1.0 Project Description

BakkenLink Pipeline LLC (BakkenLink) is proposing to build, own, and operate an approximately 144-mile long pipeline for the transportation of crude oil from existing and proposed truck receipt locations and pipeline gathering receipt stations. The proposed pipeline will be constructed in portions of Billings, Dunn, McKenzie, Stark, and Williams counties, North Dakota. The Horizontal Directional Drilling (HDD) crossing method will be used at the crossing listed in Table 1.

TABLE 1. HDD CROSSINGS AND ESTIMATED WATER USEAGE FOR DRILLING PURPOSES

HDD Sections	Segment Length (ft)	Approx. MP	Water Volume (gal) Drilling
Lake Sakakawea – North Bluff	4,000	9	28,200
Little Missouri River - North Bluff and River (assumed as one drill)	8,000	69	56,401
Little Missouri River - South Bluff	5,650	72	39,833
Green River	1.565	109	11,033
I-94	1,004	124	7,078
Totals	**19,055**		**142,548**

*Table estimates water use for drilling purposes independently of hydrotest. It is possible that water from Hydrotest activities can reused for use in drilling operations. Table 1 does not account for water reuse.

1.1 Drilling Basics

Horizontal directional drilling is a trenchless pipeline installation technique with the advantage of minimal surface impact, limited to the established entry and exit sites for drilling equipment which can be located outside the environmentally sensitive area. This method of crossing will eliminate any future ground surface disturbance associated with an operating company's required annual maintenance for bank stabilization and depth of cover control typically for an open ditch crossing. This is a technically advanced process requiring skilled operators. Detection of drilling fluid seepage is dependent upon the skill and experience of the drilling crew. For this reason, BakkenLink will contract with firms that specialize in horizontal directional drilling. The entry and exit sites vary in size depending on the diameter of the drill and associated equipment required. No surface ground disturbance by equipment will occur between the entry and exit drill path locations. The typical minimum depth of a drill will be 25 feet below the area of avoidance based on the site-specific design parameters. Pipe with increased wall thickness and abrasion resistant overcoat will be utilized to insure pipeline integrity for the proposed crossing.

Any future maintenance of an HDD crossing if problems occur will result in the existing pipe abandonment and re-drilling the crossing which again minimizes any surface impacts. There is a potential for drilling fluid release during installation, which can be signaled when pressure in the drill hole is not maintained. Minimal consistent loss of drilling fluid typically occurs 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 drill hole. For example, a loss of drilling fluid and an absence of subsurface material would indicate a loss of containment pressure within the hole.

2.0 Drilling Fluid and Drilling Fluid System

The directional drilling process uses drilling fluid to remove the cuttings from the borehole, stabilize the borehole, and act as a coolant and lubricant during the drilling process. The fluid consists primarily of water and bentonite, 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 as it is composed of benign components, however, an inadvertent release will require mitigation measures to reduce the impact to a waterbody or sensitive area.

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 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. 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. The cuttings are disposed of at an approved disposal site.

3.0 Drilling Fluid Release

3.1 Prevention

Horizontal directional drilling is a pipeline installation method typically used to avoid disturbance of sensitive surface features, including waterbodies and wetlands. There is however the potential for surface disturbance through an inadvertent drilling fluid release. Drilling fluid releases are typically caused by pressurization of the drill hole beyond the containment capability of the overburden soil material, which allows the drilling fluid to flow to the ground surface. Releases can be caused by fractures in bedrock or other voids in the geologic strata that allow the fluid to surface even if downhole pressures are low. Providing adequate depth of cover for the installation can substantially reduce the potential for inadvertent releases.

3.1.1 Suitable Material and Adequate Overburden

Prevention of a drilling fluid seepage is a major consideration in determining the profile of the horizontal directional drilled crossing. The primary factors in selecting the pipeline crossing profile include the type

of soil and rock material and the depth of cover material. Cohesive soils, such as clays, dense sands, and competent rock are considered ideal materials for horizontal drilling. The depth of adequate overburden is also considered. A minimum depth of cover of 25 feet in competent soils is required to provide a margin of safety against drilling fluid seepage. The areas that present the highest potential for drilling fluid seepage are the drill entry and exit points where the overburden depth is minimal. At the entry and exit points, a pit can be constructed to collect and provide temporary storage for the drilling fluid seepage until it can be pumped into the drilling system. These pits will be sized adequately to accommodate the maximum volume of drilling fluid that may need to be contained in the pits. Secondary containment of the pits will contain any seepage and minimize any migration of the mud from the work area. This containment system may consist of straw bales and silt fencing around the pit.

3.1.2 Pipeline Geometry

The geometry of the pipeline profile can also affect the potential for drilling fluid seepage. In a profile that forces the pipe to make compound or excessively tight radii turns, downhole pressures can build up, thereby increase the potential for drilling fluid seepage. The profiles for the drilled crossing are intended to minimize this potential, with very smooth and gradual vertical curves. Therefore, the potential for pressure buildup caused by pipeline geometry has been minimized.

3.1.3 Responsibility of Drilling Contractor

The drilling contractor will be responsible for submitting a site specific “Fracture Prevention Plan” to include execution of the directional drilling operation, and actions for detecting and controlling drilling fluid seepage. BakkenLink will review this plan with all relevant government agencies prior to execution for approval and closely supervise the progress and actions of the drilling contractor.

