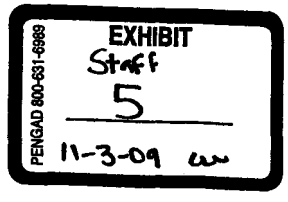
BEFORE THE
PUBLIC UTILITIES COMMISSION
STATE OF SOUTH DAKOTA

KEYSTONE XL PROJECT
DOCKET HP09-001

PREFILED TESTIMONY OF ROSS HARGROVE
ON BEHALF OF THE COMMISSION STAFF
SEPTEMBER 2009



BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DIRECT TESTIMONY OF ROSS HARGROVE

Q: Please state your name and business address.

A: Ross Hargrove, Natural Resource Group, LLC, 1000 IDS Center, 80 South 8th Street, Minneapolis, MN, 55402.

Q: Describe your educational background.

A: I received my Bachelor of Science Degree in 2000, from the University of Minnesota in St. Paul, Minnesota with a Major in Forest Resources.

Q: By whom are you now employed?

A: I have been employed by Natural Resource Group, LLC (NRG) since 2000. I currently hold the position of Consultant, and I am Manager of NRG's Operational Compliance Group. I provide environmental permitting services and environmental survey and environmental inspection management oversight to the natural gas, petroleum, and products pipeline industries.

Q: What work experience have you had that is relevant to your research on this project?

A: I have over 9 years of experience in the energy industry specializing in environmental project management for pipeline expansion and maintenance projects. I support various clients with project planning and review tasks, coordinating regulatory agency consultations, managing field surveys, acquiring permits and authorizations, providing environmental training to construction contractors, and providing compliance oversight for construction activities. I have also authored portions of Environmental Impact Statements and Environmental Assessments relating to vegetation, restoration and monitoring, land use, and transportation for the Federal Energy Regulatory Commission and the U.S. Coast Guard for pipeline and liquefied natural gas import terminal

expansion and construction projects. A copy of my resume is appended to this testimony as Attachment 1.

Q. On whose behalf was the testimony provided?

A. This testimony was provided on behalf of the staff of the South Dakota Public Utilities Commission.

Q: What is the purpose of your testimony?

A: My testimony summarizes my evaluation of the TransCanada Keystone Pipeline LP (Keystone) Construction, Mitigation, and Reclamation Plan (CMRP) to assess its adequacy with respect to restoration of areas affected by construction-related activities to original productivity within a reasonable timeframe along the proposed Keystone XL Project route.

Q: What methodology did you employ?

A: First, I reviewed Keystone's application, revised application, CMRP, and other documents filed under the docket as well as Keystone's responses to data requests from PUC staff. I also reviewed comments submitted to the PUC by the public and/or intervenors. I then compared Keystone's CMRP with standard environmental industry practices, including but not limited to those identified in the Federal Energy Regulatory Commission's (FERC's) Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures. Although the FERC does not regulate the construction of crude oil pipelines, these documents describe construction, mitigation, and restoration measures that were developed specifically to minimize environmental impacts from the construction of pipelines. As such, they provide useful guidance for all types of pipelines. Further, I considered issues specific to the proposed project location in South Dakota such as soil types crossed by the proposed route and agricultural practices in the project area.

Q: **Summarize your findings and how the possible negative effects of pipeline construction can be mitigated.**

A: Overall, I found the CMRP to be generally consistent with industry environmental standards for pipeline construction. Additionally, the plan commits to the use of Environmental Inspectors during construction to monitor the contractor's project activities for compliance with regulatory requirements. A summary of NRG's findings and recommendations to improve the CMRP is appended to this testimony as Attachment 2. NRG provides recommendations on several restoration and mitigation measures including: weed control; construction in adverse weather conditions; spill prevention and containment; road and railroad crossings; topsoil segregation; temporary erosion and sediment control; stringing; trench dewatering; padding and backfilling; clean-up; reclamation and revegetation; pasture and range lands; operation and maintenance; drain tile systems; wetland crossings; and waterbodies and riparian areas.

Q: **Please evaluate additional information Keystone provided regarding specific construction/reclamation procedures that Keystone would implement during construction of the pipeline.**

A: On July 20, 2009, PUC staff requested that Keystone provide additional information regarding the mitigation/restoration of areas with specific types of soil limitations potentially located along the pipeline route. On August 21, 2009, Keystone responded: "Specifications for construction/reclamation procedures will be developed prior to construction. These specifications, called Construction/Reclamation (Con/Rec) Units, will provide the contractor with instructions for practices such as clearing and grading, topsoil salvage, trenching, erosion control, seedbed preparation, seed mix and seeding method. The Con/Rec Unit (example Con/Rec Unit names are Mixed Grass Prairie, Badlands, Forested Waterway, Crop Field and Tame Pasture) assigned to any given

location along the pipeline route will be determined by site-specific conditions including, but not limited to, preconstruction land use, slope, soils and vegetation."

