where high winds are present the distance traveled can be several hundred feet. Items or objects coming into direct contact with crude oil will become coated. For objects that are fairly impervious (not readily absorbing oil) like metal or plastic, these items may be cleaned or decontaminated with the use of a petroleum solvent or soap and water. For those objects where absorption of oil has occurred it is likely that the item will require disposal.

Environmental Impact

The most significant immediate environmental threat following a large crude oil release is presented to wildlife coming into direct contact and surface water contamination. Subsequent long-term environmental effects can include soil contamination, degraded ground water quality and restoration activities to affected natural resources. The area of land impact following a release is chiefly a function of the area topography, rate of release, volume lost and the ability to rapidly contain the spill. In most instances for large releases (>100,000 gallons) the area of land affected can be two football fields in size or more. For waterways, the principle mechanisms that effect the spread or impact area of a release include the total volume lost, rate of loss, water current speed, temperature and wind.

- Wildlife - Direct contact of oil by an animal can cause mortality due to one or more of the following reasons: preening (ingestion of oil causing toxicity), succumb due to the physical coating of oil to the animal, interference with the insulating properties of the animal (hypothermia death) or consumption of animals already deceased due to the oil (subsequent toxicity). Depending upon the affected land area size, mortality can occur due to a loss of habitat including food/shelter and succumbing to the elements. Survival rates of oil-coated animals, with or without human intervention, are commonly minimal. For waterfowl, raptures or song-birds, hazing techniques (machines used to produce loud sounds to scare-off a bird from landing), have been used with some success.

  Some animals will have the instinct and ability to seek shelter in areas outside of the oil spill that has caused a loss of habitat. Others, such as mice, rabbits and other rodents will only be able to seek shelter underground which may be in the path of the oil spill. Depending upon the cleanup site activity, opportunistic animals such as fox, coyote and raccoon may forage on dead or distressed animals in the extended area from the spill site.

- Surface Water -Releases to lakes, rivers, wetlands and other forms of surface waters present unique challenges for response personnel. Generally speaking, rates of recovery for water-borne spills are poor but could be as much as 50% or more, depending upon such factors as: the rate of evaporation, weather conditions, available equipment, pre-planning activities, etc. The dynamics of the water body (moving or still, season of year, etc.) and the logistical needs for using response equipment must be planned for on a location-specific basis. The physical recovery of oil from surface water is commonly performed with the use of floating containment barriers (booms), vacuum equipment and skimming devices. Where the success of physical removal is limited or not possible due to logistical obstacles (remote location with no access), alternate methods of removal must be considered. The use of chemical countermeasures, chemicals used to gather/heard or disperse the oil, can be used but requires the permission of state and/or federal environmental authorities. Burning the oil is also an industry tactic used in removing gross quantities of oil but does not completely remediate the impact. Physical, chemical and other such alternate methods of mitigating a crude oil spill have pluses and minuses in terms of their effect on the environment. The pluses and minuses must be weighed given the circumstances of the situation. Evaluating such options requires input from regulatory authorities, wildlife managers and others who have a vested interest in the outcome.

  The toxicity of an oil spill to water is dependant upon many factors including, but not limited to, the size and type of water body, type of waterborne organism (fish, invertebrate), type of oil, etc. Certain fractions of oil will dissolve into the water column and may or may not reach toxic

concentrations to all or some organisms. Also, the organic nature of the oil (hydrocarbon) can cause a decrease of the available dissolved oxygen in the water creating an oxygen deficient (asphyxiating) environment for fish and other water-based organisms. The evaluation of water quality conditions following a release is often directed by state environmental officials. Upstream unaffected water quality is commonly referenced against downstream water chemistry conditions.

- Soil and Ground Water - In many instances following the discovery of a release to soil, the objective is to remove the "gross" contamination first by pumping and then by excavation. The extent of excavation is often established by deriving an acceptable amount of risk to the resources in the area that may be threatened (ground water, surface water, tile lines, sewer systems, drinking water wells, etc.). The natural processes (natural attenuation or bioremediation) is allowed to occur for remaining residual levels of oil in the soil or ground water. In those cases remaining soil and ground water contamination is monitored via the use of periodic subsurface soil sampling and/or ground water monitoring wells. Monitoring activities allow for the assessment of changing soil/ground water contamination conditions (extent, direction, etc.). The extent of soil and ground water cleanup and the developed monitoring program is commonly imposed by state environmental regulatory authorities. Such actions are typically enforceable by state law and are completed by the submittal of detailed investigation or monitoring work plans prepared by private environmental consultants working for the pipeline company.

TASK 3 IDENTIFY HCAs and USAs and DETERMINE THE ADEQUACY OF THE MITIGATION MEASURES FOR ALL SUCH AREAS

Source Documents Reviewed: Bay West reviewed the applicants submittal information relating to High Consequence Areas (HCAs), including the HCA maps, the Spill Frequency Volume Study, the Risk Assessment and Environmental Consequences filings (Appendices A and B), the Keystone Draft Environmental Impact Statement, and confidential sensitive receptor data provided by the SD DENR and TransCanada that were not released publicly.

Introduction

The purpose of this task was to confirm that the applicant has accounted for the United States Department of Transportation identified HCAs and outlined adequate mitigation measures to protect the HCAs.

Findings and Recommendations

A complete determination regarding the appropriate identification of HCAs and the adequacy of the proposed mitigation measures was not able to be made based on the information currently available and the project's "proposed" status. HCA maps appear to adequately identify "High Population Areas" and the lack of "Commercially Navigable Waters". However, due to a difference in data available from the SD DENR and TransCanada, TransCanada should further assess drinking water HCAs and their associated contributory pipeline segments. Additionally, TransCanada and the SD DENR and the Department of Fish, Game and Parks (SD GFP) need to begin actively collaborating on both drinking water and ecologically sensitive HCAs and their appropriate mitigation measures. The following discussion provides findings and offers recommendations for specific conditions to be included in the South Dakota Public Utilities Commission (SD PUC) permit.

Background

The United States Department of Transportation (USDOT) maintains the regulatory authority to ensure that crude oil pipelines are maintained and operated such that they are protective of human health and the environment.

On December 1, 2000, the Office of Pipeline Safety (OPS) published a final rule (65 FR 75378) that imposed pipeline integrity management program requirements on hazardous liquid operators that own or operate 500 or more miles of pipeline. The requirements apply to those hazardous liquid pipeline owners and operators with pipelines that could affect areas defined as high consequence areas (HCAs), generally defined as populated areas, areas unusually sensitive to environmental damage, and commercially navigable waterways. As defined in 49 CFR Ch. I (10-1-02 Edition) defines an HCA as:

(1) A **commercially navigable waterway**, which means a waterway where a substantial likelihood of commercial navigation exists;

(2) A high population area, which means an urbanized area, as defined and delineated by the Census Bureau, that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;

(3) An other populated area, which means a place, as defined and delineated by the Census Bureau, that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area;

(4) An unusually sensitive area (USA), as defined in § 195.6. 49 CFR provides the following definition of an USA. "USA means a drinking water or ecological resource area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release.

(a) An **USA drinking water resource** is:

- The water intake for a Community Water System (CWS) or a Nontransient Non-community Water System (NTNCWS) that obtains its water supply primarily from a surface water source and does not have an adequate alternative drinking water source;
- The Source Water Protection Area (SWPA) for a CWS or a NTNCWS that obtains its water supply from a Class I or Class IIA aquifer and does not have an adequate alternative drinking water source. Where a state has not yet identified the SWPA, the Wellhead Protection Area (WHPA) will be used until the state has identified the SWPA; or
- The sole source aquifer recharge area where the sole source aquifer is a karst aquifer in nature.

