# Waste Minimization Exhibit

Cascade Renewable Transmission

*Wasco, Hood River, and Multnomah Counties, Oregon*

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Prepared for
Cascade Renewable Transmission, LLC

Submitted to
Oregon Energy Facility Siting Council

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# Attachments

Attachment 1: Example Inadvertent Returns Contingency Plan

# Acronyms and Abbreviations

| | |
|---|---|
| Applicant | Cascade Renewable Transmission, LLC (CRT) |
| BMP | best management practice |
| HDD | horizontal directional drilling |
| HVAC | high-voltage alternating current |
| HVDC | high-voltage direct current |
| NPDES | National Pollutant Discharge Elimination System |
| OAR | Oregon Administrative Rules |
| Project | Cascade Renewable Transmission Project |

# 1 Introduction

This exhibit provides an analysis of solid waste and wastewater generated by the Cascade Renewable Transmission Project (Project) and demonstrates that the Project complies with the waste minimization approval standard in OAR 345-022-0120.

***OAR 345-022-0120 Waste Minimization***

*(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that, to the extent reasonably practicable:*

*(a) The applicant's solid waste and wastewater plans are likely to minimize generation of solid waste and wastewater in the construction and operation of the facility, and when solid waste or wastewater is generated, to result in recycling and reuse of such wastes;*

*(b) The applicant's plans to manage the accumulation, storage, disposal and transportation of waste generated by the construction and operation of the facility are likely to result in minimal adverse impact on surrounding and adjacent areas.*

*(2) The Council may issue a site certificate for a facility that would produce power from wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.*

*(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.*

# 2 Project Waste (OAR 345-022-0120(4)(a)(A), (B), and (D))

*(4) To assist the Council in determining whether the standard outlines in (1) through (3) has been met, the Applicant must submit:*

*(a) Information about the applicant's plans to minimize the generation of solid waste and wastewater and to recycle or reuse solid waste and wastewater, providing evidence to support a finding by the Council as required by OAR 345-022-0120. The applicant must include:*

*(A) A description of the major types of solid waste and wastewater that construction, operation and retirement of the facility are likely to generate, including an estimate of the amount of solid waste and wastewater;*

*(B) A description of any structures, systems and equipment for management and disposal of solid waste, wastewater and storm water;*

*(D) The applicant's plans to minimize, recycle or reuse the solid waste and wastewater described in (A).*

**RESPONSE**

## 2.1 Types and Amounts of Solid Waste

Solid waste generated during construction, operation, and decommissioning in Portland would be required to be delivered to an Oregon Metro-authorized material recovery facility whether it is to be recycled or disposed.[1] There are two mixed waste recovery disposal locations in North Portland; Recology Oregon Material Recovery[2] and Greenway Recycling, there are other mixed waste recovery disposal locations throughout the greater Portland metro area. Waste generated in The Dalles area would be disposed of at the Wasco County landfill.[3]

### 2.1.1 Construction

Construction of the Project would generate a small amount of non-hazardous waste. Solid waste generated during construction is anticipated to include scrap metal (e.g., wire and rebar scraps), wood, concrete, concrete washout, and other debris. Much of this waste would be packing material such as crates, pallets, and paper, and plastic wrapping to protect equipment during shipping and transport. It is estimated that approximately 5,000 to 10,000 cubic yards of waste would be produced during construction of the converter stations, and approximately 1,000 to 2,000 cubic yards of waste would be produced during installation of the underground and in-river cables.

Excavation of foundations for converter station buildings is not expected to produce dirt and rock spoils that would require disposal. The materials would be spread over areas previously disturbed during construction. Materials would only be spread as appropriate, resulting in no appreciable grade change and with adequate measures for soil conservation and erosion and sediment control (see the Soil Protection Exhibit). Excavation for the trenches would produce dirt and rock spoils that would require disposal. At the western end of the Project in Portland, approximately 281,556 cubic yards of excavated dirt and rock spoils would be disposed of at an Oregon Metro-authorized material recovery facility. At the eastern end of the Project in and near The Dalles, approximately 114,048 cubic yards of excavated dirt and rock spoils would be disposed of at the Wasco County landfill. Materials would be hauled to appropriate disposal sites; the locations of such sites will be determined on an as-needed basis during construction.

Some concrete waste would be created during construction of converter station building foundations and placement of the concrete casing in trenches for underground high-voltage alternating current (HVAC) and high-voltage direct current (HVDC) transmission cables. Concrete truck chutes would be washed down to prevent concrete from hardening within the chutes. In these cases, the concrete wastewater would be washed out into a dedicated concrete washout area. Concrete solids and washout water would be contained within a confined area and hauled away to an appropriate location. Using dedicated concrete washout areas is a common best management practice (BMP) for construction. During horizontal direction drilling (HDD) to transition the cables from land to water

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[1] Metro. 2025. Construction waste. Hauling requirements and recycling options that save money. Accessed January 2025: https://www.oregonmetro.gov/tools-working/resources-solid-waste-businesses/construction-waste.

[2] Recology Zero Waste. 2025. Recology Portland. Accessed January 2025: https://www.recology.com/recology-portland/contact/.

[3] Waste Connections. 2025. Wasco County Landfill Waste Disposal, Diversion and Recycling. Accessed January 2025: https://www.wasteconnections.com/wasco-county-landfill/.

and under sensitive areas, drill cuttings and HDD drilling mud solids would be contained within a confined area and shipped to an appropriate waste site. Approximately 53,008 cubic feet of HDD drilling mud solids from the western end of the project would be disposed of at an Oregon Metro-authorized material recovery facility and approximately 3,454 cubic feet of HDD drilling mud solids from the eastern end of the project would be disposed of at the Wasco County landfill.

Placement of the cable bundle by hydroplow would temporarily fluidize sediments on the bottom of the Columbia River, creating a trench approximately 24 inches wide. As the sediments are fluidized, the cable bundle would be placed within the trench in a simultaneous operation; most of the sediments would settle back over the cable. The Project Order requires Cascade Renewable Transmission, LLC (CRT; Applicant) to discuss proposals to verify spoils from drilling or dredging activities do not contain hazardous materials or radionuclides. As discussed in the Soil Protection Exhibit, the Applicant conducted sediment sampling in the Columbia River in coordination with the interagency Portland Sediment Evaluation Team (PSET) to analyze sediment type and determine if river sediments are contaminated those areas of proposed work. The results of that study confirmed no manmade radionuclides and other potentially hazardous contaminants were present. In addition, the proposed Project has been sited to avoid the US Army Corps of Engineers (USACE) dredged materials pile on Hayden Island, which is known to contain contaminants of concern (see the Background Information Exhibit).

### 2.1.2 Operation

The Project would produce a small amount of non-hazardous solid waste during operation and maintenance. This waste may include equipment and components that are replaced, packing materials for replacement components, and waste typical from the basic facilities at each converter station (bathroom/kitchen). It is estimated that approximately 2 cubic yards of solid waste would be produced weekly during operations at each converter station.

As described in the Soil Protection Exhibit, the Project would use up to 120 lead-acid or sulfuric-acid batteries (60 batteries per battery bank) for back-up power at each converter station. The final number and size of batteries would be determined during final design. Each battery would contain the acid in the factory-sealed, maintenance-free, leakproof battery container. If sulfuric-acid batteries are used, secondary containment would be used, as required by regulation. The batteries would be replaced every 10 years, if not earlier, as indicated by wear. A qualified contractor would replace batteries, adhering to applicable regulations for transport and disposal.