Commission staff recently requested Keystone submit any final Construction/Reclamation Units and associated restoration and mitigation procedures and corresponding pipeline milepost references. If plans are received prior to the hearing, I may supplement my testimony based on plan content. If plans are not available, however, I recommend that the PUC require Keystone to provide the final Construction/Reclamation Units and associated restoration and mitigation procedures and corresponding pipeline milepost references to the PUC prior to construction.

Q: **Please evaluate Keystone's response to PUC staff's request to identify how Keystone would monitor soil productivity along the pipeline right-of-way.**

A: Keystone acknowledges the potential for the project to result in reduced soil productivity in Sections 4.11.1 and 4.16 of its CMRP. However, no specific procedures are provided to establish yield monitoring protocols or release criteria in cultivated agricultural lands. Crop yield and soil productivity impacts are often among the larger post-construction issues affecting landowner/applicant relations. I recommend that the PUC require Keystone to provide crop monitoring protocols for agricultural lands that are more specific than those currently described in the CMRP. Crop monitoring can be used to establish damages and to determine when successful reclamation was obtained. Based on experience with other pipeline projects, successful compensation and crop monitoring plans generally include the following features:

- Requests for monitoring and claims for damages are initiated by the landowner.
- Monitoring consists of on- versus off-right-of-way yield testing performed by qualified agricultural specialists using industry-standard methods. Impacts are assumed if on- versus off-right-of-way yields are consistently (2 years within 3) less than 90 percent of the off-right-of-way yields.

- One year of monitoring is not sufficient to make a no-impact determination. Frequently adverse impacts do not become apparent until the crop is stressed. Climatic conditions must be considered when evaluating monitoring data.

Commission staff recently requested Keystone provide a plan which summarizes how it intends to monitor restoration success (intensity and frequency of inspections) to identify areas where soil productivity has not returned to pre-construction levels. The plan should include the time frames for which landowner claims for loss of soil productivity in agricultural lands will be processed or remediated. Staff also asked Keystone to summarize how claims will be settled for which a consensus regarding potential damages if an agreement cannot be reached between the landowner and Keystone. I may supplement my testimony based on Keystone's reply.

Q: **Please evaluate Keystone's response to PUC staff's inquiry regarding the measures Keystone would implement to avoid or minimize impacts on pipeline crossings of lakes and/or reservoirs.**

A: On July 20, 2009, PUC staff requested additional information regarding the potential crossings of eight lakes and five reservoirs identified in Keystone's initial application submitted in March 2009. Keystone responded that some of these crossings were avoided by reroutes identified after the filing of the initial application, or were not identified during follow-up field inspections. Keystone stated that any feature with standing water at the time of construction will be crossed using the Non-Flowing Open Cut Crossing Method described in the CMRP (Section 7.4.1).

I reviewed Detail 11 located in the CMRP, which corresponds to the Open-Cut Wet Crossing method for Non-Flowing waterbodies, and the section referenced above. The typical detail indicates that sediment barriers (straw bales and/or silt fence) will be

installed along the construction right-of-way edge within the wetland/waterbody as required.

I recommend that the PUC require Keystone to utilize floating sediment curtains to maintain sediments within the construction right-of-way in lieu of straw or hay bales when the depth of non-flowing, standing water would exceed the height of straw bales or silt fence installation.

Q: Please evaluate Keystone's contingency plan for Horizontal Directional Drill (HDD) crossings provided in response to PUC staff's request.

A: On July 20, 2009, PUC staff requested a copy of the HDD contingency plan referenced in section 5.4.1 of Keystone's application that summarizes preventative and response measures related to inadvertent releases of drilling fluids to the ground or waterbody (i.e., "frac-outs") should they occur during the use of the HDD method. Keystone subsequently provided a copy of the plan titled "Horizontal Directional Drill Frac-Out Contingency Plan" dated May 4, 2007 (Attachment 3). The plan summarizes the types of equipment and materials which would be available during HDD operations in the event of a frac-out. The plan also includes a section regarding the notification of federal and state agencies and downstream water users.

I reviewed this plan and found the mitigation measures to be consistent with industry practices. In Keystone's response to the PUC's request, Keystone stated that each contractor will be required to prepare a site-specific frac-out contingency plan for its work to be reviewed and approved (by Keystone) before the work begins. Commission staff recently requested Keystone provide site-specific frac-out contingency plans for horizontal direction drilling crossings of waterbodies. I may supplement my testimony if the plans are available prior to the hearing in this matter. If plans are not available for review prior to the hearing, however, I recommend that the PUC require Keystone to

submit these site-specific plans to the PUC prior to initiating HDD crossings of waterbodies.