(b) An **USA ecological resource** is:

- An area containing a critically imperiled species or ecological community;
- A multi-species assemblage area;
- A migratory waterbird concentration area;
- An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or an imperiled ecological community where the species or community is aquatic, aquatic dependent, or terrestrial with a limited range; or
- An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or imperiled ecological community where the species or community occurrence is considered to be one of the most viable, highest quality, or in the best condition, as identified by an element occurrence ranking (EORANK) of A (excellent quality) or B (good quality).

Integrity Management Plan HCA Requirements

The Federal pipeline regulatory requirements contained under 49 CFR part 195.452 stipulate the preparation of an Integrity Management Plan (IMP) which has the purpose of describing measures the pipeline company will be taking to prevent and detect releases from the line and specific planning activities related to identified HCA locations within a line segment. The development of the IMP is not required to be completed until no later that one year after the start of operation of the line. Of particular importance, the IMP is the required to identify preventative and mitigative measures to protect HCA's. For those segments where an HCA resource has been identified the pipeline operator must complete a risk analysis to identify additional actions to enhance public safety or environmental protection. Specifically with respect to preventive, planning and mitigative activities, the operator's risk analysis must include:

"...evaluate the likelihood of a pipeline release occurring and how a release could affect the high consequence area. This determination must consider all relevant risk factors, including, but not limited to:

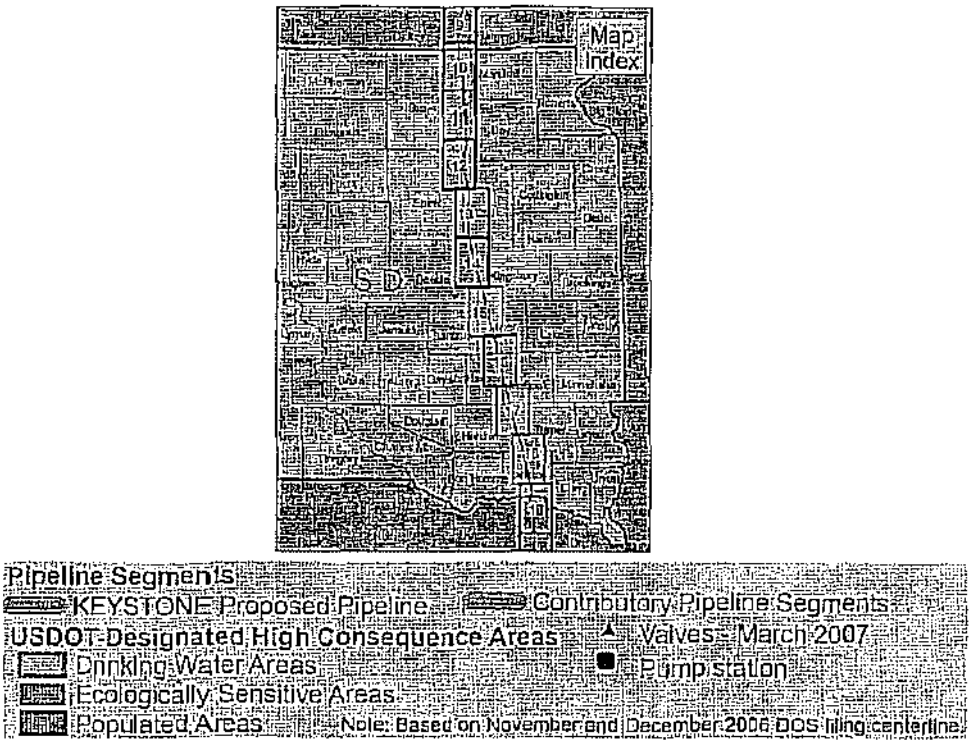
(i) Terrain surrounding the pipeline segment, including drainage systems such as small streams and other smaller waterways that could act as a conduit to the high consequence area;
(ii) Elevation profile;
(iii) Characteristics of the product transported;
(iv) Amount of product that could be released;
(v) Possibility of a spillage in a farm field following the drain tile into a waterway;
(vi) Ditches along side a roadway the pipeline crosses;
(vii) Physical support of the pipeline segment such as by a cable suspension bridge;
(viii) Exposure of the pipeline to operating pressure exceeding established maximum operating pressure".

Appendix B of the Pipeline Risk Assessment and Environmental Consequence Analysis (ENSR, May 2007), was prepared to "summarize the methodology and results of the preliminary evaluation of risk at HCA's along the Keystone Pipeline system". The proposed pipeline location was reviewed and an analysis of risk, with respect to oil reaching an HCA, and an assigned risk ranking system was developed based upon the following criteria:

- Length of contributory pipeline segment or CPS (only that segment of pipeline with contributory affect should a release occur);
- Proximity of the CPS to an HCA;
- Presence of multiple HCA's;
- Ease of impediments to spill transport (overland, underground, stream flow);
- Predicted spill frequency – spill volume for the CPS (from Appendix A)

HCA Identification and Mitigation

As part of the Pipeline Risk Assessment and Environmental Consequence Analysis (ENSR, May 2007), TransCanada provided maps #10 through #19 that depicted HCAs and their associated CPS. These maps contained environmentally sensitive information deemed "confidential", therefore, they are not contained in this report. The following graphic, which contains the map index and the map key is provided to show how the data was presented.



Bay West contacted the USDOT through the South Dakota PUC in an attempt to obtain the HCA Geographic Information System (GIS) data in a shape file format for the segment of Keystone Pipeline in South Dakota. The South Dakota PUC also requested the same electronic shape files from Transcanda. Neither the USDOT nor TransCanada provided the shape files. Shape file detail commonly includes such site specific information such as: origin and date of data, name/location of threatened, endangered or rare species, drinking water well construction specifications and animal populations and critical habitat information. The review of shape files would have assisted in confirming that the TransCanada maps appropriately depicted each of the HCAs.

Bay West also corresponded with the South Dakota Department of Environment and Natural Resources SD DENR and SD GFP. Bay West obtained the copies of Source Water Protection Areas (SWPA) along the pipeline route from the SD DENR and compared them to the drinking water HCAs presented by TransCanada. *Variance in the SWPAs provided by the SD DENR and the drinking water HCAs identified by TransCanada create a concern that TransCanada may not have all of the relevant data needed to identify drinking water HCAs. TransCanada and the SD DENR need to*

collaborate and review the SWPA data that is not presented in TransCanada's HCA maps and make a determination if additional drinking water SWPA data should be incorporated.

Bay West spoke by telephone with the SD GFP on October 19, 2007. The SD GFP reported that TransCanada representatives visited the department offices on two occasions and obtained ecological data for incorporation into the pipeline studies that were underway at that time. The SD GFP indicated that they were in receipt of approximately five reports from TransCanada. At the time of Bay West's telephone call, the SD GFP had not yet reviewed and formerly commented on the TransCanada reports. TransCanada indicates in the Draft Environmental Impact Statement that they will work with the SD GFP to design mitigation activities for each ecologically sensitive population identified along the right away. *In order to provide the most protection of the identified ecological resources, the SD GFP (in cooperation with other related agencies) need to begin actively collaborating with TransCanada on their proposed mitigation activities associated with each ecologically sensitive population.*

Estimated Risk to HCAs

The methodology developed by ENSR for the calculation of risk was found to be generally sound. However, the following comments are provided which may have a bearing on the calculation of risk for identified HCA locations.