In addition, as stated in the Soil Protection Exhibit, transformer oils would arrive on an as-needed basis and be transferred into the receiving components by a licensed contractor; none would be stored on site during construction or operation. Hazardous identified/classified fluids transported onto site or transported from site will be performed by a licensed transporter utilizing the required hazardous material handler/transporter manifest documentation. This documentation tracks the waste from “cradle to grave” and will identify the disposal facility. Copies of all related paperwork will be filed and retained per local and federal guidelines.

### 2.1.3 Decommissioning

The anticipated working lifespan of the Project is 50 years, during or after which period the Project may be extended or decommissioned. Should the Project be decommissioned, all aboveground

converter station components would be removed, and concrete foundations would be cut and removed. Metals and electrical components are expected to be recycled as scrap rather than disposed of in a landfill, wherever possible. Concrete foundations that are removed would be disposed of as construction waste. Transformers and other converter station equipment would be removed for reconditioning for use elsewhere or recycled as scrap metal. The control buildings would be demolished and disposed of unless landowners can convert them for use. Similar to descriptions in the Soil Protection Exhibit, Hazardous materials such as the batteries would be handled by a qualified contractor, who would adhere to the applicable regulation for transport and disposal.

Concrete and conduits for the underground HVDC and HVAC cables would likely remain in place, as removing them would cause unnecessary disturbance to the ground surface. The cables can be pulled out of the conduits for appropriate disposal. The in-river cables can be removed from the riverbed and disposed of appropriately; alternatively, the de-energized cables can be left in place if removing them is determined to cause undue disturbance. An affiliate of the Applicant has experience with removing underwater cables buried 10 to 15 feet below the riverbed with minimal and temporary disturbance to the overlying sediment.

### 2.1.4 Management and Disposal of Solid Waste

The Applicant would comply with all applicable waste handling and disposal regulations on lands associated with the Project. Solid waste would be stored in a manner that does not constitute a fire, health, or safety hazard until such waste can be hauled off for recycling or disposal, as appropriate. The following sections describe the handling and disposal of non-hazardous solid waste planned throughout the duration of the Project.

#### 2.1.4.1 Construction

Temporary laydown yards, converter stations, trenching areas, and all other construction areas would be kept in an orderly condition throughout the construction period. Waste generated during construction of the Project would be temporarily collected and consolidated, where appropriate, into larger disposal containers. Disposal and recycling containers would be labeled by waste type to segregate materials as appropriate for recycling or disposal.

Disposal and recycling containers would be of adequate size, design, and number to handle the amount of waste generated. Waste containers would be fitted with lids to prevent waste from being scattered by the wind.

The facility would be constructed in and around the incorporated communities of The Dalles and Portland, which provide solid waste management services to their respective areas. Collection, transfer, and recycling services in The Dalles area is by The Dalles Disposal and in the Portland area is by Republic Services. Solid waste disposal during construction would be provided through a private contract with local commercial haulers and is not anticipated to disrupt services already being provided in these communities. A licensed waste hauler, under contract to the construction contractor, if needed, would remove waste to appropriate disposal facilities in compliance with OAR 340-093-0220 for transportation of waste. The construction contractor would arrange off-site disposal of excess soils, as necessary. Disposal sites may be on public or private lands but must be approved by the Applicant’s environmental representatives and the receiving landowner. The

disposal contractor would obtain signed consent between themselves and the party receiving the earth materials and copies of the documentation must be provided to the Applicant. The disposal agreement between the landowner and construction contractor would be in place prior to disposal. The Applicant's environmental personnel would inspect disposal sites to verify that sensitive environmental resources are not impacted.

The construction contractor would submit a plan for the Applicant's approval for reusing, recycling, or disposing of solid waste materials during construction, in accordance with OAR 340-093-0010. That plan would specify the number and types of waste containers maintained at construction sites and laydown areas, and how wastes would be segregated for recycling and disposal. It would also specify the names and locations of appropriate recycling and waste disposal facilities, collection requirements, and hauling requirements.

#### 2.1.4.2 Operation

During operations, solid waste generated during repair of cables or other Project components would be collected and transported to the converter stations for the disposal or recycling. The batteries would be replaced every 10 years, if not earlier, as indicated by wear. A qualified contractor could replace the batteries, adhering to applicable regulations for transport and disposal. Spent batteries would be disposed of at a facility permitted to handle them, in compliance with appliable Resource Conservation and Recovery Act and Toxic Substances Control Act regulations administered by the Environmental Protection Agency (USEPA) or the Oregon Department of Environmental Quality (ODEQ).

#### 2.1.4.3 Decommissioning

Wastes from decommissioning activities would be managed and disposed of in a similar manner to the waste produced during construction and operation. To the extent practicable, components would be sold for reuse or scrap, minimizing the amount of waste requiring disposal at a solid waste facility.

Solid waste generated during construction, operation, and decommissioning would be disposed of at one of multiple public landfills near Portland, including Fazio Landfill and Recycling and Portland Landfill. The public landfill nearest to The Dalles is the Wasco County Landfill. As identified above, a qualified contractor would transport and dispose of batteries at the appropriate facility identified by the contractor; the contractor may use any licensed facility for disposal of lead-acid and sulfuric-acid batteries.

## 2.2 Types and Amounts of Wastewater

Wastewater generated by the Project would include sanitary waste and construction wastewater; the latter would consist of equipment wash water, concrete washout water, and HDD fluids.

### 2.2.1 Sanitary Wastewater

During construction, sanitary waste would be collected on site in portable toilets provided and maintained by a licensed subcontractor, responsible for servicing the toilets at regular intervals and disposing of wastewater in accordance with local jurisdictional regulations. The construction contractor would verify that a sufficient number of toilets are provided.

During operation, approximately 12 full-time employees would be located at each converter station; minimal discharges of domestic wastewater are anticipated. The western converter station would discharge to the municipal system within the utility easement that abuts N Leadbetter Road. It is unknown if the eastern converter station would discharge to a municipal system or require a licensed, on-site septic system; however, significant impacts to community sewer systems are not anticipated.

Sanitation during decommissioning activities would be addressed similarly as for construction.

### 2.2.2 Construction Wastewater

The wastewater generated during construction would be concrete washout during construction of the converter stations and concrete casings in trenches (to hold the cable conduits), and during HDD drilling. Concrete wastewater would be washed out into a dedicated concrete area located within each converter station; the contractor would determine washout methods. Concrete washout water typically makes up 25 percent of the total water used for concrete in foundations and casings; therefore, estimated concrete washout at the converter station locations would make up approximately 56,250 gallons of water per converter station (see the State and Local Laws and Regulations Exhibit for water use estimates).

The HDD process would use drilling fluid (water and bentonite clay), which would be stored in holding tanks where it could be continuously pumped into the drill pipe to the cutting tools where it mixes with the soil or bedrock cuttings. This mixture would be carried back to the drill pit where the entrained cuttings could be carried to a separation tank where the fluid can be reused during drilling and reaming. As described in the State and Local Laws and Regulations Exhibit, approximately 215,600 gallons of water would be used during HDD drilling. Once the HDD drilling at each location is completed, the remaining water in the drill pit would be allowed to infiltrate.