3.2 Detection and Monitoring Procedures

To determine if an inadvertent release has occurred, horizontal directional drilling activities will constantly be monitored on this project, either by the Contractor, the Construction Inspector, the Environmental Inspector or any combination of these. Monitoring and sampling procedures will include:

- Inspection along the drill path
- Continuous examination of drilling mud pressures and returns flows
- Periodic status information regarding drilling conditions during the course of drilling activities
- If a wetland release occurs inspection to determine the potential movement of released drilling mud within the wetland will be necessary
- If a wetland release occurs, drilling mud will be collected at the drill entry location for future analysis, as required. If a wetland release occurs, monitoring of the release will be documented by the Environmental Inspector. BakkenLink will keep photographs of release events on record.

4.0 Notification Procedures

If an inadvertent release is discovered, procedures will be taken by the drilling contractor and BakkenLink to contain the release as described below in the Corrective Action section. Procedures for notification of construction management personnel and regulatory agencies are identified in this section. If monitoring indicates a wetland release has occurred or is occurring, the Contractor, Construction Inspector, or Environmental lnspector will immediately notify BakkenLink's construction management personnel.
BakkenLink will notify all applicable federal and state agencies immediately upon discovery by telephone and/or facsimile of an inadvertent wetland release, detailing the location and nature of the release, corrective actions being taken, and whether the release poses any threat to public health and safety.

5.0 Corrective Action

The greatest potential for drilling fluid seepage is during drill entry and exit where the overburden is minimal. To contain and control drilling fluid seepage on land, the contractor will have available equipment and materials onsite, including backhoes or small bulldozers, portable pumps, sand bags, and hay bales. BakkenLink will address an inadvertent release immediately upon discovery. Containment equipment including portable pumps, hand tools, sand, hay/straw bales, silt fencing, and lumber will be readily available and stored at the drilling site. The following measures will be implemented to minimize or prevent further release, contain the release, and clean up the affected area:

5.1 Upland Release

- The Contractor will determine and implement any modifications to the drilling technique or composition of drilling fluid (e.g. thickening of mud by increasing bentonite content) to minimize or prevent further releases of drilling mud.
- BakkenLink will place containment structures at the affected area to prevent migration of the release.
- If the amount of the release is large enough to allow collection, the drilling mud released into containment structures will be collected. It will then be returned to the drilling operations, taken to a disposal site by hose or tanker, or filtered through bladder bags(with bags either buried on site or removed for disposal).
- If the amount of the release is not large enough to allow collection, the affected area will be diluted with fresh water and pumped into a vacuum truck or equivalent. Steps will be taken to prevent silt-laden water from flowing into a wetland or waterbody.
- If public health and safety are threatened by an inadvertent release, drilling operations will be shut down until the threat is eliminated.

5.2 **Waterbody Release**

- If a release occurs within a waterbody, BakkenLink will stop work and contact all applicable Federal and State agencies as soon as possible. BakkenLink will notify the applicable state representative for department of environmental quality control if there is a threat to public health and safety and explain whether or not the release can be corrected without incurring additional environmental impact. If necessary, drilling operations will be reduced or suspended to assess the extent of the release and to implement corrective actions.
- If public health and safety are threatened, drilling fluid circulation pumps will be turned off. This measure will be taken as a last resort because of the potential for drill hole collapse resulting from loss of down-hole pressure.
- If monitoring indicates that the intake water quality at downstream user locations is impacted to the extent that it is no longer suitable for treatment, alternative water sources (i.e. trucked or bottled water) will be provided to impacted users.

5.3 Wetland/Riparian Area Release

- The Contractor will determine and implement any modifications to the drilling technique or composition of drilling fluid (e.g., thickening of mud by increasing bentonite content) to minimize or prevent further releases of drilling mud.
- If a release occurs within the wetland, reasonable measures, within the limitation of directional drilling technology and Contractor's capability, will be taken to re-establish drilling mud circulation.
- BakkenLink will evaluate the release to determine if containment structures are warranted and can effectively contain the release. When making this determination, BakkenLink will also consider if placement of containment structures will cause additional adverse environmental impact.
- Upon completion of the drilling operations, BakkenLink will consult with applicable regulatory agencies to determine any final clean-up requirements for the inadvertent release.
- If public health and safety are threatened by an inadvertent release, drilling operations will be shut down until corrective actions can eliminate the threat. If corrective actions do not prevent the threat, BakkenLink may opt to re-drill the hole along a different alignment after receiving appropriate regulatory approvals. In this case, the following procedures will be implemented to abandon the previous drill hole: To seal the abandoned drill hole, thickened drilling mud will be pumped into the hole as the drill assembly is extracted. At the surface (within approximately 5 feet of the surface) BakkenLink will fill the drill end points with soil and grade the location to the original contour.

5.4 Follow-up

After a drilling fluid seepage has been contained, the drilling contractor and BakkenLink will make every effort to determine the cause of the seepage. After the cause has been determined, measures will be implemented to control the factors causing the seepage and to minimize the chance of recurrence.

Developing the corrective measure will be a joint effort of BakkenLink and the drilling contractor and will be site and problem specific. In some cases, the corrective measure may involve a determination that the existing hole encountered a void, which could be bypassed with a slight change in the profile. In other cases, it may be determined that the existing hole encountered a zone of unsatisfactory soil material and the hole may have to be abandoned. If the hole is abandoned, it will be filled with cuttings and drilling fluid.

6.0 Response Equipment

Containment equipment and materials, including lumber for temporary shoring, sandbags, portable pumps, hand tools, silt fence, and hay bales, will be stored within the drilling sites. The drilling contractor will also have heavy equipment such as backhoes that can be utilized to control and clean up drilling fluid seepage. The drilling contractor will be responsible for correctly implementing these devices as soon as an incident is detected.