- *TransCanada does not appear to give sufficient consideration to how the presence of field drain tile systems could affect subsurface transport. Due to the ability of field drain tile systems to be direct conduits for transport away from the spill site, the presence of these drain tile systems should be specifically accounted for in the development of the Integrity Management Plan.*

- *TransCanada states that CPSs were identified through the review of topographic maps and information. Maps provided by TransCanada indicate that the pipeline is located in areas that are relatively flat and sometimes atop topographic peaks or divides between watershed areas. Ground-truthing of topographic changes near the pipeline should be performed to more accurately identify CPS and adequately protect HCAs.*

- *TransCanada provides the following text regarding downstream transport; "the assumption is made that transport is to be constant and a spill would be intercepted within five miles downstream of the release location." That assumption does not appear be considerate of a catastrophic release or a release that occurs during a simultaneous event that significantly complicates the release interception/response. The description of a worst case discharge, contained within the pending Pipeline Oil Spill Response Plan, calls for planning for a very large release, probably near or into a very sensitive area (HCA) during inclement weather conditions. With stream/river flow velocities of five miles per hour or more during rain storm events; it is very unlikely that all or even some of the oil would be contained within five miles down stream of the release point. As a point of reference, planning requirements for fixed facilities under the Oil Pollution Act of 1990 (OPA 90), must calculate down stream planning distances for worst case discharges. In most instances, these distances are 15-20 miles or more. This calculation formula takes into account the dynamics of water body, travel time, properties of the oil product and others. The staging of limited response resources, finite access and recovery locations and other logistical issues make complete containment*

(interception) to a moving water release within five miles downstream an unlikely occurrence. To improve upon response success, the development of HCA-specific response strategies, including planning for more significant downstream transport is highly recommended. This topic is also discussed as part of Task 4.

TASK 4 DETERMINE THE ADEQUACY OF THE EMERGENCY RESPONSE PLAN [AND OTHER ASPECTS OF EMERGENCY RESPONSE PLANNING AND PREPAREDNESS]

Source Documents Reviewed:

- Keystone Construction Mitigation and Reclamation Plan (CMRP), Sections 3.1, 3.2.
- Pipeline Risk Assessment and Environmental Consequence Analysis, Section 5.0.
- Draft Keystone Pipeline Emergency Response Plan
- Draft Environmental Impact Statement

Introduction

The purpose of this task is to review the adequacy of the prepared Emergency Response Plan, as required by DOT, 49 CFR part 194.107, and other aspects of the TransCanada's preparedness related to a pipeline release. A detailed description of emergency response planning is provided following the Findings and Recommendations below.

Findings and Recommendations

The following recommendations are provided regarding the preparation of emergency response planning documents and activities:

- *An SPCC plan is required to be completed and then approved by a professional engineer prior to tank facility operation. Submittal to the federal EPA or the state for approval is not required. At this time TransCanada has not prepared such plans pending determination of the exact location of the contractor yards. It is recommended that all such prepared plans be submitted for review 30 days prior to operation.*

- *The Oil Spill Response Plan referenced in Appendix C of the draft EIS has been submitted in template form and is incomplete at this time. The Oil Spill Response Plan, when completed, is required to be submitted to the federal DOT (Pipeline and Hazardous Material Safety Administration) prior to operation for review and comment. Approval of the plan is not required to allow pipeline operation but noted deficiencies must be addressed within a specific time frame. It is recommended that this plan be reviewed for adequacy 30 days prior to operation of the pipeline.*

- *An Integrity Management Plan is required to be submitted to the federal DOT within one year following the start of operation of the pipeline. Certain plan content regarding emergency response planning is believed to be vital to for preparing for effective response to a release incident. It is recommended that the following information be collected prior to pipeline operation and contained in detail in the Oil Spill Response Plan. This information should be reviewed 30 days prior to pipeline operation. With respect to identified HCA and USA locations, at a minimum, the following should be completed:*

- *Identify access locations for water and land based emergency response equipment. Detailed site-specific access information should include: land ownership and agreements, after-hour access requirements and other pertinent logistical information.*
- *The following site-specific information should be required to be collected and contained in the Oil Spill Response Plan and otherwise be readily available during and emergency.*
    - *Terrain surrounding the pipeline segment, including drainage systems such as small streams and other smaller waterways that could act as a conduit to the high consequence area*
    - *Elevation profile*
    - *Characteristics of the product transported*
    - *Amount of product that could be released*
    - *Possibility of a spillage in a farm field following the drain tile into a waterway*
    - *Ditches along side a roadway the pipeline crosses*
- *For releases potentially entering moving water bodies, identify downstream at-risk resource(s), pre-determine booming locations and response resources and pre-plan to evaluate priorities and objectives. Based upon available response equipment location(s), mobilization time, river current and other factors, the assumption of a 5 mile downstream planning distance does not appear be considerate of a catastrophic release or a release that occurs during a simultaneous event that significantly complicates the release interception/response. Bay West recommends that downstream planning distances on the order of 20 miles be evaluated. This information should be contained in the Oil Spill Response Plan.*
- *Identification of site-specific acceptable and unacceptable response tactics/countermeasures and techniques based upon effectiveness, intrusiveness (subsequent damage caused by the cleanup effort) and other considerations as determined relevant. It is recommended that such activity be completed with input from the South Dakota DENR and other local environmental trustees. This information should be contained in the Oil Spill Response Plan.*
- *A model for response planning activity has been completed for the Minneapolis/St. Paul Sub-Area through the efforts of state and federal agencies and industry. Coordination of response strategy planning activities on the Mississippi River can be found at the following link: http://www.umrba.org/isa.htm. It is recommended that such sources be reviewed when preparing response planning activities.*
- *Page 24 of the Keystone Pipeline Response Plan references that response actions will be directed by the responding FOSC. It is recommended that this statement be modified to indicate that during the public safety phase of an incident, the most senior public safety official (usually the local fire chief), is in charge and has full authority over the hazardous material incident and scene. As cleanup operations are undertaken the role of the responding FOSC (typically on scene several hours into the incident) is to monitor cleanup progress. The pipeline operator, as the responsible party, is ultimately responsible for the cleanup outcome and will likely be collaborating (via a unified command structure) with SD DENR staff to establish cleanup priorities*

and objectives. The intent of the FOSC is not direct or takeover a response, unless requested or if it is necessary.

- *For state agency staff responding to pipeline releases, it is recommended that at a minimum the following training be obtained:*
  - *OSHA compliance training (40 hour HAZWOPER)—safety requirement for field personnel involved in emergency response operations.*
  - *Incident Command System (ICS)—organizational scheme required at all hazardous material incidents*
  - *Tabletop/functional exercises developed with representation from pipeline officials. These activities allow for the testing of response plan, organizational function and the use of response resources.*
  - *Inland and on-water oil spill control tactics (including containment boom deployment). Such training allows a better understanding of logistical obstacles and limitations of response equipment.*

Background

The purpose of emergency response planning is to pre-plan and prepare for expected and unexpected events causing emergency (time-critical) conditions. With that purpose, the primary concerns for this task are TransCanada's planning activities that address the public's safety, public's health and environmental impact in the event of a release from the construction and operation of the pipeline. Certain emergency or contingency planning activities are required of public and private entities by local, state or federal regulations as demonstrated by the need to plan for emergency events such as: mass casualty incidents, natural disasters, acts of terrorism and hazardous material accidents. The development of an emergency planning document contains much of the critical information to prepare for and carry-out response efforts. Sound planning will incorporate all elements of emergency response preparedness while looking holistically at anticipated (probable) as well as unexpected (usually catastrophic) events. Just as important as being prepared to respond to an emergency is the need to prevent a release. Many of the prevention aspects associated with a petroleum pipeline are related to the construction, maintenance and operation of the line which are being evaluated by an independent engineering firm and are not part of this analysis.