During construction, the Applicant would prepare an HDD Inadvertent Returns Contingency Plan to avoid water used for construction being discharged into wetlands, streams, or other waterways. An example HDD Inadvertent Returns Contingency Plan is included as Attachment 1. Stormwater is not considered wastewater. The Applicant would implement erosion control measures required by the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge General Permit 1200-C and the erosion, sedimentation, and pollution control plan (ESPC) to control stormwater runoff (see the Soil Protection Exhibit for further information). The Project will not produce industrial wastewater.

Construction dewatering activities are generally not anticipated; however, if necessary, they would be addressed by the NPDES permit. Typically, dewatering discharge (including groundwater dewatering) is allowed back to the land, provided:

- Dewatering is applied in a way that results in complete infiltration with no potential to discharge to a water of the state; and
- BMPs or an approved treatment system (e.g., filter bags) are used to ensure compliance with discharge and water quality requirements.

Testing would not be required unless hazardous materials are suspected of being in the water.

### 2.2.3 Operation Wastewater

During operation, approximately 12 full-time employees would be located at each converter station; minimal discharges of domestic wastewater are anticipated. The western converter station would discharge to the municipal system within the utility easement that abuts N Leadbetter Road. It is unknown if the eastern converter station would discharge to a municipal system or require a licensed, on-site septic system. If an on-site septic system is used, it would be licensed, constructed, and maintained in compliance with state permit requirements with a discharge capacity of less than 2,500 gallons per day.

### 2.2.4 Decommissioning Wastewater

Wastewater generated during decommissioning would be minimal and similar to descriptions above under construction wastewater.

# 3 Reduction of Consumptive Water Use (OAR 345-022-0120(4)(a)(C)

*(C). A discussion of any actions or restrictions proposed by the applicant to reduce consumptive water use during construction and operation of the facility.*

**RESPONSE**

Minimizing use of water is an important environmental consideration as the Project moves into the construction phase. The Applicant would use appropriate BMPs during construction to reduce water use, such as:

- Regularly monitoring weather and soil conditions to minimize water use during dust control.
- Applying water, only as needed, in areas of active construction, and using binders or tackifiers, such as magnesium chloride, to reduce dust, if permitted by landowners and applicable regulations.

During operations, water use would be limited. Water use in the converter station control buildings would be small amounts similar to typical office use.

# 4 Impacts of Project Waste (OAR 345-022-0120(4)(a)(E) and (F))

*(E). A description of any adverse impact on surrounding and adjacent areas from the accumulation, storage, disposal and transportation of solid waste, wastewater and stormwater during construction and operation of the facility;*

*(F). Evidence that adverse impacts described in (D) are likely to be minimal, taking into account any measures the applicant proposes to avoid, reduce or otherwise mitigate the impacts;*

### RESPONSE

Measures for handling, controlling, and minimizing project waste are described in this exhibit. Based on these descriptions and the relatively low quantities of wastes, no adverse impacts are expected to result from the accumulation, storage, disposal, and transportation of solid waste, wastewater, and stormwater during the construction and operation of the facility.

# 5 Monitoring (OAR 345-022-0120(4)(a)(G))

*(G). The applicant's proposed monitoring program, if any, for minimization of solid waste and wastewater impacts.*

### RESPONSE

Because no significant adverse impacts from waste or wastewater would occur in the adjacent or surrounding areas, no monitoring program is proposed. Waste management activities would be subject to periodic inspections to ensure compliance with applicable regulations.

# 6 Materials Analysis (OAR 345-022-0120)(4)(b)(A) through (C)

A materials analysis is included in the Soil Protection Exhibit. The materials analysis addresses the following:

(A) An inventory of substantial quantities of industrial materials flowing into and out of the proposed facility during construction and operation;

(B) The applicant's plans to manage hazardous substances during construction and operation, including measures to prevent and contain spills; and

(C) The applicant's plans to manage non-hazardous waste materials during construction and operation.

# 7 Conclusions

The evidence provided the exhibit demonstrates that the waste minimization approval standard in OAR 345-022-0120 is met because waste generated due to construction, operation, and maintenance of the Project would be minimized, reused, or recycled, where feasible, and because minimal adverse impacts on the surrounding or adjacent areas would result from the management of waste related to the Project.

# Attachment 1: Example Inadvertent Returns Contingency Plan

# Inadvertent Returns Contingency Plan

Example Horizontal Directional Drilling Crossing

August 12, 2025

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Appendix 1: Example HDD Inadvertent Drilling Fluid Return Response Items
Appendix 2: Example HDD Inadvertent Return Incident Summary

# Acronyms and Abbreviations

| | |
|---|---|
| BHA | bottom hole assembly |
| CRT | Cascade Renewable Transmission |
| HDD | horizontal directional drilling |
| HFIA | hydraulic fracture and inadvertent returns analyses |
| IR | inadvertent return |
| LCM | lost circulation material |
| Plan | Inadvertent Returns Contingency Plan |
| SDS | safety data sheet |

# 1 Project Introduction

Cascade Renewable Transmission, LLC (CRT) proposes installing a high-voltage transmission line in Oregon and Washington. Portions of the planned high-voltage direct current (HVDC) alignment will be placed underground, into the Columbia River, and under a portion of the Columbia River (referred to as the Oregon Slough), and portions of the planned high-voltage alternating current (HVAC) alignment will be placed underground beneath the Columbia Slough and the Willamette River. CRT has determined the horizontal directional drill (HDD) construction method is preferred for a trenchless installation at these locations.

Where CRT plans to install electric cables in conduits via HDD underneath these sensitive areas, these areas are called HDD crossings in this document.

# 2 Purpose

The purpose of this Inadvertent Returns Contingency Plan (Plan) is to identify measures that CRT will take prior to or during construction to control, contain, and collect inadvertent drilling fluid returns and minimize impacts to environmentally sensitive areas. This Plan also summarizes the steps CRT will take to determine feasibility for the HDD construction method, assess IR potential, and account for the identified subsurface conditions in design and planning of the proposed HDD crossings. Finally, this Plan outlines preventative measures and protocols established for reducing the probability, frequency, and severity of inadvertent returns (IRs).

Preliminary drawings and specifications provide details of the HDD portions of the project. If required by the contract documents for specific HDD crossings, the selected HDD contractor should also generate site-specific contingency plans to augment these minimum requirements and address site-specific items based on its planned means and methods. The HDD contractor(s) responsible for the work must adhere to this Plan and the approved, site-specific contingency plan during the entire HDD construction process.

The specific objectives of this Plan are to:

1. Minimize the potential for a drilling fluid release associated with HDD activities;
2. Protect environmentally sensitive areas;
3. Provide for the timely detection of indicators for drilling fluid loss and/or detection of IRs to the surface;
4. Establish proper protocols for monitoring, reporting, containing, cleaning, and reporting IR events;
5. Establish ground rules for contractor reactions to IR events, including resuming work;
6. Ensure an organized, timely, accurate, and efficient response in the event of a release of drilling fluid; and
7. Ensure appropriate notifications are made immediately to designated CRT project and environmental field support. CRT is responsible for notifications to appropriate regulatory agencies.

