
# NEW ENGLAND CLEAN POWER LINK PROJECT

# HORIZONTAL DIRECTIONAL DRILLING INADVERTENT RETURN CONTINGENCY PLAN

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## 1.0 PURPOSE AND NEED

Champlain VT, LLC, d/b/a TDI-New England (TDI-NE) is proposing the New England Clean Power Link project (Project), a 1,000 megawatt (MW) high-voltage direct current (HVDC) electric transmission line that will provide electricity generated by renewable energy sources in Canada to the New England electric grid. The transmission line will be comprised of two approximately 5-inch diameter cables, with each having a nominal operating voltage of ±320 kilovolts. The underwater portion of the transmission line, approximately 98 miles in length, will be buried in the bed of Lake Champlain, except at water depths of greater than 150 feet where the cables will be placed on the bottom and self-bury. The cables will enter the Lake in Alburgh, Vermont and emerge in Benson, Vermont. The overland (terrestrial) portions of the transmission line, approximately 56 miles in length, will be buried underground within existing public road rights-of-way ("ROWs") from Benson to Ludlow.

The transmission line will enter and exit Lake Champlain using the horizontal directional drill (HDD) method, a trenchless construction technique, to minimize impacts to the Lake shoreline and nearshore habitat. HDD is a method of installing underground utilities in a shallow arc along a prescribed path by using a surface-launched drilling rig. The HDD method will also be used along the terrestrial route to cross other waterbodies where an open-cut trench method is not feasible or expressly permitted by regulatory agencies, such as where the transmission line will cross at the southern end of Lake Bomoseen.

Ideally, the HDD method involves no disturbance to the bed or bank of the waterbody being crossed. However, if a natural fracture or unconsolidated area in the ground is encountered, an unexpected release of drilling mud to the environment, known as an "Inadvertent Return," could occur. As TDI-NE has not selected a contractor for the Project yet, this HDD Inadvertent Return Contingency Plan provides a general outline of the measures that the selected contractor would be required to complete in order to mitigate the inadvertent release of drilling mud. TDI-NE will require the selected contractor to produce and adhere to their own comprehensive contingency plan developed in accordance with this plan and with industry standards.

## 2.0 DRILLING BASICS

The HDD method is a technically advanced process involving specialized equipment and skilled operators. The primary environmental risk associated with this crossing method comes from the potential for inadvertent release of drilling fluid. The selection and supervision of the drilling contractor will be the responsibility of TDI-NE.

A drilling fluid release is indicated when pressure in the drill hole is not maintained and a loss of circulation of drilling fluids occurs. 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 hole.

## 3.0 DRILLING FLUID AND DRILLING FLUID SYSTEM

The HDD process uses drilling fluid consisting primarily of water and bentonite, a naturally occurring clay. Drilling fluid removes the cuttings from the borehole, stabilizes the walls of the

borehole and acts as a coolant and lubricant to the drill bit during the drilling process. The drilling fluid mixture consists of 1 to 5 percent bentonite clay and from 0 to 40 percent inert solids from the borehole cuttings with the remainder being water. Other drilling additives may be used depending on conditions encountered and contractor experience. TDI-NE expects that any other additives would be non-toxic.

The drilling fluid is prepared in the mixing tank using both new and clean recycled drilling fluid. The fluid is pumped through the center of the drill pipe to the drilling tools. Return flow is through the annulus created between the wall of the drilled hole and the drill pipe. During pilot hole drilling, the cuttings are returned to a small excavation at the entry point called the entry pit. From the entry pit, the returned fluid is pumped to the fluid processing equipment. Typically, shaker screens, desanders, desilters and centrifuges process and remove increasingly finer cuttings from the drilling fluid. The cleaned fluid is recycled to the mixing tank for reuse in the borehole. The cuttings removed by the cleaning process are disposed of at a site approved to accept this type of material.

## 4.0 PREVENTING AND CONTROLLING INADVERTENT RETURNS

HDD is a pipeline installation method typically used to avoid disturbance of sensitive surface features, including waterbodies and wetlands. HDD does, however, present a remote potential for surface disturbance through inadvertent drilling fluid releases. Drilling fluid releases are typically caused by blockage of the return flow path around the drill pipe when pressure of the drilling fluid exceeds the containment capability of the overburden soil material. Pressurized drilling fluids follow the path of least resistance, which may result in the drilling fluid flowing to the ground surface should the annulus around the drill pipe become plugged. Releases may follow fractures in bedrock or other voids in the strata that allow the fluid to surface. This phenomena is known as an Inadvertent Return.