For the purpose of constructing and operating a crude oil pipeline, some of the more important aspects of emergency preparedness include:

- Prepare emergency response or contingency plans as required by local, state and federal regulatory authorities.
- Establish contractual relationships with qualified and capable response resources that can support response efforts along the entire length of the pipeline. Identified resources will need to be available 24/7/365 and be located within a reasonable response distance.
- Plan for responding to emergencies in all climates, weather conditions and terrains. Extreme cold or heat can limit the effectiveness of response activities. For instance, access to a pipeline due to heavy snow cover and equipment operation can be severely affected during the dead of winter.

- Ensure that information contained in planning documents is "refreshed" or updated annually and communicated to involved parties. Of particular importance are contact numbers to reach response resources and regulatory agencies.
- Assess risk (a function of the likelihood of an event and severity of consequence) by accounting for small probable and large "worst case" discharge situations with the identification of at-risk resources (natural and man-made).
- Adequately train personnel and develop specific response strategies, where possible, to enhance response preparedness.

Evaluation Of TransCanada Emergency Planning Activities

The purpose of this deliverable is to evaluate the project emergency response plan(s) to ensure that the applicant has complied with all applicable emergency planning and preparedness requirements and such prepared plans are adequate to address emergencies of varies sizes and complexities.

Emergency response planning is necessary for two principle portions of the project—construction and operation.

Construction

The construction of the pipeline will require the use of heavy equipment (trucks, backhoes, side-boom CATs, trenchers, etc.). Such equipment requires oils, fuels and other hazardous substances to support its operation and maintenance. The construction of field support centers or "contractor yards" are locales where materials and supplies will be staged for use and machinery is parked. For the State of South Dakota, Keystone Pipeline will be establishing two of these support areas (Yankton and Kingsbury). According to information contained in the project EIS, each contractor yard will be constructed with two or three 10,000 gallon above ground tanks (AST) for diesel fuel and one 10,000 gallon AST for gasoline. These tanks will support the on-site fueling of vehicles and equipment with capacities varying typically from 20-200 gallons. Other materials used for equipment maintenance purposes are typically found in smaller 1-5 gallon containers such as hydraulic fluids and lubricating oils. Contractor yards are approximately 20 acres in size and will be utilized for weeks to months over the life of the construction phase.

As temporary structures, AST construction and operation must observe the following requirements per state and federal regulatory standards.

- Be supported by and adhere to all of the requirements of a Spill Prevention Control and Countermeasure (SPCC) plan as specified by 40 CFR part 112.
- Be constructed of compatible materials and to DOT, API, ASTM and/or other applicable regulatory or industry storage tank standard.
- Adhere to and all local and national fire code requirements.
- Be properly registered, if necessary, with state and federal regulatory programs.
- Be inspected for working condition prior to installation and daily during use.

- Be assembled with adequate secondary containment, overflow prevention and leak detection systems.
- Be supported by adequate fuel transfer procedures, personnel training, on-site spill response materials and contracted local spill response resources.

For planning purposes, potential release causes that should be addressed include:

- Mechanical failure of any part of a tank system (overfill protection, piping, corrosion of the tank, etc.)
- Vandalism, theft or act of terrorism
- Sever weather—tornado or thunderstorm/lightning
- Operational accidents—overfills during transfers

The principle planning document required to address prevention, preparedness and release response measures during the construction phase of the pipeline is a Spill Prevention Control and Countermeasures (SPCC, 40 CFR part 112) plan. One SPCC plan will be necessary for each contractor yard.

Operation

Once construction is complete the pipeline will be hydrostatically tested prior to being placed into use to transport crude oil. The two principle federally required planning documents that address preparedness and response during the line's operation is an Oil Spill Response Plan (49 CFR part 194.107) and the Integrity Management Plan (49 CFR part 195.452).

Oil Spill Response Plan

The intent of this plan is to describe the operator's overall preparedness to respond to oil discharges over the entire length of its line. Information in this plan would be accessed during an emergency. Components of the plan include:

- Identification that the pipeline can cause significant and substantial harm to the environment.
- The evaluation of a "worst case discharge" event—calculation of the largest loss of oil from the line during inclement weather.
- Identification of response resources (in-house and contracted).
- Identification of environmentally and economically sensitive areas.
- Emergency notification contact numbers
- Response training provided to company employees and drills/exercises conducted to test response procedures.
- Prepare the document to be consistent with the federal National Contingency Plan and Area Contingency Plan.
- Ensure the protection of safety at a response site.

Integrity Management Plan

This plan has two primary responsibilities—detailing how the operator is preventing and detecting a release and how it will respond to a release in an identified High Consequence Area (HCA) and Unusually Sensitive Area (USA). HCA's and USA's are defined as those areas that based upon the line's proximity could cause substantial harm if a release were to occur. These areas include certain populated areas, navigable waterways, drinking water sources and state/federal designated ecological resources. This aspect of the plan is meant as a pre-planning tool to identify exceptionally vulnerable areas and propose prevention and mitigative measures to protect them.

TASK 5 DETERMINE THE ADEQUACY OF THE PROPOSED CONSTRUCTION, MITIGATION, AND RECLAMATION PLAN TO RESTORE AFFECTED AREAS BACK TO FULL PRODUCTIVITY IN A REASONABLE TIMEFRAME

Source Documents Reviewed: Construction Mitigation and Reclamation Plan

Introduction

This task involves the evaluation of the TransCanada Keystone Pipeline L.P. (Keystone) Construction Mitigation and Reclamation Plan (Plan) prepared by Universal Ensco, Inc. to assess its adequacy to ensure areas affected by project-related activities would be restored to original productivity within a reasonable timeframe along the proposed Keystone Pipeline Project route.

Findings and Recommendations

Bay West find that the construction mitigation and reclamation practices included in the Plan are generally adequate and comply with pipeline industry standards. The following discussion provides findings of where the Plan could be improved and offers recommendations for specific conditions to be included in the South Dakota Public Utilities Commission (SD PUC) permit.

SECTION 2.0 - GENERAL CONDITIONS

General conditions in Section 2.0 of the Plan provide standard measures for mitigating adverse impacts to the environment and landowners affected by the project. The following findings and recommendations should be noted to further mitigate impacts resulting from the project.

Environmental Inspection

The Plan did not specifically stipulate the use of an environmental inspector during and after construction. Environmental inspectors are commonly used by pipeline companies on large-scale construction projects. Requiring at least one environmental inspector per construction spread during the proposed project would help ensure compliance with the SD PUC's permit, other environmental agency permits and approvals, and landowner agreements. Bay West recommends the following conditions to be included in the SD PUC permit:

> *At least one environmental inspector is required for each construction spread during construction and restoration to help ensure compliance with the PUC's permit, other environmental agency permit conditions, and landowner requirements. Environmental inspectors shall have peer status with all other activity inspectors and shall have the authority to order appropriate corrective actions or to stop activities that violate the environmental requirements.*
>
> *The environmental inspector shall keep records of compliance with regard to environmental conditions of the SD PUC Permit, and the mitigation measures proposed by TransCanada, and other Federal or state environmental permits during the construction and restoration phases of the project.*

Noise Control

Noise impacts from a pipeline project are generally categorized in two ways: 1) short-term temporary impacts resulting from the use of construction-related equipment and 2) long-term permanent impacts resulting from the operation and maintenance of the facility.