# 3 Drilling Fluids for Horizontal Directional Drilling

HDD is a common method used to install underground utilities through heavily developed areas, roadways, waterways, steep slopes, and environmentally sensitive areas to minimize the surface disturbance typically required by traditional open-cut trenching methods. HDD construction generally limits disturbances along project corridors with intent to achieve a reduced workspace footprint in comparison to open-cut installations. HDD construction methods typically involve three phases:

1. The first phase involves a smaller diameter pilot hole drilled along a designed drill path.
2. After completion of the pilot hole, the hole is enlarged (or reamed) to a diameter that will accommodate the HDPE conduit and then prepared for pullback.
3. Finally, the HDPE conduit is pulled back into the reamed hole.

Drilling fluid is an essential component for all phases of HDD operations and typically consists of 4 to 8 percent bentonite in solution with 92 to 96 percent fresh water. All three phases of HDD construction use circulating drilling fluid that provides the following functions:

- **Hydraulic Excavation**: Excavates softer soils along the drill path by high velocity fluid streams dispensed through jet nozzles installed in bits or hole opening tools.
- **Hydraulic to Mechanical Power Transfer**: Provides the power required to turn a bit and mechanically drill a hole in dense soils and rock via a positive displacement mud motor.
- **Transportation of Solids**: Suspends excavated solids, consisting of soil or rock cuttings, and carries them to returns pits at HDD endpoints as the drilling fluid returns circulate through the hole annulus.
- **Hole Stabilization**: Creates a thin “wall cake” that stabilizes and provides a seal to the surrounding formation of the drilled hole. This is critical for HDD conduit installation as holes are often drilled through formations highly susceptible to extracting the free, available water from the drilling fluid.
- **Cooling and Cleaning of Downhole Tooling**: Cools drill bits, hole-opening tools, and other downhole tooling. Pre-approved additives can provide support for optimizing the hole cleaning process and helping keep the bit and/or tooling clean.
- **Friction Reduction**: Reduces friction between the downhole drill string and wall of the drilled hole using the lubricating properties of drilling fluid.
- **Modification of Soil Properties**: In applicable soils, mixing drilling fluid with the native soils along the drilled path facilitates conduit installation by reducing the soil’s shear strength to a near fluid condition or state. The resulting soil and drilling fluid mixture can then be displaced as a carrier pipe is pulled through it.

Because of drilling fluid’s required use during HDD operations, drilling fluid has the potential to inadvertently migrate to the surface (e.g., IR). These IRs happen when the drilling fluid exits the ground surface at locations other than the intended entry and/or exit. In practice, IRs typically occur in proximity to entry and exit points where near surface soils generally have lower shear strengths

and soil cover is thin. IRs can also occur at locations along a drill path where there are low shear strength soils, where the depth of soil cover is reduced, or along pre-existing fractures or voids. Other locations where IRs can occur include exploratory boring locations or along the edges of existing subsurface structures, such as piles or utility poles. For an IR to occur, the drilling fluid must first migrate out of the drilled hole by means of hydraulic fracture or formational drilling fluid loss.

Formational drilling fluid losses typically occur when drilling fluid flows through pore spaces in the surrounding formation. Thus, a formation with a higher porosity, or permeability, can potentially absorb a larger volume of drilling fluid than a formation with a lower porosity/permeability. Silty sands/clays, silts, and clays typically have a low susceptibility to formational drilling fluid losses. Coarse sand and gravel units with low percentages of silt and clay have a moderate to high susceptibility for formational drilling fluid loss.

The term “hydraulic fracture” describes a situation where downhole drilling fluid pressures exceed the confining overburden pressure and shear strength of surrounding soil along the drill path. Soils most vulnerable to hydraulic fracture include relatively weak cohesive soils (soft clays) or loose granular soils with low shear strength. Medium dense to very dense sands and very stiff to hard silts and clays typically have a low to moderate hydraulic fracture potential. HDD installations with greater depths of cover or where the drill path is situated in formations with higher shear strength may have reduced potential for hydraulic fracture and IR.

Proper management of drilling fluid properties can reduce the potential and/or severity of drilling fluid loss. In some cases, the use of drilling fluid additives is warranted to improve drilling fluid properties and overcome challenging or problematic subsurface conditions. Prior to construction, the HDD contractor will develop a drilling fluid management plan, including planned drilling fluid composition and any proposed additives to account for subsurface conditions anticipated at the HDD crossing location. CRT will review and approve additives proposed by contractors, associated safety data sheets (SDSs), and the plans for implementation prior to use. CRT will not approve additives for use if they are not also approved by local, state, federal, or any other regulating bodies having jurisdiction at an HDD crossing location.

# 4 Pre-Construction Measures

Prior to construction, CRT will determine the feasibility of using the HDD construction method and assesses IR potential by identifying subsurface conditions at proposed HDD crossings. The primary objectives are to:

- Assess the probability of IRs occurring as it relates to proposed geometrical design;
- Establish measures for reducing the probability of IRs to occur, and
- Identify procedures intended to minimize severity of IRs.

The following subsections outline the steps that CRT has taken and will take prior to construction to achieve these objectives.

## 4.1 Feasibility Assessment

HDD crossings can only be considered feasible if the installations can achieve success with a presumptive level of risk acceptable by all parties. In addition, the geometric and geological

conditions must be conducive to the current technology's capabilities. CRT will use front-end engineering and design (FEED) principles to support the presumed feasibility for pursuing HDD construction at these crossing locations. In addition to evaluating if subsurface conditions are conducive to the HDD construction method, the FEED initiatives require consideration be given to IR risk due to subsurface conditions, assuming the use of responsible construction practices and suitable equipment. A feasibility assessment for these HDD crossings is intended to evaluate the site-specific conditions and will include:

- A desktop study of publicly available information regarding geography and geology, including public well data.
- Site reconnaissance by conducting a site visit to the crossing location in order to evaluate the suitability and feasibility for design and construction using the HDD construction method.
- Site surveys for existing utilities and surface features that may impact HDD construction activities and delineated wetlands in the vicinity of the alignment.
- A site-specific geotechnical investigation consisting of three geotechnical borings along each alignment, extending to depths in feet below ground surface. Subsequent lab testing will be completed on select samples and a geotechnical data report generated for the borings.
- A constructability evaluation accounting for the surface and subsurface conditions identified at the proposed HDD crossing location. The findings from the constructability assessment will be incorporated to the extent practical given all other project constraints and requirements to develop an HDD design for each HDD crossing.

## 4.2 Design

An HDD design will be completed for each crossing that accounts for the site-specific conditions and constraints identified through the FEED approach. The HDD design will be considered geometrically feasible and aligned with criteria established for acceptable resulting conduit stresses during installation and operation. The intent of reducing frequency and severity of IRS with elevated focus on environmentally sensitive areas will be incorporated in the design process.

## 4.3 Hydraulic Fracture and Inadvertent Returns Analyses

CRT will complete a hydraulic fracture and inadvertent returns analyses (HFIA), based on the final approved design and identified subsurface conditions at the crossing location, to estimate anticipated annular pressures and formation limit pressures and determine the probability for IRs to occur along the planned alignment. The HFIA report (which will be an appendix) will reference estimated annular pressures, formation limit pressures, and corresponding factors of safety calculated at regular intervals along the alignment, which the HDD contractor will use during construction to compare against annular pressures collected during the pilot hole operations. Therefore, areas of elevated risk can be pre-identified before construction and indicators of potential fluid loss from the holes and/or subsequent IRs can be identified and addressed during construction.

