ENABLE™
MIDSTREAM PARTNERS

BEAR DEN PHASE 2 PROJECT

Plan of Development

APPENDIX G
Horizontal Directional Drill and Contingency Plan

BEAR DEN PHASE 2 PROJECT

Plan of Development

Horizontal Directional Drill and Contingency Plan

Prepared for:

BUREAU OF LAND MANAGEMENT

MAY 2014

This page is intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

This page is intentionally left blank.

1.0 PURPOSE OF PLAN

A Horizontal Directional Drill (HDD), or bore, is a process that allows for trenchless construction across an area. With this method, a borehole is drilled under the area and a prefabricated segment of pipe is installed through the borehole, thereby avoiding direct disturbance to the surface of the right-of-way and the area traversed. HDDs are most commonly used to cross underneath sensitive or difficult to construct areas such as areas with slope stability issues, roads, wetlands, and waterbodies. HDDs provide a number of advantages over typical pipeline construction and installation methods, such as avoidance of surface disturbance, riparian tree clearing, and in-stream construction. If an HDD crossing is successful, there are little to no negative impacts on the area crossed.

This plan provides the location of all HDDs proposed and contingency plans in the event that a HDD fails in a certain location. The primary environmental risk associated with the HDD crossing method is associated with the potential for inadvertent release of drilling fluid. Section 3.0 of this plan also outlines the measures that would be taken to mitigate the inadvertent release of drilling mud during HDD operations associated with the Project.

1.1 Project Description

Enable Bakken Crude Services, LLC (EBCS) proposes to construct, own, and operate a crude oil and produced water gathering system that will service five existing and three proposed wells in McKenzie County, North Dakota called the Bear Den Phase 2 Project (Project). Specifically, the Project pipeline system will receive crude oil at the subject wells and transport it to interconnects on the existing Bear Den (Phase 1) Project pipeline system where it would be delivered an aboveground facility for temporary storage before being transferred to an outlet pipeline. Additionally, water produced at the subject wells will be transported to third-party injection wells for disposal. Both of the project pipelines will generally be installed within a common right-of-way (i.e., the nominal project right-of-way will contain two pipelines) with approximately 14.8 miles of right-of-way housing dual, collocated pipelines.

1.2 Drilling Basics

The HDD method is a technically advanced process involving specialized equipment and skilled operators. This method uses drilling fluid to remove the cuttings from the borehole, stabilize the borehole, and act as a lubricant and coolant to the drill. Drilling fluid consists primarily of water and bentonite. Bentonite is a naturally occurring clay made up of 1-5 percent active clays, 0-40 percent inert solids, and the remainder being water. Drilling fluid is not a hazardous material; however, an inadvertent release will require mitigation measures to minimize the impact to a waterbody or sensitive area.

The first step of HDD will be to drill a small-diameter pilot hole from one side of the crossing (entry side) to the other (exit side). Drilling will be achieved using a powered drill bit. The drilling fluid will be pumped into the drill hole through the drill pipe during the drilling process. The pressure of the drilling mud will transmit hydraulic power through the drill bit, transport cuttings to the surface, lubricate the drill bit, and stabilize the drill hole. Water, the main ingredient of drilling mud, will be trucked in from a municipal source.

Small pits will be dug at or near the entry and exit holes to temporarily store the drilling fluid and cuttings. During an HDD, the drilling fluid is prepared in the mixing tank using both new, recycled, and cleaned drilling fluids. The fluid is pumped at rates of 200 to 1,000 gallons per minute through the center of the drill pipe to the cutters. Return flow is through the annulus created between the wall of the bore and the drill pipe. Cuttings are returned to the entry pit. In the entry pit, the fluid is pumped to fluid processing equipment. Typically, shaker screens, desanders, desilters, and centrifuges remove increasingly finer cuttings from the drilling fluid. The cleaned fluid is recycled to the mixing tank and pumps for reuse in the borehole.

As drilling of the pilot hole progresses, segments of drill pipe will be inserted into the pilot hole to extend the length of the drill. The drill bit will be steered and monitored throughout the process to maintain the designated path of the pilot hole. To assist in steering, a sensor grid may be established on the surface on both the entry and exit sides of the horizontal directional drill. The sensor grid will be fabricated by installing several stakes along and above the drill path and wrapping with an insulated coil wire. The coil wire will be then energized with a portable generator, which creates a magnetic field to help track the drill bit path.

Once the pilot hole is complete, the sensor grid will be removed and the hole will be enlarged to accept the pipeline. To enlarge the pilot hole, a larger reaming tool will be attached to the end of the drill pipe on the exit side of the hole. The reamer will then be drawn back through the pilot hole to the drill rig (entry side). Drill pipe sections will be added to the rear of the reamer as it progresses toward the rig, thereby allowing a string of drill pipe to remain in the hole at all times. Typically, several passes of consecutively larger reaming tools are required before the hole will be of sufficient size. The final hole will be approximately 1½ times larger than the pipeline to be installed.