The proposed project crosses areas that are sensitive to construction-related noise (*e.g.*, residential, commercial/industrial areas, active livestock areas, *etc.*). To help ensure that sensitive areas in the vicinity of construction activities would not be affected by noise levels, Keystone stipulated it would minimize noise during non-daylight hours and would attempt to abide by municipal bylaws in noise-sensitive areas and would install noise attenuation at above-ground facilities, if necessary, to ensure that noise levels comply with the applicable state or local standards.

The United States Department of State has indicated in its Environmental Impact Statement that it would require Keystone to set up a hotline to enable individuals to contact Keystone in the event that construction noise levels affect them. In those instances, Keystone should conduct noise assessment surveys at the affected area to ensure that the noise attributable to construction does not exceed Day-Night Sound Level (Ldn) of 55 decibels of the A-weighted scale (dBA). In the event that construction noise cannot meet regulated levels, Keystone should work with these individuals to develop an acceptable alternative construction work plan. In addition, Keystone should ensure that construction equipment would be operated on an as-needed basis and would be maintained to manufacturers' specifications to minimize noise impacts.

Noise from pump station operation could also result in long-term impacts on nearby residences. Keystone conducted noise studies suggesting that noise generated by the pump stations would not exceed the criterion of Ldn of 55 dBA at any nearby residences. Although noise impacts from the electrically powered pump stations are projected to be minor, Keystone should perform a noise assessment survey during operation to confirm the level of noise at each listed noise-sensitive area.

In the absence of specific measures proposed by Keystone to mitigate for noise impacts associated with noise generated by operating the pump stations and by construction-related activities, including around-the-clock horizontal directional drilling (HDD) activities proposed near residences at the Missouri River crossing near Yankton, Bay West recommends the following conditions be included in the SD PUC permit:

Keystone shall perform a noise assessment survey during operation to confirm the level of noise at each listed noise-sensitive area. If the noise attributable to operation of any pump station exceeds 55 dBA Ldn at any noise-sensitive area, Keystone shall implement noise mitigation measures to ensure that regulation levels are not exceeded.

The criterion of L_{dn} of 55 dBA shall be adopted for horizontal directional drilling operations near residences, or Keystone shall develop a plan for South Dakota Public Utilities Commission review and approval that includes specific measures to mitigate for noise impacts from drilling operations during non-daytime hours. Measures may include the installation of a temporary noise barrier system at the directional drill site.

Weed Control

The measures included in the plan for weed control are sufficiently prepared and generally comply with standard industry practices. However, Bay West recommends including the following conditions to the SD PUC permit with regard to herbicide application:

Keystone shall obtain landowner consent in writing prior to herbicide application.

Keystone shall inform landowners of the brand name/active ingredient, the application method, and application rate for each herbicide planned for use on this project.

Keystone shall make available a copy of the herbicide's MSDS information.

Dust Control

The measures included in the plan for dust control are sufficiently prepared and comply with standard industry practices, with one exception. Bay West recommends including the following condition to the SD PUC permit:

Keystone shall cover all open-bodied trucks while in motion to minimize fugitive dust emissions.

Road and Railroad Crossings

The measures included in the plan for road and railroad crossings are sufficiently prepared and comply with standard industry practices, with one exception. Bay West recommends including the following condition to the SD PUC permit:

Keystone shall coordinate with emergency responders where project-related activities occur near road and railroads and where road closures are necessary.

SECTION 3.0 SPILL PREVENTION AND CONTAINMENT

A comprehensive assessment of the adequacy of the proposed remediation efforts related to spills in provided under Task 6 of this document.

SECTION 4.0 UPLANDS (AGRICULTURAL, FOREST, PASTURE, RANGE / GRASSLANDS)

Approximately 97 percent of the proposed project crosses upland areas consisting of agricultural, forest, pasture, range and grasslands. Project-related activities will cause short-term impacts to these areas during and after construction of the proposed facilities. Unavoidable short-term impacts to upland areas would include but are not limited to vegetation disturbance and clearing; soil erosion; segregation of topsoil; compaction to prime farm soils; interference with irrigation practices; and damages to drain tiles systems. Section 4.0 of the Plan outlines construction and mitigation procedures that would be implemented to minimize impacts to these areas. Keystone would also comply with conditions of landowner agreements, and any necessary federal, state, and local agency permits and approvals that may apply to the project. The measures outlined in the Plan were found to be sufficiently prepared and comply with standard industry practices, with few exceptions, to minimize construction-related impacts and to restore the affected upland areas to preconstruction use and productivity. The following findings and recommendations should be noted to further mitigate project-related impacts to upland areas.

Topsoil Removal and Storage

The Plan specifies measures to conserve the productivity of topsoil affected by project-related activities. In cultivated agricultural lands, Keystone proposed a trench line-only topsoil segregation technique. Using this technique, topsoil would be segregated from the trench line and stored on undisturbed topsoil next to the trench in the area where the pipe would be strung, welded, and stored before lowering-in and backfilling. Trench line-only topsoil segregation would minimize the quantity of topsoil disturbance, and the amount of topsoil excavated thereby reducing the potential for wind erosion of excavated topsoil. Further, it would preserve a larger amount of undisturbed existing root stock. Leaving as much of the sod and root layer intact as practical would increase the probability

that post-construction revegetation would be successful and reduce the potential for weedy plant species to become a dominant component. However, subsoil excavated from the trench would be placed directly on undisturbed topsoil on the non-working side of the right-of-way (also referred to as the subsoil storage area or the spoil side), thereby increasing the potential for mixing of topsoil and subsoil in these areas especially during backfilling. Mixing of subsoil with topsoil, particularly in agricultural lands, dilutes the superior chemical and physical properties of the topsoil and lowers soil fertility and the ability of disturbed areas to revegetate successfully. To minimize the potential for mixing of topsoil and subsoil, Bay West recommends including the following condition to the SD PUC permit:

Unless the landowner specifically approves otherwise, topsoil shall be segregated either along the full right-of-way or from the trench and subsoil storage area in actively cultivated or rotated crop lands and pastures, residential areas, hayfields, and other areas at landowner request.

In deep soils (more than 12 inches of topsoil), segregate at least 12 inches of topsoil unless otherwise specified by the landowner. In soils with less than 12 inches of topsoil make every effort to segregate the entire topsoil layer. Where topsoil segregation is required, maintain separation of salvaged topsoil and subsoil throughout all construction activities. Segregated topsoil may not be used for padding the pipe.

Temporary Erosion and Sediment Control

The measures included in the plan for temporary erosion and sediment control are sufficiently prepared and comply with standard industry practices, with one exception. The plan specifies temporary slope breakers (section 4.5.4) and permanent slope breakers (section 4.11.5.2) will be installed on slopes greater than 5 percent in non-cultivated areas with adequate spacing requirements. However, Keystone proposes to install the slope breakers at a gradient of 2 to 8 percent. Standard practice is to install the slope breaker at a gradient of 2 to 4 percent. Logically, the slope breaker should be installed at a slope less than or equal to the minimum slope threshold (*i.e.*, 5 percent). Bay West recommends including the following condition in the SD PUC permit:

Install temporary slope breakers on slopes greater than 5 percent on non-cultivated lands where the base of the slope is less than 50 feet from a waterbody, wetland and road crossings at the following spacing (closer spacing may be used if necessary):

Slope (%)	*Spacing (feet)*
5 – 15	*300*
>15 – 30	*200*
>30	*100*

The gradient of each slope breaker shall be 2 to 4 percent.