**Note**: The geotechnical data report will be appended to the HFIA report for reference of subsurface conditions.

## 4.4 Execution Plans

CRT will verify the design documentation, including geotechnical data collected in the design phase, that the HDD contractor will receive and review to understand expected site conditions. The HDD contractor will use this information to develop a detailed and site-specific drilling plan for CRT review and approval prior to construction. CRT will review the plan for consistency with appropriate methods aligned with reducing potential for IRs and adherence to any site-specific agency requirements having jurisdiction at the crossing location. Construction methodologies that must be outlined in the contractor's plans include but are not limited to:

- Anticipated pump rates and pressures
- Anticipated penetration rates
- Planned trips and/or hole sizing initiatives to relieve annular pressure
- Any preemptive containment/pressure relief measures (if applicable)
- Equipment and tooling
- Pilot hole plan
    - Bottom hole assembly (BHA) components (including an annular pressure tool)
    - Pilot hole size
- Reaming plan, including stages and final hole size
- Pullback plan, including pullback assembly components
- Drilling fluid composition and properties, including SDSs
    - Drilling fluid additives proposed for use, which CRT must approve prior to construction.
- Disposal Plan

## 4.5 Worksite Preparation

The HDD contractor will prepare and maintain the worksite, as follows, prior to and throughout the HDD construction process:

- Prior to construction, delineate sensitive area limits (wetland boundaries, setbacks, etc.) with stakes or flags. Place erosion and sediment controls on down-sloping sides of the work pads and around the drilling fluid returns pits as a preventative measure against drilling fluids leaving the work sites.
- Generate a list of any pre-identified sensitive areas near the alignment where access and/or methods for containment and cleanup may be limited. Outline pre-approved means and methods for overcoming the pre-identified challenges in the drilling plan described in Section 4.4.
- Locate staging areas for containment and cleanup materials and equipment within available workspaces (and between endpoints, if needed) for timely use if necessary. The materials staged on site may include but are not limited to those items listed in Appendix 1.

- Install secondary spill containment beneath the HDD rig(s), power unit(s), and other stationary equipment such that any hydrocarbon leaks can be contained and cleaned.
- Place drilling fluid returns pits at the HDD endpoints to prevent drilling fluid from leaving the workspaces at the entry and exit points. Place silt fences, wattles, or other appropriate measures along the downgradient boundaries of the pits and workspaces. Excavations will not be made until CRT and applicable agencies, if any, approve.
- Keep SDSs for all anticipated and pre-approved drilling fluid products on site.
- Stage this Plan on site during construction and make it readily available for review by the project team and applicable agencies, if requested.

## 4.6 Pre-Construction Meetings

Prior to HDD construction, all parties (CRT, inspection team, contractor, etc.) will attend an environmental safety meeting or pre-construction meeting to gain familiarity with and understanding of the requirements set forth by this Plan and any additional requirements specified by contract documents, permits, and/or agency(ies) having jurisdiction. For any conflicting requirements between this Plan and any similar plans that apply to the project, the more stringent will govern the work. The HDD contractor's site supervisor will verify that copies of the contingency plans are available (on site) and accessible to all construction personnel and CRT representatives. The site supervisor will also verify contractor employees are properly trained and familiar with the necessary procedures to respond to a drilling fluid release prior to beginning drilling operations.

Before approval is granted to proceed with construction activities, a CRT representative will verify the following and document on the pre-HDD checklist:

- Construction limits are clearly marked;
- Sensitive resources within and adjacent to the construction workspace are flagged;
- Required clearances and setbacks related to sensitive features have been obtained;
- Required coordination with jurisdictional regulatory agencies has occurred;
- Erosion and sediment controls are appropriate for the current and expected conditions, are installed, and are functioning properly;
- Spill response kit(s) are at the drill site(s) and properly stocked;
- Appropriate response equipment is on site and in good working order (minimum required equipment is listed in Appendix 1); and
- The on-site briefing described above with the HDD contractor and HDD inspector has been conducted.

# 5 Prevention Measures

The primary objectives of establishing preventative measures are to:

- Establish proper protocols for drilling fluid and equipment monitoring, recording, and reporting;

- Establish on-site inspection responsibilities and ensure competent personnel are assigned;
- Mandate construction means and methods that will be used to reduce probability for IRs to occur; and
- Provide for the timely detection of indicators for drilling fluid loss and/or detection of IRs to the surface to minimize environmental impacts.

## 5.1 Monitoring Protocols

The HDD contractor will make every effort to maintain annular circulation of drilling fluid to the endpoints of the HDD crossings and reduce the potential for IRs throughout the duration of construction. The contractor will comply with the following monitoring procedures to reduce the likelihood for an IR during construction and reduce the severity of impacts from an IR event.

- Incorporate a working annular pressure tool as a primary component of the BHA during pilot hole operations. Consistently monitor annular pressures observed while drilling and record the maximum and average annular pressures observed for each drilled joint.
    - Review the HFIA report for each HDD crossing for details regarding anticipated annular pressures and formation limit pressures.
    - Compare the annular pressures observed to anticipated pressures along the drill path, and when annular pressure(s) are observed that may compromise and/or exceed estimated formation limit pressures, make every effort to reduce downhole annular pressures and maintain full annular circulation without inducing a hydraulic fracture and/or inadvertent returns.
- Monitor circulation of drilling fluid visually and assess fluid volumes circulating through the drilling fluid system.
    - The drill rig operators will halt drilling operations and take corrective action(s) immediately upon detection of a loss of circulation, a drop in annular pressure, or any other indicator of fluid loss.
    - If circulation cannot be regained, the contractor will develop a plan of action for CRT review and approval prior to progressing forward.
- Monitor facilities and other sensitive areas within 300 feet of the drill path, or as specified by CRT, for drilling fluid migration and release at least three times per shift or more often if fluid migration is detected and/or slowed or loss of circulation is observed.
- Monitor and manipulate drilling fluid composition and volumes to maintain favorable properties and parameters throughout each phase of construction.

## 5.2 Cascade Renewable Transmission Inspection

CRT will assign a competent HDD inspector who will remain on site for the duration of HDD construction activities. The CRT HDD inspector will be responsible for monitoring, documenting, reporting, and notifying applicable parties as outlined in this Plan. The CRT HDD inspector will monitor operational parameters and characteristics in real-time and record detailed documentation regarding the drilling operations and the observed materials being removed from the hole so that

field conditions can be compared to expected conditions predicted in the geotechnical investigation completed in the design phase of the project. The CRT HDD inspector will record operational details, including but not limited to penetration rates, pump volumes, rotary torque, thrust/pull, water acquisition volumes, disposal volumes, and problematic conditions encountered throughout the drilling process. The HDD contractor will provide the CRT HDD inspector full access to view/monitor the equipment and instruments during construction.