### 4.1 Considerations

Prevention of drilling fluid seepage is a major consideration in determining the profile of the HDD crossing. The primary factors in selecting the pipeline crossing profile include the type of soil and rock in the geological material, the depth of cover material, pipeline geometry, and actions of the drilling contractor.

#### 4.1.1 Suitable Material and Adequate Overburden

The selected HDD Contractor shall complete a detailed geotechnical study prior to design of the HDD in order to design the HDD drill plan with consideration of the sediment and/or soil type along the selected route. Cohesive soils, such as clays, dense sands and competent rock are considered ideal materials for horizontal drilling. The depth of adequate overburden also needs to be considered. A minimum depth of cover of 20 feet in competent soils is desirable 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 thickness is least, due to the low approach angle. Along both the entry and exit points for terrestrial crossings, above ground containment pits will be constructed with berms to collect and provide temporary storage for any potential inadvertently returned drilling fluid or seepage until it can be pumped back into the drilling system. For the aquatic transition areas, cofferdams or casings will be constructed at the emergence points to contain potential inadvertently returned drilling fluid.

### 4.1.2 Pipeline Geometry

The geometry of the pipeline profile can slightly affect the potential for inadvertent returns. In a profile which forces the pipe to make compound or excessively tight radius turns, key-seating of the drill pipe may develop, blocking the return flow to surface, allowing downhole pressures to build up, thereby increasing the potential for inadvertent returns. The profiles for TDI – NE's cable crossings minimize this potential, with very smooth and gradual vertical curves placed deep in the crossing profile, therefore affording maximum cover. Therefore, the potential for pressure buildup caused by pipeline geometry has been minimized.

### 4.1.3 Responsibility of Drilling Contractor

The drilling contractor is responsible for execution of the HDD, including actions for preventing, detecting, and controlling inadvertent returns. TDI-NE will closely supervise the progress and actions of the drilling contractor.

Prior to construction, the selected drilling contractor will prepare and submit a detailed drilling plan for TDI-NE review and approval. The contractor's drilling plan will be required to include the following elements:

- Work plan and detailed description of the drilling program (specifications for executing pilot hole, reaming, pull back operations, and schedule);
- Description of the proposed drilling equipment and drill site layout;
- Material Safety Data Sheet (MSDS) information for all drilling fluid products proposed for use;
- Geotechnical data and other subsurface data for of the proposed HDD pathway;
- Procedures for drilling fluid management (e.g., metering of makeup water, recording of drilling fluid product quantities utilized, fluid return volumes, fluid and cuttings disposal quantities, etc.);
- Area specific contingency plan for inadvertent returns; and,
- Drilling Mud disposal procedures

## 4.2 Detection and Monitoring Procedures

To determine if an advertent return has occurred, HDD activities will be constantly monitored on this project by the Contractor, with oversight by the Construction Inspector and Environmental Inspector. Monitoring procedures will include:

- Visual observation along the drill path during HDD operations.
- Continuous examination of drilling mud pressure gauges and return flows to the surface pits.
- Monitoring of drill status information regarding drilling conditions and alignments of the drilling profile during the course of drilling activities.
- If an inadvertent return occurs in a wetland or waterbody, monitoring of the release will be documented by the Environmental Inspector. TDI-NE will keep photographs of release events on record.

### 4.3 Control Measures

In the contingency planning for the cable crossings, drilling fluid seepage containment will be incorporated into the drill plan. Containment equipment and materials, including lumber for temporary shoring, sandbags, portable pumps, floating containment booms, hand tools, silt fence, and straw bales, will be stored within the drilling sites. The drilling contractor will also have heavy equipment such as backhoes and bulldozers that can be used to control and clean up inadvertently returned drilling fluid.

For land to lake HDD transitions, it is anticipated that receiver casings will be used. Receiver casings shall be driven into the lake bottom at sufficient depth to ensure adequate earth cover to contain drilling fluid. Suitable magnetic tracking devices or similar will be used to guide the drill lead into the receiver casing. As an alternative, cofferdams will be utilized where necessary to stabilize bottom sediment at the HDD terminus and to receive potential inadvertent return of drilling fluid. The receiver casing or cofferdam will extend above the waterline in shallow water. In deep water, casing or cofferdams may not be extended to the water surface but will be marked by buoys and other navigation aids.