Trenching

The plan specifies measures that will be implemented during trenching activities, including safety measures if blasting becomes necessary to remove rock from the trench line. In addition to provisions provided in the Plan, Bay West recommends including the following in the SD PUC Permit to better ensure safety during trenching operations and further minimize the effects of blasting:

In addition to provisions provided in the Construction and Mitigation and Reclamation Plan, Keystone shall install exclusion fencing around the perimeter of the pipe trench or pit excavations in residential areas if the trench/pit would remain open during non-working hours.

Keystone shall also comply with the following to further minimize the effects of blasting and to better ensure safety during blasting operations:

6) *post warning signs, flags, and barricades;*
7) *sound warning horns or sirens;*
8) *follow procedures for safe storage, handling, loading, firing, and disposal of explosive materials;*
9) *coordinate with emergency responders as necessary; and*
10) *blasting shall be conducted by registered blasters.*

If blasting will occur within 150 feet of structures, Keystone shall use an independent contractor to inspect structures before blasting and other locations if requested by the landowner. Post-blast inspections would be performed as warranted. During blasting, the independent contractor shall monitor ground vibrations at the nearest structure within 150 feet.

Keystone shall evaluate any damage complaints associated with blasting activities. In the unlikely event that blasting would affect nearby water wells, Keystone shall provide alternative sources of water or otherwise compensate affected landowners. Keystone shall also compensate landowners if buildings or structures are damaged as a result of the blasting activities.

Padding and Backfilling

The measures included in the plan for padding and backfilling are sufficiently prepared and comply with standard industry practices, with one exception. One stipulation states if it is impossible to avoid water-related damages, Keystone shall reasonably compensate the landowners for the damages or shall correct the damages so as to restore the land, crops pasture, water courses, *etc.* to their preconstruction condition. Bay West recommends including the following in the SD PUC Permit:

If it is impossible to avoid water-related damages, Keystone shall reasonably compensate the landowners for the damages and shall correct the damages so as to restore the land, crops pasture, water courses, etc. to their preconstruction condition.

Clean Up

The measures included in the plan for cleanup activities are generally sufficiently prepared and comply with standard industry practices. However, some language should be more specific. Bay West recommends including the following additional measures in the SD PUC Permit:

Keystone shall commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (temporary slope breakers and sediment barriers) until conditions allow completion of cleanup.

Reclamation and Revegetation

The measures included in the plan for reclamation and revegetation are generally sufficiently prepared and comply with standard industry practices. However, Bay West recommends including the following additional requirements in the SD PUC Permit:

In addition to provisions provided in the Construction and Mitigation and Reclamation Plan, Keystone shall comply with the following provisions when implementing measures included in Section 4.11, Reclamation and Revegetation:

5) *Relieving compaction: submit and obtain written approval from the SD PUC on a winterization plan if construction will continue into the winter season when conditions could delay successful de-compaction, topsoil replacement, or seeding until the following spring.*
6) *Rock removal: rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench should be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner.*
7) *Mulching: Apply mulch on all slopes (except in actively cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. If anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies. Mulch before seeding if:*
    c. *final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas); or*
    d. *construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.*
8) *Erosion Control Matting: Install erosion control fabric on waterbody banks at the time of final bank re-contouring as shown in Detail 4 in the Plan, unless riprap or other bank stabilization are employed in accordance with federal, state, and local permits and approvals.*

Forested Lands

The measures included in the plan for forested lands are generally sufficiently prepared and comply with standard industry practices. One stipulation states that if trees of commercial or other value to the landowner are to be removed, Keystone shall allow the landowner the right to retain ownership of the trees with the disposition of the trees to be negotiated prior to clearing. This provision does not include requirements for reasonable compensation to landowners for the value of the timber. Bay West recommends including the following in the SD PUC Permit:

If trees need to be removed that have commercial or other value to affected landowners, Keystone shall compensate the landowners fair market value of the trees to be cleared and/or allow the landowner the right to retain ownership of the felled trees.

Operation and Maintenance

The measures included in the plan for operation and maintenance are generally sufficiently prepared and comply with standard industry practices, with a few minor exceptions. One stipulation states that Keystone will conduct post-construction monitoring after the first growing season. It is standard industry practice to perform post-construction monitoring after the first and second growing seasons. A second stipulation states that Keystone shall monitor yield of cultivated lands impacted with the

help of an agricultural specialist, when requested by landowners. Yield monitoring should be offered in all cases, unless specifically declined by specific landowners. Bay West recommends including the following stipulations in the SD PUC Permit:

Conduct follow-up inspections of all disturbed areas after the first and second growing seasons to determine the success of revegetation. If after the first growing season, revegetation is successful, no additional monitoring would be required.

In cultivated areas, Keystone shall monitor for at least two years the yield of land impacted by construction using agricultural specialists in all cases, unless specifically declined by specific landowners.

SECTION 5.0 DRAIN TILE SYSTEMS

Much of the proposed project crosses areas that may contain drain tile systems. Project-related activities will cause short-term impacts to these systems during and after construction of the proposed facilities. The mitigation measures included in the plan for affected drain tile systems are sufficiently prepared and comply with standard industry practices. However, Bay West recommends including the following additional requirements in the SD PUC Permit:

Location information of drain tiles exposed during the project shall be collected by a craft inspector, environmental inspector, or its equivalent, using a sub-meter accuracy Global Positioning System, or at a minimum, by accurately documenting the pipeline station numbers of each exposed drain tile. Keystone shall maintain on file the drain tile location information and tile specifications (e.g., diameter, type, depth, etc.). Future availability of this information would be essential to relocate drain tiles in the event a pipeline leak/spill occurs during the operation of the facility and would help in a spill recovery effort to contain transport of pipeline liquids via drain tiles.

SECTION 6.0 WETLAND CROSSINGS

The proposed project will cause short-term impacts to up to 98 acres of wetland/riparian areas in South Dakota. The area is less than 3 percent of the entire project area within South Dakota. Most of the wetlands crossed are palustrine emergent wetlands. Less than one percent of the wetlands affected are forested.

Section 6.0 of the Plan outlines construction and mitigation procedures that would be implemented to minimize impacts to wetlands crossed by the proposed project. Keystone would also comply with conditions of its federal, state, and local permits and approvals that must be obtained prior to beginning project activities within wetlands. Wetland mitigation measures outlined in the Plan were generally found to be sufficiently prepared and comply with standard industry practices in wetland areas. The following findings and recommendations should be noted to further mitigate impacts resulting from the project.

Easement and Workspace

Keystone stipulated that the width of the construction right-of-way shall be reduced to 85 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width. Standard industry practice is to reduce the width to 75 feet in standard wetlands. Keystone also stipulated that it would locate all extra work areas (such as staging areas and additional spoil storage areas) at least 10 feet away from wetland boundaries. Standard industry practice is to locate extra

work areas at least 50 feet away from wetland boundaries, except where the adjacent upland is actively cultivated or rotated cropland or other disturbed land. Bay West recommends including the following stipulations in the SD PUC Permit:

Unless a wetland is actively cultivated or rotated cropland, limit the width of the construction right-of-way to 75 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width.

Unless a wetland is actively cultivated or rotated cropland, locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries. Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

Operation and Maintenance

Keystone stipulated that it would not conduct vegetation maintenance over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, Keystone would maintain a corridor centered on the pipeline and up to 30 feet wide in an herbaceous state. In addition, trees within 30 feet of the pipeline that are greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way. Standard industry practice is to maintain a corridor centered on the pipeline up to 15 feet wide and to selectively cut trees greater than 15 feet in height within 15 feet of the pipeline. Bay West recommends including the following stipulations in the SD PUC Permit:

Do not conduct vegetation maintenance over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 15 feet wide may be maintained in an herbaceous state. In addition, trees within 15 feet of the pipeline that are greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way.