Q: **Please evaluate Keystone's response to PUC staff's request for additional information regarding potential noise created by operation of pump stations.**

A: On July 20, 2009, PUC staff requested additional information from TransCanada regarding the potential noise created by operation of new pump stations located along the pipeline route. Keystone responded that noise studies will be conducted, if required by the PUC, to determine the measures needed (if any) to meet a 55 decibels on the A-weighted scale (dBA) guideline at Noise Sensitive Areas (NSAs) prior to operation.

I recommend that the PUC require Keystone to conduct post-construction operational noise assessments to confirm that the proposed pump station facilities meet the 55 dBA guideline at the nearest NSA. If the sound levels exceed 55 dBA, I recommend that the PUC require Keystone to install mitigation measures to reduce noise levels below 55 dBA.

Q: **Please evaluate Keystone's Response to PUC staff's request for clarification regarding potential in-stream construction activities during spawning periods.**

A: On July 20, 2009, PUC staff requested that Keystone clarify whether any in-stream construction activities would occur during the spawning season for recreationally or commercially important fishery species. On August 21, 2009, Keystone responded that "Keystone does not anticipate the need to construct outside spawning windows in any stream crossings in SD. There currently is no such regulatory requirement and doing so would be a schedule constraint that is detrimental to Keystone's schedule."

In Keystone's revised application dated August 2009, Keystone identifies nine rivers which have designated fishery classifications of Warm-Water Permanent, Semi-Permanent, and Marginal. I recommend that the PUC require Keystone to consult with the South Dakota Department of Game, Fish, and Parks to determine fish spawning

periods (if any) in which in-stream construction activities should be avoided to limit pipeline installation impacts on specific fisheries with commercial or recreational importance.

Q: Does this conclude your testimony at this time?

A: Yes. Based on Keystone's reply, however, to various questions specified above I may supplement my testimony.

Ross Hargrove
email: rchargrove@NRG-LLC.com

Ross Hargrove is a regulatory consultant at Natural Resource Group, LLC (NRG), specializing in environmental permitting and the preparation of NEPA-compliant documents for crude oil and natural gas facilities. Ross is also the Group Manager for the Operational Compliance Group in Minneapolis. Ross has prepared environmental permit applications for pipeline expansion and operations and maintenance projects for a number of regulatory bodies, including the U.S. Army Corps of Engineers, the Environmental Protection Agency, National Forests, and state and local agencies within Minnesota, Wisconsin, and Michigan. In addition, Ross has experience providing environmental compliance management oversight for large pipeline construction projects and managing the restoration of pipeline construction rights-of-way.

Selected Project Experience

- Minnesota Pipe Line Company MinnCan Project: obtained state and local environmental permits, managed environmental surveys to identify the presence of threatened or endangered species, and managed environmental compliance during construction of 300 miles of 24-inch diameter petroleum pipeline in Minnesota.
- FERC Creole Trail LNG Project: authored vegetation section of an Environmental Impact Statement (EIS) prepared for the construction of an LNG import terminal and 118 miles of dual 42-inch-diameter pipeline in Louisiana.
- U.S. Coast Guard Pearl Crossing LNG Project: authored land use and marine transportation sections of an EIS prepared for the construction of an LNG import terminal located in the Gulf of Mexico, and 118 miles of 42-inch diameter pipeline located in the Gulf of Mexico and Louisiana.
- Guardian Pipeline Project Environmental Inspection: coordinated/supervised construction right-of-way restoration and managed crop and sensitive habitat monitoring following construction of 142 miles of 36-inch-diameter pipeline located in Illinois and Wisconsin.
- FERC Crown Landing LNG Facility: authored vegetation section of an EIS prepared for the construction of an LNG import terminal and associated sendout pipelines located in New Jersey and Pennsylvania.
- FERC Weaver's Cove LNG Facility: authored vegetation section of an EIS prepared for construction of an LNG import terminal located on the Taunton River and associated sendout pipelines in Massachusetts.
- Great Lakes General Consulting: prepared environmental permit applications (federal, state, and local) for pipeline operation and maintenance activities for two 36-inch-diameter, 973-mile-long natural gas pipelines in Minnesota, Wisconsin, and Michigan; notable maintenance activities include Revetment Projects for two Section 10 rivers, a two-mile pipeline replacement project within the Fond du Lac Reservation, and more than 30 pipeline inspection and recoat project sites located within the Chippewa and Ottawa National Forests.
- Enbridge Terrace 3 Pipeline Expansion Project: prepared environmental permit applications (federal, state, and local) for construction of 110 miles of 36-inch diameter petroleum pipeline in Minnesota and Wisconsin; authored recreation, aesthetics, and soils sections of an Applicant Prepared Environmental Assessment for construction of 12 miles of new pipeline within the Chippewa National Forest; prepared and implemented a clearing protocol in conjunction with National Forest staff to minimize the clearing of mature trees within the construction right-of-way in the Chippewa National Forest.