The pipeline segment to be installed in the HDD bore will be fabricated into one section on the right-of-way on the exit side of the crossing. The pipe segment will be radiographically inspected and/or hydrostatically tested prior to installation. After the hole is completed, the pipeline segment will be attached to the drill pipe on the exit side of the hole and pulled back through the drill hole toward the drill rig.

Once the pipeline is installed, excess drilling mud will be collected and incorporated into the soil in an upland area or disposed of at an appropriate facility. If water will be left over from the drilling process, it will be discharged into a well-vegetated upland area or into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale dewatering structure at the site.

2.0 HORIZONTAL DIRECTIONAL DRILL LOCATIONS

Selection and supervision of the HDD drilling contractor for the Project will be the responsibility of EBCS. EBCS plans to use the HDD crossing method in 29 locations. In association with the Project, the HDD method will be used to cross wetland and waterbodies, sensitive areas such as steep slopes, wildlife habitat, foreign pipelines, and roads, as described below.

2.1 Wetland and Waterbody Crossings

Table 2.1-1 lists the pipeline segment, milepost, and length of each HDD crossing of a waterbody or wetland.

TABLE 2.1-1

Bear Den Phase 2 Project
Horizontal Directional Drill Crossings of Waterbodies and Wetlands

Line Name	Waterbody ID (Name)	Enter Milepost	Exit Milepost	Length (feet)
AR-25*	Cherry Creek (s-mc-kl-002)	4.4	4.4	260
AR-48	Pond (o-mc-kf-001	0.4	0.5	285
AR-51*	wetland (w-mc-kf-001)	0.6	0.7	360

*Bore crosses more than one feature; see Table 2.2-1 or 2.4-1

2.2 Steep Slopes, Wildlife Habitat, and Foreign Pipelines

Table 2.2-1 lists the pipeline segment, milepost, length, and diameter of each HDD crossing associated with steep slopes, wildlife habitats, foreign pipelines, or other sensitive areas.

TABLE 2.2-1

Bear Den Phase 2 Project
Horizontal Directional Drill Crossings Associated with a Side Slope, Foreign Pipeline, or Other Sensitive Area

Line Name	Feature Description	Enter Milepost	Exit Milepost	Length (feet)
AR-18*	Steep Slope	0.4	0.5	744
AR-25*	Foreign Pipeline	0.1	0.1	240
AR-25	Foreign Pipeline	1.2	1.3	150
AR-25	Steep Slope	1.6	1.7	500
AR-25	Foreign Pipeline	2.1	2.2	200
AR-25*	Steep Slope	4.7	4.8	499
AR-48*	Steep Slope	0.0	0.1	269
AR-48	Wildlife Habitat	1.9	2.0	660
AR-48*	Foreign Pipeline	0.1	0.3	750
AR-48	Sensitive Resource Buffer	2.3	2.4	200
AR-48	Sensitive Resource Buffer	5.2	5.3	375
AR-48	Foreign Pipeline	3.5	3.5	80
AR-48	Wildlife Habitat	3.7	3.8	452
AR-51	Steep Slope	0.0	0.0	150
AR-51*	Foreign Pipeline	0.6	0.7	360

*Bore crosses more than one feature; see Table 2.1-1 or 2.4-1

2.3 Roads

Table 2.4-1 lists the roads, pipeline segment, milepost, and length of each HDD crossing of a road.

TABLE 2.4-1

Bear Den Phase 2 Project
Horizontal Directional Drill Crossings of Roads

Road Name	Segment and Milepost (MP)	Crossing Method	Bore Length (feet)
21st Street SW	AR-18 at MP 0.5*	HDD	744
117th Avenue NW	AR-25 at MP 0.1*	HDD	140
Private Road	AR-25 at MP 1.4	HDD	400
Private Road	AR-25 at MP 1.8	HDD	200
Private Road	AR-25 at MP 2.1	HDD	250
Private Road	AR-25 at MP 2.7	HDD	185
22nd Street NW	AR-25 at MP 4.4*	HDD	261
22nd Street NW*	AR-25 at MP 4.7*	HDD	499
107th Avenue NW	AR-48 at MP 0.0*	HDD	260
Private Road, County Route 53	AR-48 at MP 0.1*	HDD	750
County Route 53	AR-48 at MP 1.0	HDD	164
21st Street SW	AR-48 at MP 2.8	HDD	130
111th Avenue NW	AR-48 at MP 5.0	HDD	194
21st Street NW	AR-48 at MP 5.5	HDD	118
Private Road	AR-48 at MP 6.5	HDD	175
Private Road	AR-51 at MP 0.0*	HDD	140
Private Road	AR-51 at MP 0.5	HDD	163
107th Avenue NW	AR-55 at MP 0.1	HDD	185

*Bore crosses more than one feature; see Table 2.1-1 or 2.2-1

3.0 DIRECTIONAL DRILL CONTINGENCY PLAN

Inadvertent drilling fluid releases could result if the drilling fluid escapes containment at pits that would be excavated at the HDD entrance and exit points or if a “frac-out” occurs. A frac-out occurs when drilling fluids escape the drill bore hole and are forced through the subsurface substrate to the ground surface. Frac-outs occur most often in highly permeable soils during the entrance and exit phases of the pilot hole drill, as this is when the greatest pressures are exerted on the bore walls in shallow soils. Minimal, consistent loss of drilling fluid may also occur during the drilling process when layers of loose sand, gravel, or fractured rock are encountered and drilling fluid fills voids in the material. The loss of returning drilling fluid and a reduction in drilling pressure indicates that seepage is occurring outside of the bore hole.