SECTION 7.0 WATERBODIES AND RIPARIAN LANDS

The proposed project would cause short-term impacts to several waterbodies and riparian lands. Keystone would minimize impacts on surface waters by implementing the waterbody construction and mitigation procedures contained in Sections 7.0 of the Plan. Keystone would also comply with conditions of its federal, state, and local permits and approvals that must be obtained prior to beginning project activities that affect waterbodies and riparian areas. Waterbody crossing methods and mitigation measures outlined in the Plan were generally found to be sufficiently prepared and comply with standard industry practices for waterbodies and riparian areas. The following findings and recommendations should be noted to further mitigate impacts to waterbodies and riparian lands resulting from the project.

Easement and Workspace

Keystone stipulated it would locate all extra work areas (such as staging areas and additional spoil storage areas) at least 10 feet away from the water's edge. Standard industry practice is to locate extra work areas at least 50 feet away from water's edge, except where the adjacent upland is actively cultivated or rotated cropland or other disturbed land. Bay West recommends including the following stipulations in the SD PUC Permit:

Locate all extra work areas (e.g., staging areas, additional spoil storage areas, etc.) at least 50 feet away from water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Limit clearing of vegetation between extra work areas and the edge of the wetland to the construction right-of-way. Work area boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas.

Operation and Maintenance

Keystone did not include a section in its plan that addresses post-construction operation and maintenance activities. Bay West recommends including the following stipulations in the SD PUC Permit:

Limit vegetation maintenance adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be maintained in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that are greater than 15 feet in height may be cut and removed from the permanent right-of-way.

Pesticides and herbicides should be used in accordance with their label instructions and should be used in or within 100 feet of a waterbody except as allowed by the riparian landowner, and appropriate land management or state agency.

SECTION 8.0 HYDROSTATIC TESTING

Water from up to five streams in South Dakota would be used to hydrostatically test the pipe during the final phases of the project. Provided Keystone obtains and complies with the necessary permits and approvals for the appropriation and discharge of hydrostatic test water, the measures included in the plan for hydrostatic testing are sufficiently prepared and comply with standard industry practices.

TASK 6 DETERMINE THE ADEQUACY OF THE PROPOSED REMEDIATION EFFORTS RELATED TO SPILLS

Source Documents Reviewed: Keystone Pipeline Emergency Response Plan

Introduction

The necessity to remove (cleanup) oil from the environment is primarily based upon the risk it poses to human health, safety and environment. For instance, risk-based corrective action, developed to address environmental repair caused by leaking underground petroleum storage tanks, often involves leaving some contamination behind—allowing "mother nature" to complete the job. Petroleum products, hydrocarbon molecules, are fairly amenable to the natural biological breakdown processes. The completeness of a cleanup (determination of "how clean is clean") is driven primarily by state and local environmental regulatory agencies.

Following the Findings and Recommendation section is narrative regarding the two phases of the cleanup process—immediate and long-term.

Findings and Recommendations

Bay West find that the proposed remediation efforts related to spills to be adequate and consistent with industry practice. To allow for a more expedient decision process and a more favorable cleanup outcome, it is encouraged that specific cleanup techniques be evaluated in advance for at least all identified HCA and USA locations, to be consistent with the findings outlined in Task 4 of this report. No other recommendations are offered.

Background

Immediate Cleanup

Immediate actions are required following a release to "stabilize" the situation. During this time the immediate threats to the public's safety, health and environment are managed usually by containing and then physically removing the bulk of oil on land or in the water. This process, depending upon the size of the release and circumstances, can take days to weeks and can involve such actions as pumping, soil excavation, on-water recovery with boats, shoreline cleaning, etc. Immediate cleanup actions may result in a thorough or sufficient cleanup and not require any or minimal additional cleanup or monitoring effort. Those vested parties responding during the emergency phase of a release (environmental regulators, fire department, pipeline company), are expected to develop an immediate cleanup action plan consisting of objectives and priorities which are often based upon the following factors:

- Overall life-safety, public health and environmental threats
- Timing and amount of available response equipment and personnel
- Weather conditions, site access and other logistical issues

It is true that each incident is unique in its requirements to complete the cleanup. The availability and identification of the correct type and amount of response resources is critical during the early phases of a response. For instance, in some cases where the pipeline is remotely located, the creation of a

make-shift road may be necessary. This would require heavy equipment and possibly gravel. Inland and water-way spill response training can help responders develop techniques and prepare for the challenges and eventualities of a release. Response efforts often involve around-the-clock operations for the first several days to as quickly as possible contain and recover oil. The development of specific response strategies (at least at HCA and USA locations), and the regular testing (practicing) of those strategies, will help to minimize the threat to the public safety, public health and the environment.

Long-term Cleanup

If the natural resources have sustained damaged or remain threatened due to un-recovered contamination, long-term remediation (cleanup), monitoring and/or restoration (returning the resource to a pre-spill state) activities may need to be considered. Ground water contamination is often of concern for land based releases and is monitored with the use of monitoring wells. This approach allows for the extent and magnitude of ground water contamination to be evaluated through time. The success of ground water remediation can be limited depending upon the technology used. Clean-up goals, or desired levels of specific contaminants allowed to remain in the environment (air, soil, surface and ground water), are commonly established by state and federal environmental regulatory agencies.

Natural Resource Damage Assessment: 15 CFR Part 990 (National Oceanic and Atmospheric Administration) enables the designated state trustee (DENR) to complete, with or without the involvement of the responsible party, a natural resource damage assessment (NRDA). The assessment is intended to determine, quantify and propose a remedy due the effects of the spill and any remediation. It accounts for the "services of the resource lost" on behalf of the state. It is not a penalty mechanism but rather seeks a compensatory settlement in returning the resource to its original state. For instance, if during a pipeline release the best approach, to minimize public safety, health and environmental damage was to burn the spill, and in so doing destroyed several acres of forest area, the NRDA would evaluate the cost of the lost resource and develop a restoration plan. From the CFR regarding NRDA actions:

"This goal is achieved through the return of the injured natural resources and services to baseline and compensation for interim losses of such natural resources and services from the date of the incident until recovery. The purpose of this part is to promote expeditious and cost-effective restoration of natural resources and services injured as a result of an incident. To fulfill this purpose, this part provides a natural resource damage assessment process for developing a plan for restoration of the injured natural resources and services and pursuing implementation or funding of the plan by responsible parties. This part also provides an administrative process for involving interested parties in the assessment, a range of assessment procedures for identifying and evaluating injuries to natural resources and services, and a means for selecting restoration actions from a reasonable range of alternatives."

TASK 7 HYDROGEOLOGIC AND GEOLOGIC VULNERABILITY

Source Documents Reviewed:

- United States Department of State, Draft Environmental Impact Statement, for the Keystone Oil Pipeline Project, August 10, 2007 (USDS, 2007).
- United States Geological Survey http://geology.usgs.gov/connections/fws/landscapes/karst_map.htm
- South Dakota Geological Survey (SDGS) Department of Environmental and Natural Resource Maps including:
  - Geologic Map of South Dakota, 2004.
  - First Occurrence of Aquifer Materials, South Dakota, including:
    - Map 2, Clark County
    - Map 3, Marshall County
    - Map 4, Brown County
    - Map 12, Minor County
    - Map 14, Yankton County
    - Map 15, Beadle County
    - Map 24, Kingsbury County
    - Map 25, Hutchinson County
    - Aquifer Materials maps were not available for Day, Hanson, and McCook Counties.
  - SDGS Geologic Quadrangle Maps have not been developed for the study area.