Attachment 1

- FERC Cove Point LNG Facility: authored threatened and endangered species, vegetation, and wildlife sections of an Environmental Assessment prepared for the recommissioning and expansion of an LNG import facility in Maryland.

Education and Training

- B.S., Forest Resources, University of Minnesota, Minneapolis, Minnesota
- FERC Environmental Report Preparation Seminar, 2002
- FERC Natural Gas Pipeline Environmental Compliance Workshop, 2002
- University of Minnesota, Certified Erosion and Sediment Control Inspector/Installer, 2007
- Independent Organic Inspectors Association, Certified Agricultural Monitor, 2008

Keystone XL Project
Construction, Mitigation, and Reclamation Plan Review

Natural Resource Group, LLC's (NRG's) review of the TransCanada Keystone Pipeline, LP (Keystone) Construction, Mitigation, and Reclamation Plan (CMRP) found the document to be generally consistent with industry environmental standards for pipeline construction. Additionally, the plan commits to the use of Environmental Inspectors during construction to monitor the contractor's project activities for compliance with regulatory requirements. The discussion below identifies additional mitigation measures NRG recommends based upon industry standards. The section numbers presented correspond to those used in Keystone's CMRP.

2.13 - Weed Control
The CMRP contains a summary of several weed control measures that may be used by Keystone to prevent/reduce the spread of noxious weeds during construction. The methods described are likely to be successful if properly implemented. NRG recommends, however, that Keystone obtain the permission of individual landowners or the appropriate land management or state agency in writing before treating weeds with herbicides on their property.

2.17 - Road and Railroad Crossings
The proposed construction methods and procedures described in the CMRP for road and railroad crossings are generally consistent with industry standards. NRG additionally recommends that Keystone coordinate with emergency responders regarding the timing and intended duration of any temporary road closures.

2.18 - Adverse Weather
The CMRP states that the contractor would restrict certain construction activities in cultivated agricultural areas in excessively wet soil conditions to minimize rutting and soil compaction, but it does not provide specific performance measures to indicate when rutting would be considered excessive. NRG recommends that these wet weather restrictions be applies to improved hay lands and pasture lands in addition to agricultural lands.

3.0 - Spill Prevention and Containment
The CMRP identifies a number of measures that would be implemented to prevent the occurrence or minimize the severity of construction-related spills. The proposed measures are generally consistent with industry standards. NRG also recommends that fuel storage and/or refueling activities be prohibited within 400 feet of private water wells.

4.3 - Topsoil Segregation
Keystone has indicated in it's CMRP that it intends to segregate topsoil in cultivated and agricultural lands to the actual depth of the topsoil layer or up to a maximum depth of 12 inches, which is consistent with pipeline industry standards. Keystone states that three different methods may be used for topsoil segregation depending upon landowner agreements and site-specific conditions. NRG has briefly summarized the benefits and limitations for each method proposed by Keystone below. It is important to note that no single method may be practical or possible for all situations that may be encountered during construction of the pipeline. NRG recommends that Keystone work closely with landowners to determine the method most suitable for their property.

Trench Line Only – Topsoil stripping of the trench line only would require that Keystone temporarily store subsoil on top of topsoil during construction. This practice often leads to some

Attachment 2

mixing of subsoil and topsoil which may be visible on the surface following construction of the pipeline but generally does not cause a measurable decrease in soil productivity. The method is often most effective for grazing or pasture lands where topsoil layers may be thin and the presence of grass under the stored subsoil would help reduce the likelihood of soil mixing during backfilling operations.

Trench and Subsoil Storage Area – With this method, topsoil is placed on topsoil and subsoil is temporarily stored on subsoil. This method decreases the probability of soil mixing, but storage of the extra topsoil would require a greater proportion of the construction right-of-way.

Full Right-of-Way Topsoil Segregation – This method involves striping topsoil off the entire working portion of the construction right-of-way. This method is often used where side-slopes are encountered during construction, which requires leveling of the right-of-way for safe use of side-boom tractors. As such, Keystone has proposed to strip and stockpile topsoil from the entire right-of-way prior to cut-and-fill grading in areas of steep terrain.

The full right-of-way topsoil segregation method minimizes the probability of soil mixing during construction especially during wet construction periods. However, use of this method could require a wider construction right-of-way than currently proposed by Keystone in locations with deep topsoils. Further, if subsoil compaction problems are identified following completion of pipeline construction they can be difficult to reach with most typical deep ripping implements. Keystone states that the subsoil would be decompacted prior to replacing the topsoil. NRG also recommends that decompaction be repeated following replacement of the topsoil, especially in deep soils, to allow a continuous path for crop roots to develop between the topsoil and subsoil layers.