The HDD contractor will coordinate with the on-site CRT HDD inspector and communicate indicators of problematic conditions, specifically IRs, in a timely manner so the CRT HDD inspector can assist with monitoring and notification efforts. The CRT HDD inspector will document monitoring and preventative measures taken and drilling fluid flow characteristics and report to the project team any events that require notification to the agencies per this Plan. In the event of an IR, the CRT HDD inspector or designee, with the assistance of the HDD contractor, will complete an IR Incident Summary per notification protocols described in this Plan; an example incident summary is attached in Appendix 2

**Note: There will be concurrence from all parties including HDD contractor for all information collected and documented in the IR incident summary and corresponding notifications.**

## 5.3 Drilling Fluid Management

Proper drilling fluid management is essential for successful HDD installations that reduce frequency and severity of IRs. The HDD contractor will maintain favorable drilling fluid properties to reduce downhole annular pressures, to the extent practical, while excavating and maintaining a stable hole. A qualified drilling fluid technician will remain on site during all phases of construction to manage the drilling fluid properties and pump volumes. The drilling fluid management program will account for and consider modifying drilling fluid density, suspension, and rheological properties, as necessary, to address subsurface conditions encountered. **Only additives, pre-approved by CRT, may be used to manipulate the drilling fluid composition and parameters. If any new additives are proposed during construction, they will be reviewed prior to use to verify compliance with local, state, and federal agencies. SDSs for all drilling fluid additives in use will remain on site at all times.**

## 5.4 Addressing Inadvertent Return Indicators

If the HDD contractors observes indicators of potential IRs, such as slowed/lost circulation or spikes/drops in annular pressure, the HDD contractor will take immediate and responsible reactive measures to address the indicators. **If circulation is lost or slowed, the HDD contractor will temporarily stop drilling activities and notify the CRT HDD inspector or designee, who will make follow-up notifications, as required. The HDD contractor will evaluate the drilling and site conditions to determine the most appropriate remedial actions but must make every effort to regain full circulation to the returns pit(s) prior to advancing the construction process.** The HDD contractor will also enhance the monitoring procedures by performing more frequent observations, or centerline walks, and expanding the footprint of the area being observed outside the limit of disturbance, where authorized. The HDD contractor will increase focus on monitoring initiatives near environmentally sensitive areas. Depending on the operational conditions observed, one or more of the following construction practices may be administered as applicable or necessary:

- Retract (trip out) the downhole drill string and tooling to inspect equipment and clean the hole behind the bit or hole opening tools.
- Swab a specific portion of the hole to clean and/or size the hole to clean and relieve annular pressure.
- Modify penetration rates and drilling fluid pump rates to reduce annular pressure to the extent practical so the hole can be clean and maintained as stable.
- Circulate drilling fluid, potentially achieving “bottoms up,” without progressing the downhole tooling forward.
- Modify drilling fluid density and/or rheological properties to perceived favorable parameters for the materials encountered.
    - Use only pre-approved drilling fluid additives.
    - Maintain on site SDS sheets for all additives and bentonite in use.
- Pump approved lost circulation material (LCM) downhole to attempt to plug off location(s) where drilling fluid is escaping the hole into the formation.
    - Suspend HDD operations to allow LCM plugs or grout to set-up, as necessary.
- Install large or small diameter casing to depths required to combat poor subsurface conditions.
- Excavate pressure relief hole(s) at strategic and pre-approved location(s), if necessary. Containment and proper protocols for managing drilling fluid will be in place at any pre-excavated pit/hole intended for directing fluid flow or relieving annular pressures.
- Increase monitoring intervals/areas.
    - Perform constant monitoring of specific area(s) along the alignment, if necessary.

The CRT HDD inspector will record any corrective measures taken by the HDD contractor and monitor the resulting effectiveness.

# 6 Response Measures

In the event of an IR, the primary objectives are to:

- Follow established protocols for contractor reactions to IR events, including reporting, containing, cleaning, and resuming work;
- Execute a team-based (HDD contractor and CRT), organized, timely, accurate, and efficient response in the event of a drilling fluid release; and
- Make appropriate and timely notifications to applicable contacts and regulatory agencies.

## 6.1 Notifications

If there is an IR or any other environmental or safety incident, the HDD contractor must report the incident to the designated CRT representative immediately. If the designated CRT representative is not immediately available, the HDD contractor must report the incident to the Project Owner.

### 6.1.1 Cascade Renewable Transmission Notifications

Table 1will provide the contact information for the CRT representatives who will be notified for each IR.

**Table 1: Project Contacts for HDD-Related Notifications**

| Company | Name | Title | Phone | Email |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

[1]Requires submittal of IR Incident Summary (Appendix 2) with notification.

### 6.1.2 Agency Notifications

CRT will notify applicable agencies.

## 6.2 General Response

Different IR scenarios require different levels of reactionary measures, depending on the quantities released, the IR location, and the accessibility to contain and clean up the IR. The general response procedures for any IR are as follows:

- Drilling operations will be temporarily ceased upon identification of drilling fluid on the surface or in waterbodies to evaluate the nature and magnitude of the IR. The estimated drilling fluid quantities released to the surface will be evaluated and recorded with concurrence between the HDD contractor and CRT HDD inspector.
- The IR will be contained and cleaned up, as required.
- If necessary, CRT will deploy a qualified professional to evaluate and report on the incident.
- In the IR Incident Summary attached in Appendix 2, the CRT HDD inspector or designee will document the details regarding the IR event and drilling operations at the time of the incident.
    - All applicable parties, including HDD contractor, will concur with the details in the IR Incident Summary.
- The HDD contractor will prepare and transmit to CRT any mitigation measures for modifications to drilling procedures, monitoring protocols, and addressing any reoccurring IR events.
- The appropriate verbal and/or written notifications to CRT and applicable agencies will be made.
- Drilling will resume with the necessary authorizations from CRT and applicable agencies with appropriate preventative measures in place for altering drilling practices and containing any remaining surfacing fluids (as applicable).

- Upon re-starting HDD operations, the CRT HDD inspector will monitor and document any corrective drilling procedures, including modifications to drilling fluid parameters, equipment, or tooling.
- After construction is complete the HDD contractor will remove or clean up any remaining containment structures or drilling fluid in containment areas.

### 6.2.1 Monitoring Adjustments

The monitoring protocols as required by this Plan may be adjusted if a loss of circulation or IR occurs. Within the notifications and corresponding reporting to applicable agencies, CRT will revise the Plan to document the corrective actions taken and describe enhanced monitoring.

### 6.2.2 Containment and Cleanup

Immediately following detection of an IR, the HDD contractor will contain the IR, using use straw bales, silt fences, sandbags, and earth berms to prevent fluid from migrating or flowing from the IR location. Containment will particularly focus on preventing flow toward any critical areas (as determined by CRT) such as but not limited to surface waters, environmentally sensitive areas, or areas outside the approved workspace. If the IR occurs within surface waters, the HDD contractor will use appropriate containment measures/equipment (turbidity curtains, silt fence, sandbags, etc.), approved by CRT to address the location, flow characteristics, and depth of water.

The HDD contractor will position hoses and pumps or a vacuum truck near the containment structure(s) to redirect the fluid that surfaced during the IR and any fluid continuing to migrate out of the hole to the returns pits and/or storage containers, such as vacuum trucks. Cleanup will commence after the release is contained. Cleanup will include removing all visible drilling fluids located in the accessible area. Removal methods will vary based on the volume of the release and site conditions. Removal equipment may include vacuum trucks, loader and track hoe buckets, small pumps, shovels, and buckets.