Introduction

The purpose of Task #7 was to review the applicant's filings and available hydrogeological publications for the pipeline area and identify areas where the geology would be highly susceptible to a crude oil release from the pipeline. Our assessment of sensitive geologic and hydrogeologic areas primarily consisted of attempting to identify the most highly susceptible areas where surface contamination may reach groundwater resources and potential catastrophic events like landslides, sinkholes that change topography that could rupture the pipeline. The hydrogeologic evaluation, focusing primarily on drinking water source area protections, was addressed as part of Task 3. Therefore, this assessment focuses mainly on geologically sensitive areas.

Bay West's review was limited by time and to available published geologic maps in conjunction with the summaries provided in the Draft Environmental Impact Statement (DEIS). In addition, several attempts were made to contact representatives of the SDGS to discuss conclusions and summaries of the hydrogeologic and geologic data. However, the SDGS was not available during the time of the review.

Findings and Recommendations

The DEIS presents a general overview of potentially sensitive geologic and hydrogeologic areas. The DEIS geologic summary generally coincides with SDGS geologic maps reviewed. The type of geologic material present at the surface determines the vertical travel time for water-soluble, geologically inert contaminants released at the surface to reach the uppermost aquifer. Travel times are controlled by the permeability, and thickness of the geologic materials through which

contaminants would move. The sensitivity of an aquifer is inversely proportional to the time of travel. Longer travel times are associated with both a greater degree of geologic protection and reduced sensitivity to ground-water pollution. Shorter travel times represent an increased sensitivity and an inability to protect ground water from vertical contaminant movement. However, high sensitivity does not indicate that water quality has or will be degraded. Low sensitivity does not guarantee that ground water will remain pristine.

In general the current published geologic maps available for the pipeline route do not contain enough detailed information about distribution of surficial geologic materials and bedrock outcrops to allow for a complete evaluation of hydrogeologically and geologically sensitive areas. One potential highly susceptible geologic feature is the Niobrara Formation, a carbonate rock that can form fissures up to 1,000 feet long and 100 feet deep. Carbonate bedrock are typified hydrogeologically by very high flow rates along interconnected, solution-enlarged fractures and cavities, which may result in a very high sensitivity area where present, typically regardless of the depth to the water table.

The DEIS indicates the Niobrara Formation may be present in the southern half of the state from mile post (MP) 353 to 436 (Nebraska border). It also states that karst features are found in southern portions of Miner County, northern Hanson County, southern Hutchinson County, and all of Yankton County (ENSR 2006a). However, it does not describe what these features are. The USGS defines Karst as a type of topography that is formed over limestone, gypsum, and other rocks by dissolution. It is characterized by sinkholes, caves, and underground drainages. Human activities can negatively impact karst areas, resulting in subsidence and ground-water contamination. USGS maps indicate that Karst terrain is potentially present in the southern half of the study area. The SDGS First Occurrence Aquifer Maps indicate the Niobrara Formation is the first aquifer present in Beadle County, although it is greater than 100 feet below the ground surface and as you move south it can be between 50 to 100 feet below the ground surface. The aquifer maps suggest that the Niobrara Formation may cover a larger area than summarized in the DEIS. The Geologic Map of South Dakota indicates that the surficial Quaternary deposits can be as thick as 300 feet. However, depth to bedrock was not provided on the maps reviewed.

In concurrence with the DEIS, Bay West recommends that additional measures be performed to assess the thickness of overburden and distribution of bedrock outcrops in the karst areas. Additionally, a detailed review of depth to bedrock maps, boring logs, and well logs should be completed to confirm the thickness of overburden and bedrock type along the pipeline ROW. This review could be supplemented through meetings with the SDGS and a field walking survey in areas where available information is limited and areas that have a potential for landslides, sinkholes, and/or flooding where topography can change rapidly. Also, it is recommended that the karst features in Miner County, northern Hanson County, southern Hutchinson County, in the DEIS be further described and an analysis of their potential impacts to the study area be completed.

We recommend that TransCanada report each identified karst outcropping and areas of shallow overburden (less than 50 feet in depth) that they are aware of or identify in the future that exist within 0.5 miles of the pipeline ROW to the SDGS, SD PUC and United States Department of Transportation (USDOT). In addition to the karst areas, the Environmental Analysis section of the DEIS summarized other potential impacts and mitigation measures which in some instances included recommendations for further evaluation in the study area. These recommendations could best be addressed as conditions of the PUC issuing a construction permit for the project. Findings associated with this more detailed review should be provided to the USDOT, the SD PUC and the Geological

Survey. The USDOT may use the findings to assess if this new information would cause some areas to be defined as geologically sensitive High Consequence Areas.

TASK 8 DOCUMENT REVIEW AND COMPLIANCE

Bay West reviewed the applicable sections of Administrative Rules of South Dakota for Energy Facilities(ARSD 20:10:22). The applicants filings reviewed in association with this project were found to be in compliance with sections ARSD 20:10:22: 13, 14, 15, 16, 17, 18, 20, 21, 23, & 38 and in general accordance with other regulations regarding environmental issues.

TASK 9 UNIDENTIFIED IMPACT ISSUES OF CONSEQUENCE

The purpose of this task was to call attention to and proposes mitigation for other environmental impact issues of consequence not previously identified. The ability to identify environmental issues of consequence were somewhat limited by the documents reviewed as part of Bay West's scope of work. During the review of project documents, environmental issues of consequence, other than what were already identified by others or by Bay West, have not been identified.

TASK 10 SAFETY RISK DETERMINATION

Introduction

Safety risk pertains to the following populations: the general public, first responders, pipeline maintenance crews, regulatory officials and others that may be involved during normal operations or during an emergency situation. Safe operations involve the identification of associated hazards and then properly controlling those hazards.

Finds and Recommendations

During the course of its evaluation Bay West did not find undue safety risks, or associated spill damage, not otherwise associated with normal or emergency pipeline operations. It is imperative that the first responder community be adequately trained to ensure protection of nearby populations.

5.0 CONCLUSION

The construction of the proposed Keystone Pipeline presents both significant and insignificant risk to the environment and inhabitants of South Dakota. The proper implementation of the regulatory design requirements, construction and operational requirements, TransCanada's proposed mitigation measures, and the recommendations provided within this document, reduces, to currently recognized industry standards, the:

- threat (risk) of serious injury to the environment or the inhabitants within the siting area;
- impairment of the health, safety or welfare of the inhabitants in the siting area; and,
- complies with all applicable laws and rules (as they pertain to the Tasks 1 through 6 of this document);
- Interference with the orderly development of the region with due consideration being given the views of governing bodies of affected local units of government.

TransCanada would be required to comply with all applicable laws and rules during construction

6.0 LIMITATIONS

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Bay West based on the data obtained from the work. Due to the nature of assessment, the incomplete nature of some project documents, and the limited data available, Bay West cannot warrant against undiscovered environmental liabilities. Conclusions and recommendations presented in this report should not be construed as legal advice. Should additional information become available which differs significantly from our understanding of conditions presented in this report, Bay West requests that this information be brought to our attention so that Bay West may reassess the conclusions provided herein.

REFERENCES

Each Section of the report identifies source documents reviewed as part of this effort.