4.5 - Temporary Erosion and Sediment Control

Keystone's provisions for erosion control as described in the CMRP are generally consistent with industry standards. NRG additionally recommends installing sediment barriers in the vicinity of delineated wetlands and waterbodies regardless of the presence of flowing or standing water at the time of installation. It is also industry practice not to use liquid mulch binders within 100 feet of wetlands and waterbodies.

4.6 - Stringing

Stringing of the pipeline has the greatest potential to cause compaction in agricultural areas. NRG recommends that stringing trucks utilize the proposed trench line for travel when stringing the pipeline wherever conditions allow. Using this approach, some of the most compacted areas would be alleviated by excavation of the pipeline trench.

4.7 Trenching (Alternative Soil Handling Methods)

Keystone has indicated that "Keystone will work closely with landowners and soil conservation agencies to identify and implement recommended soil conservation practices in specific areas where they are needed." There are two soil conditions where alternative soil handling procedures during the trenching and backfill operations should be made available to the landowner as an option to maintain soil productivity in agricultural lands, including crop land and tame pasture land. Both conditions involve the presence of poor quality subsoils that could permanently reduce soil productivity when mixed with overlying soil layers.

1. Where paralithic shale and sandstone underlie unconsolidated subsoils, soils will be removed and stored in three separate lifts, topsoil (A-horizon), unconsolidated subsoils (B-horizons), and consolidated paralithic shale and sandstone.

4.7.1 – Trench Dewatering/Well Points
Keystone has indicated that salinity would be considered during trench dewatering in locations where it could affect soil and crop productivity. Keystone stated that an Environmental Inspector would perform a field conductivity test of the water to determine a course of action for disposal if the water is found to be too saline. NRG recommends that Keystone provide the minimum electrical conductivity value (in appropriate units, e.g. millimhos/centimeter) below which standard discharge methods would be suitable. Keystone has indicated that treated (via overland flow or sediment barrier) water would be directed to alternative disposal locations (i.e., ditches or brackish water wetlands or waterbodies) if trench dewatering discharge water is too saline to discharge on site. NRG recommends that Keystone also develop procedures to follow when such disposal areas are not available.

Keystone's CMRP states that heavily silt-laden trench water would not be allowed to *directly* (emphasis added) enter waterbodies or wetlands. NRG recommends that Keystone implement best management practices to prevent heavily silt-laden trench water from reaching all wetlands and waterbodies, directly or indirectly, to prevent exceeding federal and state water quality standards.

4.9 – Padding and Backfilling
Keystone's CMRP states that the lesser of 4 feet or the actual depth of topsoil cover would not be backfilled with soil containing rocks of any greater concentration or size than existed prior to pipeline construction. It is industry practice to replace rock in the trench only to the top of the existing bedrock profile. All other rock should be considered construction debris and removed from the right-of-way.

4.10 – Cleanup
Keystone states that clean-up would occur immediately following backfilling operations when weather or seasonal conditions allow. NRG recommends that final grading, topsoil replacement, and installation of permanent erosion control structures be completed in non-residential areas within 20 days after backfilling the trench and within 10 days in residential areas unless practically infeasible.

4.11 - Reclamation and Revegetation
Keystone's procedures for reclamation and revegetation of the pipeline right-of-way are generally consistent with industry standards. Below is a summary of NRG's additional recommendations.

4.11.1 – Relieving Compaction – NRG recommends that Keystone prepare a winterization plan for submittal to the Public Utilities Commission if construction would continue into the winter season when weather conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring.

4.11.2 – Rock Removal – NRG recommends that excess rock be removed from at least the top 12 inches of soil in all actively cultivated, rotated cropland and pastures, and in hayfields. The size, density, and distribution of rock within the construction right-of-way should be similar to adjacent areas not disturbed by construction.

4.11.5.1 – Trench Breakers – NRG recommends that trench breakers be installed in all areas crossed by the pipeline where slope breakers are not practical (e.g., in cultivated areas) at the same spacing provided in the CMRP for permanent slope breakers. NRG also recommends that Keystone install trench breakers at crossings of saline seeps or zones transmitting saline

water, if present, to ensure that seepage water is not diverted along the pipeline trench to create a new saline seepage area.

4.11.5.3 – Mulching – NRG recommends that mulch be installed on slopes (except in actively cultivated cropland) concurrent with or immediately after seeding wherever necessary to stabilize the soil surface and to reduce wind and water erosion. Mulch should be installed prior to seeding only if final grading and installation of permanent erosion control measures would not be completed in an area within 20 days after the trench is backfilled (10 days in residential areas) or when construction or restoration activities are interrupted for extended periods (e.g., when seeding cannot be completed due to seeding period restrictions). If liquid binders are used to anchor mulch they should be used at the rates specified by the manufacturer.