Containment and/or cleanup activities that require the installation of construction matting, placement of materials in the wetland or waterway, or access of construction vehicles outside the approved workspace require approval prior to implementation, except in an emergency where inaction would pose an imminent threat to human health, sensitive environment, or property. CRT will obtain landowner or agency permission prior to accessing locations outside of the approved workspace for fluids containment and cleanup operations. If the release occurs in an environmentally sensitive area where the containment and/or cleanup initiatives may cause additional damage, the HDD contractor and CRT will collaborate to determine the proposed method of removal and provide corresponding plans to applicable agencies/landowners for review and approval prior to implementation. Only approved measures may be implemented.

CRT will evaluate potential for secondary impacts from the cleanup activities. The following containment/cleanup measures are considered appropriate at this time:

- Shovels, buckets, and soft bristled brooms, used by hand, to minimize damage to existing vegetation;
- Turbidity curtains (if applicable);
- Small collection pumps to remove released fluids, as necessary; and

- Vacuum (vac)-trucks to collect and remove drilling fluids, as needed.

### 6.2.3 Response Close-out Procedures

After an IR has been contained and cleaned up, the HDD contractor will take the following actions:

- Recycle the recovered drilling fluid or haul it to an approved facility for disposal. The HDD contractor will provide CRT with documented proof of disposal. No recovered drilling fluids or materials will be discharged into streams, wetlands, storm drains, or any other environmentally sensitive areas.
- Remove any material coming into contact with drilling fluids to a depth where there are no visible signs of the drilling fluid material, and then contain and properly dispose of that material.
- Return all containment excavations and cleanup of high ground sites to pre-project contours using clean fill and appropriate seeding activities, as necessary. Cleanup procedures for areas within wetlands, streams, or other sensitive environmental areas will be on a site-specific basis in consultation with CRT and regulatory agencies, if appropriate.
- Maintain all containment measures (wattles, straw bales, silt fences, etc.) until the site is properly stabilized and such measure removal is authorized by CRT. Upon CRT approval, the HDD Contractor will remove all containment structures/devices and recovery equipment, tools, supplies, materials, wastes, and debris.

In addition to the HDD IR Incident Summary (see Appendix 2), the HDD contractor's site supervisor and CRT will record details of drilling fluid losses or IRs in their daily logs. The logs will include any notes or details regarding containment, characterization, cleanup, or stabilization activities not otherwise captured from the HDD IR incident form (attached in Appendix 2).

### 6.2.4 Construction Re-Start

CRT will be part of the re-start process in all cases. For small releases that do not reach surface waters, wetlands, or other environmentally sensitive areas, drilling may continue if the release is promptly contained and cleaned up, and the location of the IR is monitored regularly throughout the remainder of the HDD construction process.

For all other releases that are within environmentally sensitive areas or a threat to public safety, construction activities will not re-start without prior approval from CRT and appropriate agencies. IRs into environmentally sensitive areas will require at least one member of the HDD contractor's crew to remain at the IR location throughout the remainder of the HDD construction process. In addition, the HDD contractor will provide a plan to prevent fluid loss for the remainder of the project.

Unless the IR poses imminent danger to the environment or public safety, if the IR occurs during pullback, the installation may resume at CRT's discretion while appropriate and pre-approved containment/cleanup measures are executed in parallel with pullback operations.

## 6.3 Upland Inadvertent Returns

In all upland IR cases, HDD operations will temporarily cease while the IR is contained and the cause and nature of the IR evaluated. The HDD contractor and CRT will make proper notifications in

accordance with this Plan. The CRT HDD inspector, with the concurrence of the HDD contractor, will generate and submit the IR Incident Summary (Appendix 2) to the contacts identified in Table 1. Re-start will not occur until conditions meet those described in this Plan.

For IRs that occur within the permitted workspace that can be easily contained and redirected to a secondary workspace containment or returns pits, the HDD contractor will immediately isolate the area with silt fence, wattles, or similar measures to contain drilling fluid. Containment structures or pits will be located on high ground to keep drilling fluid from reaching environmentally sensitive areas and removal will begin by vac-truck, pumps, or hand tools. In areas that cannot be reached by a vac-truck for drilling fluid removal, a tiered system of contained areas and portable pumps will relay drilling fluid to a location accessible by a vac-truck for removal.

When upland IRs occur, the CRT HDD inspector or designee will collaborate with the HDD contractor to develop an IR Response Report (inclusive of the IR Incident Summary appended to this Plan) identifying the containment, cleanup, and reactionary measures for HDD construction activities and monitoring initiatives moving forward. CRT must review and approve the IR Response Report prior to re-starting drilling activities. Additional approvals may be required by regulatory agencies having jurisdiction.

## 6.4 Wetland and Surface Water Inadvertent Returns

The proposed HDD path crosses beneath X and wetlands adjacent to it from about station X to Y. Wetlands exist within Z feet of the proposed drill path approximately from station XX to YY. Additional wetlands occur above and adjacent to the proposed drill path on both sides of the feature for approximately ZZ feet, between stations XY and YX. If an IR does occur, the reactionary measures taken associated with IR events in wetlands or surface waters depend on the quantity of fluid released and the recurring nature of the IR. Because of site-specific variables such as distance from open water, surface hydrologic conditions, and vegetation cover, the selection of the most appropriate response methods will be made on a case-by-case basis. However, in the case of any IR in wetlands or surface waters, the CRT HDD inspector or designee will collaborate with the HDD contractor to develop an IR Response Report identifying the containment, cleanup, and reactionary measures for HDD construction activities and monitoring initiatives moving forward. The appropriate CRT representative will complete the IR Response Report, which will contain, at a minimum:

- The completed IR Incident Summary attached in Appendix 2.
- An overview of the HDD activities at the time of the IR event.
- The designated representative's assessment of the subsurface material present where the IR occurred.
- Depth and alignment (X, Y, Z location) of the downhole tool at time of the IR.
- As-built drill path overlaid on the designed and permitted drill path.
- Proposed mitigation measures to address the IR moving forward, including but not limited to:
    - Consideration of the use of alternative entry and/or exit points and angles,
    - Alternative depth profiles,
    - Reducing drilling fluid pressures,
    - Modifying drilling fluid composition and parameters,

  - Use of casing, or
  - Excavating pressure relief holes/pits.
- An analyses of the risk for continued IR(s) to occur.
- A list of notified parties.

CRT (and any applicable agencies) must review and approve the IR Response Report prior to re-start of drilling activities.

In preparation for drilling fluid reaching the surface in wetlands or surface waters, response materials will be staged within the approved workspace and where accessible near the sensitive areas. Deployment of materials and installation will only occur when an IR event is identified and CRT determines their use is appropriate. If an IR occurs, drilling fluid will be contained (if possible) and cleaned up as soon as possible. The CRT HDD inspector or designee will complete the IR Incident Summary and an IR Response Report identifying the containment, cleanup, and reactionary measures for HDD construction activities and monitoring. The IR response must address the following:

- The area directly affected by the released drilling fluids will be measured or estimated. The area affected may be estimated from a distance, if access to the affected area for measurement would result in additional impacts, or if the IR location is outside the approved workspace.
- The type of impact caused by the released drilling fluids (e.g., temporary, vegetation only, permanent, change in surface hydrology) will be characterized and documented. CRT will seek regulatory agency concurrence, if required.
- The HDD contractor and CRT HDD inspector or designee will collaborate to estimate and define the additional impacts to wetlands and/or surface waters likely to occur as a result of accessing the affected area for containment and removal of the drilling fluids. The anticipated additional impacts likely to occur if the drilling fluid were contained and cleaned per the approved plans versus a scenario where drilling operations are allowed to continue with some other mitigation strategy to reduce impacts (LCM, modifying drilling fluid parameters, etc.) in place should be compared.
- If it is determined that the released drilling fluid is to be contained and recovered, the HDD contractor will provide removal/cleanup plans for the contained drilling fluid to CRT (and applicable agency) for review and approval prior to implementation.
- All access to the wetlands will be done in such a manner as to cause the least impacts to the vegetation and surface hydrology, and only with prior agency approval (as required). Adequate quantities of personnel and equipment necessary to successfully accomplish the task safely and in a timely manner will be deployed.
- The HDD contractor will stage personnel to continuously monitor the IR location for timely observation and notification of changed conditions from what was initially evaluated.