Drilling fluid pressures in the bore hole and drilling fluid pumping and return flow rates would be monitored to detect the potential occurrence of a frac-out or loss of drilling fluid. If survey and monitoring procedures indicate that a frac-out may have occurred, EBCS would implement the following measures to mitigate the inadvertent release of drilling mud.

3.1 DRILLING FLUID RELEASE

In the event a complete loss of circulation of drilling mud occurs during operation of an HDD, the Contractor will:

- cease pumping immediately;
- contain any drilling fluid which has surfaced;
- notify the Chief Inspector and Environmental Inspector; and

- evaluate data and circumstances leading to the loss of circulation to determine what method is to be utilized to seal the fracture. Most fractures can be sealed, if detected early, by pumping special materials to prevent loss of circulation down hole.

3.1.1 Detection and Monitoring Procedures

The Contractor will monitor operations during HDD activities, with oversight provided by EBCS' Construction Inspector(s) and/or Environmental Inspector(s). Monitoring activities during drilling operations will include:

- visual inspection along the drill path, fluid return pit(s) and wetland/waterbody surfaces for evidence of a release;
- observation and documentation of drilling fluid pressures using HDD instrumentation;
- observation and documentation of drilling fluid recirculation volumes; and
- documentation of all drilling fluid products used.

3.2 CORRECTIVE ACTION

3.2.1 Containment

The Contractor will have readily available containment equipment to contain inadvertent releases of drilling mud including earth-moving equipment, portable pumps, containment booms, hand tools, hay bales, silt fence and sandbags. The Environmental Inspector(s) will ensure that adequate quantities of spill containment equipment and supplies are at the drilling location prior to allowing the contractor to begin drilling. Further, the Environmental Inspector(s) will ensure that each individual involved in drilling operations is familiar with the locations of all spill containment equipment and the specific procedures for handling potential drilling fluid releases.

If a significant reduction of drilling fluid circulation is detected without total loss of circulation, Contractor will reduce drilling fluid volumes and subsequent pressures and will increase the yield point of drilling fluid. Then, depending upon the progress of the drilling, the drill pipe may be tripped out until return flow is restored.

Should an inadvertent release of drilling fluid occur, containment and subsequent clean-up will begin immediately upon detection. Field measures to contain inadvertent releases of drilling fluid will vary according to site-specific conditions (e.g. volume of fluid, topography, and environmental setting). Field measures will differ in wetland/waterbody areas versus upland areas. In wetlands, the most commonly utilized system for containment of surface releases of drilling fluid would incorporate a perimeter coffer constructed of hay bales and silt fences. Where this system of containment cannot be employed the containment procedures will be directed by the Chief Inspector assisted by the Environmental Inspector to minimize the adverse impacts. Alternate mitigating methods within wetlands and waterbodies would include, but not be limited to:

- damming of dry drainage swales using sandbags or plastic water structures;

- isolation using skirted containment booms in inundated or aquatic environments; and

- isolation in shallow stream sections utilizing sandbags and plastic water structures.

In upland areas, the most commonly utilized system for containment of surface releases of bentonite would incorporate a perimeter earthen berm or hay bales. Again, where this system of containment cannot be employed, containment procedures will be directed by the Chief Inspector assisted by the Environmental Inspector, again, to minimize impact.

Isolation under certain field conditions is virtually impossible. In the unlikely event that a release occurs within an area that cannot be isolated or contained (e.g., a large stream or river), drilling operations will be stopped immediately. Upon evaluation by appropriate personnel a decision will be made on how best to continue the crossing construction which minimizes impacts.

3.2.2 Clean-Up and Restoration

After containment, clean-up and restoration will generally be accomplished utilizing one of the following:

- hand labor, hand tools and buckets;
- portable pumps and hand tools;
- rubber tired equipment and hand tools; and
- vacuum trucks and hand tools.

3.3 Abandonment

If a directional drill must be abandoned, the drill hole will be filled with drilling fluid and/or grout and sealed for a distance of not less than thirty feet at each end.

3.4 Notification

In the event of an inadvertent release of drilling fluid within a waterway, EBCS will immediately contact applicable agencies by telephone and/or facsimile detailing:

- the location and nature of the release;
- corrective actions being taken; and
- whether the release poses any threat to public health and safety.

The Bureau of Land Management Project Manager will also be notified by telephone of an inadvertent water body release, as well via any applicable reports submitted by EBCS.