4.11.5.5 – Riprap and Stream Bank Stabilization – NRG recommends that erosion control fabric be installed on waterbody banks immediately following final stream bank restoration unless riprap or other bank stabilization methods are utilized in accordance with federal or state permits.

4.12 - Pasture and Range Lands

NRG recommends that Keystone coordinate with the landowners of grazing and pasture lands regarding the movement of livestock after the pipeline has been welded and prior to installation of the pipeline. Keystone should leave gaps in the welded pipeline at specific intervals or areas frequently crossed by livestock. NRG also recommends that Keystone utilize periodic ramps within the trench in grazing and pasture lands to allow livestock to escape the trench if necessary.

4.16 - Operation and Maintenance

NRG recommends that Keystone monitor the revegetation of the pipeline for at least 2 years following installation of the pipeline. Revegetation of non-cultivated areas should be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent areas. Temporary erosion control devices should be maintained or replaced as necessary until successful revegetation of the right-of-way or as required by federal or state permits.

5.0 - Drain Tile Systems

Keystone's procedures for identification and repair of drain tile systems are generally consistent with industry standards. Below is a summary of NRG's additional recommendations.

5.4 - Responsibility for Repair of Drain Tile Systems - NRG recommends that only experienced drain tile contractors be employed to complete permanent drain tile repairs.

5.5 – Drain Tile Repairs - NRG questions the effectiveness and practicality of repairing drain tile systems using headers as shown in drawings #26 and #27 in the CMRP for most situations that may be encountered along the pipeline route. The potential for varying grades of the existing drain tile system make repairs such as these difficult and prone to error. Rerouting of the drain tile system outside of the trench additionally may reduce soil drainage in the vicinity of the pipeline.

If solid pipe or culverts are used to support the permanently repaired drain tile across the trench, NRG recommends that holes or slots be cut in the support around its entire circumference so that the drainage capacity of the previous drain tile remains unchanged.

5.6 – Inspection/Acceptance of Drain Tile Repairs - NRG recommends that Keystone record the location of permanent drain tile repairs for identification on as-built alignment sheets to aid in their relocation, if necessary, for repairs or in the event of a pipeline release during operation of the facility.

6.0 - Wetland Crossings

Keystone's procedures for wetland crossings are generally consistent with industry standards. Below is a summary of NRG's additional recommendations.

6.2 – Easement and Workspace – Keystone has indicated that the width of the construction right-of-way would be reduced to 85 feet or less in wetlands unless non-cohesive soil conditions require utilization of a greater width. Industry practice is to reduce the typical construction right-of-way width to 75 feet in non-cultivated wetlands, although exceptions are sometimes made for larger-diameter pipelines or where warranted due to site-specific conditions.

Keystone states that extra work areas (such as staging areas and additional spoil storage areas) would be located at least 10 feet from wetland boundaries where topographic conditions permit. Industry practice is to locate these extra work areas a minimum of 50 feet back from wetland boundaries except where the adjacent upland consists of actively cultivated or rotated cropland, disturbed land, or where site-specific conditions do not permit a 50-foot setback.

Vegetation clearing should be limited to the construction right-of-way between extra work areas and the edge of the wetland. If the pipeline parallels a wetland, Keystone should attempt to maintain at least 15 feet of undisturbed vegetation between the wetland and the construction right-of-way. Wetland boundaries and buffers should be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

6.3 – Vehicle Access and Equipment Crossing – NRG does not recommend the use of timber and slash to support equipment crossings of wetlands due to the difficulty of its removal from the wetland following construction activities.

6.4 – Temporary Erosion and Sediment Control – NRG recommends that temporary sediment barriers be installed as necessary to prevent sediments from entering all delineated wetlands crossed or adjacent to the project.

7.0 Waterbodies and Riparian Areas

Keystone's procedures for waterbody crossings are generally consistent with industry standards. Below is a summary of NRG's recommendations.

7.2 – Easement and Workspace – Keystone states that extra work areas (such as staging areas and additional spoil storage areas) would be located at least 10 feet from waterbody boundaries wherever topographic conditions permit. Industry practice is to locate these extra work areas a minimum of 50 feet back from the waterbody's edge, except where the adjacent upland consists of actively cultivated or rotated cropland, disturbed land, or where site-specific conditions do not permit a 50-foot setback. Vegetation clearing should be limited to the construction right-of-way between extra work areas and the edge of the waterbody. If the pipeline parallels a waterbody, Keystone should attempt to maintain at least 15 feet of undisturbed vegetation between the waterbody and the construction right-of-way. Waterbody boundaries and buffers should be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

7.7 – Temporary Erosion and Sediment Control – NRG recommends that temporary sediment barriers be installed as necessary to prevent sediments from entering all waterbodies crossed or adjacent to the project.