In cases where the IR is within surface waters or wetlands, it may be impractical or impossible to contain and remove the release. Initially, the HDD contractor will attempt to remove the surface release using a wand (i.e., a perforated plastic pipe attached to a suction hose). The HDD contractor will provide proposed alternative methods and measures in these instances to CRT for review and

approval prior to implementation. CRT will coordinate with applicable agencies that may require additional approval.

If the decision is made and approved by applicable parties to forgo containment and proceed with HDD operations because a lesser impact is perceived to occur, CRT will provide personnel to continuously monitor the IR location throughout the duration of construction. The monitor(s) will observe operations, record volumes and characteristics of the IR, and periodically reevaluate the determination to continue until containment and removal are justified or the HDD is complete.

### 6.4.1 Known Surface Waters and Wetlands

As mentioned above, the HDD crossing alignment and associated drill path will pass beneath surface waters and delineated wetlands. During design, a site-specific HFIA will be performed and the results provided in an appendix. The HFIA results will provide estimated formation limit pressures, annular pressures and relative risk of hydraulic fracture and IR along the entire HDD alignment (including the areas noted to include environmental features) for the HDD contractor's review for reference and determination of mitigative/response strategies. The HDD contractor should enhance monitoring initiatives and actively compare field conditions encountered to those expected when downhole tooling is proximal to the environmental features. The HDD contractor will take the necessary steps to prepare the workspace for operations such that impacts are minimized and so that drilling fluids are contained within approved designated areas, preventing runoff or migration into waters near the crossing location. Reactionary measures that the HDD contractor should take are described above in relation to environmentally sensitive areas.

## 6.5 Hole Abandonment

Abandonment of a drill path will only be considered when all efforts to control the drilling fluid loss have failed or hole conditions have deteriorated to the extent that completing the HDD is infeasible. Any hole abandonment locations will be documented and shown on as-built documents.

The HDD contractor will take following steps during hole abandonment:

- Determine a new drill path for the HDD crossing (if feasible).
- Pump a thick grout plug into the hole to securely seal the abandoned hole.
- Remove all downhole equipment and tooling from the abandoned hole.

## 6.6 Communication during an HDD Project

Communication for routine aspects of an HDD will be between the HDD contractor's site supervisor and CRT assigned HDD inspector or designee. During IRs, additional CRT policies, permit requirements, or agreements into such dialogs for guidance and concurrence on IR response actions may be incorporated.

# 1

# Appendix 1: Example HDD Inadvertent Drilling Fluid Return Response Items

Containment, response, and cleanup equipment will be provided by the contractor(s) and readily available at the HDD site to assure a timely response to inadvertent releases. Equipment may include, but is not limited to:

- Shovels, push brooms, squeegees, trowels, pails, and/or other appropriate hand tools
- Straw bales, wattles and wooden stakes
- Silt fence, T-bar posts, post pounders
- Plastic sheeting or geotextile fabric
- Sediment/silt curtains, sandbags, absorbent booms, or pads
- Turbidity curtains
- Pumps with sufficient suction and lifting heads, control and check valves, and leak-free hoses
- Tanks for non-potable water and/or waste mixture storage
- Earth moving equipment (backhoes, dozers, skid-steers, as appropriate)
- Secondary containment for all on-site mobile equipment, fuel, lube, or other chemical storage containers
- Vacuum truck (or on 24-hour call)
- Safety data sheets for all pre-approved, on-site, materials
- This Inadvertent Returns Contingency Plan with appended Inadvertent Returns Incident Summary template

# 2

# Appendix 2: HDD Inadvertent Return Incident Summary

# HDD Inadvertent Return Incident Summary

| Project Name/ Number/Location: | | Date: | |
|---|---|---|---|
| | | Data Collected By: | |

| General Information Required | Collected Information |
|---|---|
| 1. Person(s) reporting incident with contact information | |
| 2. Release date and time | |
| 3. Responsible parties / Contractor(s) involved | |
| 4. Location (county and coordinates) / Address / Station Number | |
| 5. Environmental impact (Wetland, Stream, etc.) | |
| 6. Estimated release volume (gallons) and surface impact area | |
| 7. Contingency Plan implemented? (Yes/No) If yes, attach plan. | |
| 8. Photo documentation (provide pre-cleanup photos of IR, upgradient and downgradient view, impact areas). | |
| 9. Contained to permitted workspace or ROW? (Yes/No) | |
| 10. Accessibility requirements (4x4, equipment or worker access mats, hose length, etc.). | |
| 11. Proposed method of drilling fluid/waste recovery. | |
| 12. Proposed waste material storage or disposal plan. | |
| 13. Proposed disposal site for waste material. | |
| 14. Planned/intended final hole diameter and crossing's carrier pipe diameter for installation. | |
| 15. Phase of HDD operation in process at time of inadvertent release. | |
| 16. General description of subsurface materials identified for the tool's downhole location at time of release event. | |
| 17. Diameter and type of downhole tool at time of release (i.e. – pilot hole bit diameter, reamer diameter, type of bit or reamer, etc.). | |
| 18. Diameter of drill pipe used, and specifically the tube and tool joint diameter(s). | |
| 19. Distance downhole from identified end of crossing (i.e. – entry or exit) where drilling fluid returns were surfacing just prior to release event occurring. | |
| 20. Distance from Environmentally Sensitive Area | |

| HDD Inadvertent Return Incident Summary | | | |
|---|---|---|---|
| **Project Name/ Number/Location:** | | **Date:** | |
| | | **Data Collected By:** | |
| 21. X, Y, Z location of release, with correlating delta between entry/exit elevations, ground surface elevation at release point, and the as-drilled profile depth at the release point. | | | |
| 22. Any/all casings installed and distance downhole for each. | | | |
| 23. Drilling fluid materials (i.e. – bentonite, additives, etc.) used, leading up to and at the time of the release event. Include SDS sheets of materials in use. | | | |
| 24. Drilling fluid properties (i.e. – drilling fluid density, viscosity, sand content, rheology, fluid loss, pH of make-up water, etc.) leading up to and at the time of release. | | | |
| 25. Penetration rates and drilling fluid pump volumes, leading up to and at the time of the release event. | | | |
| 26. Downhole annular pressures, leading up to and at the time of the release event. | | | |
| 27. Any Lost Circulation Materials (LCMs) introduced to the drilling fluid program once the release event occurred. | | | |
| 28. Any other mitigation measures taken to prevent or contingency plans implemented once the release event occurred. | | | |
| 29. All steps taken to regain circulation after the release event occurred. | | | |
| **Additional Comments:** | | | |