## 5.0 NOTIFICATION PROCEDURES

If monitoring indicates a release is occurring or has occurred, the Contractor shall immediately begin containment while the Construction Inspector or Environmental Inspector will immediately notify TDI – New England's construction management personnel.

TDI-NE will notify the appropriate agencies identified in Table 1 below immediately upon discovery of an Inadvertent Return, detailing the location and nature of the release, corrective actions being taken, and whether the release poses any threat to public health and safety.

Table 1: Regulatory Contact Information

| Agency | Primary Contact | Phone Number |
|---|---|---|
| US Army Corps of Engineers New England Division | Mr. Michael Adams | (802) 873-2893 |
| VT DEC Waste Management and Prevention Division Spills Hotline | NA | 1-800-641-5005 |
| VT DEC Lakes and Ponds Management and Protection Program | Kevin Burke | 802-490-6165 |
| VT DEC Rivers Program | Michael Kline | 802-490-6155 |

## 6.0 CORRECTIVE ACTION

TDI-NE will correct an Inadvertent Return immediately upon discovery. The following measures will be implemented to minimize or prevent further release, contain the release, and clean up the affected area:

Upland Release:

The entry or exit locations will generally be located in upland areas on a dry land segment where drilling fluid seepage can be readily detected and contained. To isolate and contain potential drilling fluid seepage, an above ground containment pit will be constructed between the entrance and exit points and the feature boundary. Straw bales or silt fencing will also be used to further reinforce the berm.

- 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, temporary lowering of the downhole pressures) to minimize or prevent further releases of drilling mud.
- TDI-NE will oversee the placement of 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 will be collected and returned to either the drilling operations or a disposal site by hose or tanker.
- If the amount of the release is not large enough to allow collection, the released drilling fluid will be swept, shoveled, or mixed with sand and temporarily left in place to dry. Steps will be taken to prevent drilling fluid or silt-laden water from flowing into a wetland or waterbody (e.g installation of silt fence and/or haybales, excavation of diversion trenches or dikes).
- If the release occurs within a Wellhead Protection Area or Source Protection Area for a water supply well (refer to TDI - NECPL Project Overland Component - Natural Resource & Public Water Supply Map Series, December 2, 2014), notify the water system operator, and coordinate with the water system and the Vermont DEC for follow-up investigation and actions, if appropriate.
- If public health and safety are threatened by an inadvertent release, drilling operations will be shut down until the threat is eliminated. This measure will be taken as a last resort because of the potential for drill hole collapse resulting from loss of down-hole pressure.

Waterbody Release:

- If a release occurs within a waterbody, TDI-NE will contact the appropriate agency as soon as possible to inform them if there is a threat to public health and the environment, and to 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 the release is a single-point release, accessible with a hose and truck, the Contractor will 'cap' the release by placing a section of pipe over the release to contain the fluid within the pipe section, or similar method. With a larger release, the Contractor will place a water-filled bladder around the release in order to isolate it from the waterbody prior to removal. After the release is contained, the fluid will be pumped into trucks and reused or disposed of at an appropriate facility.
- 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.
- TDI-NE will assist agencies with any sampling they may require.

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, temporary lowering of the downhole pressures) 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.
- If a release occurs in a wetland, containment of the drilling fluids, and continued inspection to determine any potential for movement of released drilling mud within the wetland, and collection of drilling mud returns at the location for future analysis, will be performed as required.
- TDI-NE will evaluate the release to determine if containment structures are warranted and can effectively contain the release. When making this determination, TDI-NE will also consider if placement of containment structures will cause additional adverse environmental impact. If containment structures are not practicable, TDI-NE will consult with engineers and regulatory authorities to determine how to best contain the release using standard industry methods.
- Upon completion of the drilling operations, TDI-NE 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 the inadvertent release, drilling operations will be shut down until the threat is eliminated.
- TDI-NE will assist regulatory agencies with any sampling they may require.

## 6.1 ABANDONMENT

If corrective actions do not prevent the threat to public health and safety, or if the pipeline installation is unsuccessful, TDI-NE 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 and cuttings will be pumped into the hole as the drill assembly is extracted.
- Within approximately 10 vertical feet of the surface, TDI-NE will remove drilling mud and cuttings, then fill the drill end points and any mud pits with soil, and grade the location to the original contour.

## 6.2 FOLLOW-UP

After the inadvertent return has been contained, the drilling contractor and TDI-NE 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 TDI-NE 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, as described in section 6.1.