7.8 – Trenching – NRG recommends that spoil from waterbody crossing construction be temporarily stored at least 10 feet from the waters edge. Temporary in-stream sidecasting of spoil for wide waterbody crossings should only be conducted with approval of the appropriate federal or state agency.

Keystone Pipeline Project

HORIZIONTAL DIRECTIONAL DRILL
FRAC-OUT CONTINGENCY PLAN

Prepared for:

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Project No: THES0050388E
DCN: KAA01-01183-03-AA-0620
Revision No: 3
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Attachment 3

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1. Introduction

This Horizontal Directional Frac-out Contingency Plan provides specific procedures and steps to contain the inadvertent releases of drilling mud (frac-outs) for water bodies that are crossed using horizontal direction drilling (HDD) techniques.

2. Drilling Fluid and Drilling Fluid System

The HDD process involves the use of a drilling fluid (also referred to as drilling mud) made up primarily of water. Bentonite clay is added to the water to enhance lubricating, spoil transport and caking properties of the drilling fluid. Bentonite is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI 60 NSF Drinking Water Additives Standards and is frequently used for drilling potable water wells.

The primary purpose of drilling fluid is to power the downhole cutting tools, remove cuttings from the drill hole, stabilize the hole, and act as a coolant and lubricant during the drilling process.

The drilling fluid is prepared in a mixing tank containing both new and clean recycled drilling fluid. The fluid is pumped at rate of 100 to 1,000 gallons per minute (gpm) through the center of the drill pipe to the cutters. Return flow is through the annulus created between the wall of the boring and the drill pipe. The cuttings are then carried back to either the entry or the exit pit, depending on a combination of elevation difference and drilling/hole opening direction. Once in the entry pit, the fluid moves to the pickup pit to be pumped to the fluid processing equipment. Typically, shaker screens, desanders and desilters remove increasingly finer cuttings from the drilling fluid. The cleaned and recycled fluid is returned to the mixing tank and pumps for reuse in the borehole. Cuttings and bentonite mud (clay) are often desirable for agricultural applications and would either be made available to landowners for use or disposed of in a landfill. Landowners would be instructed that any beneficial use of the bentonite must include safeguards to keep the material separated from public water ways.

The HDD method has the potential for loss or seepage of drilling fluid into the native material through which the drill passes. In some cases, the drilling fluid may be forced to the surface resulting in what is commonly referred to as an inadvertent release or a frac-out. While one of the positive aspects of the HDD method is the avoidance surface disturbance, surface disturbances may occur when there is an inadvertent release of drilling fluid. Drilling fluid release is typically caused by pressurization of the drill hole beyond the containment capability of the overburden soil material or due to inherent weaknesses within the overlying soils such as a fissure or other pathway. In some cases, the pathway can be associated with boreholes advanced for geotechnical investigations or by bridge or building pilings.

The HDD operation is a closed system to minimize the discharge of drilling mud, fluids, and cuttings outside of the work area. In order to minimize the possibility of fluid escape, berms shall be used to contain the drilling fluids. The drilling fluids are cleaned and recycled to the extent possible. Tanks or dumpsters will be installed in lined pits. Care will be taken to prevent the fluids from getting into the soil and to prevent groundwater from entering the pits. Any drilling mud that inadvertently exits at points other than the entry and exit points shall be contained and collected to the extent practical, and the HDD contractor shall immediately notify a Keystone representative.

3. HDD Contractor Responsibilities and Requirements

The HDD contractor is responsible for execution of the HDD operation, including actions for detecting and controlling the inadvertent release of drilling fluid. Keystone will closely supervise the progress and actions of the HDD contractor through the use of onsite inspection teams.

The HDD contractor will be required to prepare a project specific Spill Preventation Control and Countermeasure Plan which includes project specific procedures concerning monitoring and response to frac-outs; including specific project and agency notification protocol. This plan will be reviewed and approved by Keystone prior to initiation of construction.

The Contractor will be equipped with a tracked hydraulic excavator, straw or hay bales, stakes to secure bails, silt fence, sand bags, shovels, pumps, and any other materials or equipment necessary to contain and clean up inadvertent releases.

A vacuum truck will be on call during drilling operations.

Ancillary items that will be readily available during drilling operations include: a light tower in case cleanup operations are needed after dark, a boat with relevant safety equipment during the crossing of large water bodies, and flexible plastic piping for potential mitigation where small creeks or drainages are involved.

4. Fracture Detection

Drilling crews and the Keystone inspection personnel will be responsible for the monitoring and detection of frac-outs. The most obvious signs of a frac-out are the visible pooling of drilling mud on the surface, a sudden decease in mud volume returns during drilling operations, or loss in drilling mud pump pressure. Drilling and mud system personnel will observe the volume of drilling fluid return and immediately report reductions to the foreman and Keystone personnel. The mud system operator will monitor actual drilling fluid volumes from the pumps and the return flow from the borehole. The operator will alert the on-site personnel if there is a significant variance. In the event of partial circulation loss, pumping of drilling fluid may be reduced to reduce pressure applied to native formation materials.

5. Corrective Action for an Inadvertent Release

In the event of an inadvertent release to the surface at locations other than the borehole location, the following actions will be taken:

If the release is large, mud circulation will cease immediately as practical. If the spill is small to moderate the contractor will continue circulation in order to maintain pressure in the hole. Maintaining circulation will also be necessary if the native material does not have the frictional characteristics necessary to maintain hole stability without the presence of mud provided under pressure.

In all cases, the contractor will also proceed as follows:

- Contain any drilling fluid that has surfaced (See section 6)
- Notify the Keystone representative
- Reduce circulation pressure and evaluate the circumstances leading to circulation loss to determine if the fracture can be sealed
- Thicken the drilling fluid to attempt to seal off the location of the release as practical.

6. Containment of Drilling Fluid Release

Immediately following the detection of the inadvertent drilling fluid release, containment and clean-up operations shall commence. For releases on land, Contractor shall use straw bales, silt fences, sand bags and earth berms to prevent fluid from migrating or flowing from the immediate area of the discharge. If the volume released is too small for containment measures or, if the release occurs in an environmentally sensitive area where release of containments can cause additional damage, the receiving area will be allowed to dry naturally. If there is a threat to a sensitive resource, or a threat to public safety, HDD activities will cease immediately until a plan to proceed is discussed.

Other containment measures include the following:

- Additional berms may be constructed around the release area as directed by the Keystone representative to prevent release of materials into the adjacent water body
- If the amount of fluid released is large enough to prevent practical collection, the affected area will be diluted with fresh water and allowed to dry. Measures will be implemented (berm, silt fence, and/or hay bale installation) to prevent silt laden water from flowing into the water body.
- If hand tools cannot contain a small on-land release, small collection sumps may be constructed to pump the released material into the mud processing system.
- Sump pumps or vacuum trucks will be used to remove and dispose of any drilling fluids as needed.

In cases of inadvertent releases to open water or flooded wetlands, it may be impractical or impossible to contain the release. For releases in shallow water, the HDD contractor will install staked sediment barriers as described in the Keystone Construction Mitigation and Reclamation Plan. Removal by vacuum truck may be attempted if deemed appropriate. The decision to proceed with the drilling operation will be at the sole discretion of the Keystone representative after all practical methods to seal off the location of the discharge have been attempted. Keystone will notify the appropriate authorities for downstream water intakes of the existence and location of any plume that extends more than 1,000 yards from the worksite. Underwater releases are typically allowed to dissipate since, by design, the HDD contractor would seek to avoid placing equipment within the water body. Water sampling equipment will be available for use by site inspectors to evaluate turbidity levels.

7. Clean-up of Releases

The clean-up shall commence after the release is contained. Clean-up shall include removal of all visible drilling fluid located in accessible areas. Removal methods will vary based on the volume of the release and the site specific conditions. Removal equipment may include vacuum trucks, loader and track hoe buckets, small pumps, shovels and buckets. If the release occurs in a sensitive area, it may be necessary to pump the fluid into an upland area for additional containment and disposal. After removal of the released drilling fluid, the release area will be returned as close to the original condition as possible. It may be necessary to store the drilling fluid residue on-site prior to disposal. If so, the necessary storage methods will be utilized to avoid future releases.

8. Agency Notification Procedures

If an inadvertent release is discovered, steps will be taken to contain the release as described in Section 6. Notification procedures for Keystone construction management personnel and regulatory agencies are as follows:

a) When monitoring indicates that an in-stream release has occurred, the Keystone representative will immediately notify the appropriate Federal and State Agencies as soon as possible. The nature of the release will be described and corrective actions will be detailed. The notified agencies will determine whether the implementation of additional measures is required. If it is determined that the release can not be remedied without causing additional adverse impact to the environment, Keystone will request agency approval to continue drilling operations. This data will be provided as specified in the project specific notification protocol established for HDD installations.

b) If downstream migration is imminent and, if water quality will be affected, downstream users will be contacted by Keystone. Relevant contact information will be gathered prior to commencement of construction operations and maintained on site as part of the project specific notification protocol.