

ENVIRONMENTAL PROTECTION PLAN FOR THE PROPOSED 2017 NGTL SYSTEM EXPANSION KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION

September 2016

Prepared for:

Prepared by:



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Revision Log: September 2016 Version:

Section	Page	Edit	Rationale
All	All	Updated date	Reflects current submission date
		Updated AEP acronym	Update provincial regulatory name to Alberta Environment and Parks (AEP)
Title Page		Removed redundant company identifier in title	Improve readability; lower text already reads "NOVA Gas Transmission Ltd. a wholly owned subsidiary of TransCanada"
1.0 Introduction	1, para 3	Removed "Revisions to the EPP may occur as a result of"	Improve readability
3.2 Environmental Setting	4, para 3	Updated wetland data	Updated wetlands crossings and classifications
	4, para 4	Updated aquatics data	Updated aquatics information relating to non fish-bearing drainages
	4, para 6	Updated wildlife data	Updated length Project crosses Key Wildlife Biodiversity Zone
3.4 Extent and Limits of the EPP	5, para 4	Revised text	Reiterates Company's commitment to minimizing Project effects on environment; explains need for flexibility through use of indefinite terms
Figure 1 Regional Location of the Project	6	Revised map	Updated: current date
4.0 Environmental Compliance	10	Measures 6-9: Added "Issue Resolution and Escalation" section	Additional information on change management/issue resolution procedures
6.0 Construction Preparation	12	Measure 8: Revised title of reference document	Updated Hydrovac Slurry Handling Management Plan; included in Appendix 1F
7.1 Resource Specific Protection Measures	15	Measure 30: Added "Contingency"	corrected omitted portion of document title
7.1 Resource Specific Protection Measures	16 to 18	Table 1: Updated metrics and mitigation measures	Feature list and KPs/UTMs have been updated to reflect minor routing changes
	17, Key Wildlife and Biodiversity Zone, bullet 1	Minor update	Changed "will prepare" to "has prepared" to reflects submission of Key Wildlife and Biodiversity Zone Protection Plan
8.3 Topsoil/Strippings Salvage and Grading	23	Measure 3: Updated reference to typical drawings	Reflects current drawing list
8.4 Watercourse Crossings	26	Measure 16: Updated reference to typical drawings	Added drawing reference "STDS-03-ML-05-137"
	26	Measure 20: Updated reference to typical drawings	Added drawing reference "STDS-03-ML-15-103"
	28	Measure 41: Updated reference to typical drawings	Added drawing reference "STDS-03-ML-05-105"
	30	Measure 65 Updated reference to typical drawings	Added drawing reference "STDS-03-ML-05-603"
8.4 Watercourse Crossings	31 and 32	Table 2: Updated	Revised content for Site No. CR-WC-7

Section	Page	Edit	Rationale
8.8 Clean-up and Reclamation	39	Measure 18: Updated reference to typical drawings	Added reference "Appendix 1D" and Drawing Reference STDS-03-ML-12-222
9.0 Post-Construction Monitoring	41, para 5 (original)	Deleted text	Improve readability, remove redundant text
	41, para 5 (revised)	Updated	Modified monitoring term to five years in keeping with the PCM term as per Condition 36
10.0 References	42 to 43	Updated internet document access dates	Includes Committee on the Status of Endangered Wildlife in Canada (2013), Environment Canada (2013), and Fisheries and Wildlife Management Information System (2014) references
Appendix 1A	1A-1	Updated contact information	Updated current Provincial representative information
Appendix 1B Contacts	1B-1 to 1B-2	Updated contact names	Updated points of contact and agency titles as appropriate
Appendix 1D Typical Drawings	1D-2	Updated drawing numbers and names	Reflects current drawing list
Appendix 1E Contingency Plans	1E-3, para 3	Updated Appendix reference	Corrected appendix numbering error.
	1E-14	Section 7, Measure 4: Added content.	Clarifies acceptable bentonite drilling mud systems
Appendix 1F Management Plans	1F-2, 1F-3	Updated TOC	
	1F-13 to 1F-15	Revised Section 3	Added Hydrovac Slurry Handling Management Plan and replaced Hydrovac Cuttings Handling Plan
	1F-20 to 1F-28	Added Section 5	Added "Breeding Bird and Nest Management Plan"
	1F-29 to 1F-35	Added Section 6	Added "Access Management Plan"

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1.0 INTRODUCTION

This Environmental Protection Plan (EPP) outlines environmental protection measures to avoid or reduce potential effects during construction of the Kettle River Lateral Loop Christina River Section (the Project), proposed by NOVA Gas Transmission Ltd. (NGTL) (the Company), a wholly owned subsidiary of TransCanada PipeLines Limited (TransCanada), as part of the 2017 NGTL System Expansion. The proposed approximately 20 km long, 609.6 mm outside diameter (O.D.) (NPS 24) pipeline is located approximately 107 km southeast of Fort McMurray, Alberta (AB). The Project will transport natural gas from the Leismer-Kettle Crossover located at NW 26-80-6 W4M to the existing Graham Lateral Loop 2 Junction located at NW 14-79-5 W4M and will have a maximum operating pressure of 9,930 kPa. Design, construction and operation of the pipeline will be in compliance with all applicable codes, standards and regulations.

The EPP is written in construction specification format and should be read in conjunction with the Environmental Alignment Sheets. This EPP provides Project-related environmental mitigation measures and commitments to be addressed during the detailed engineering design, construction and post-construction reclamation phases.

The EPP is based on:

- TransCanada Health, Safety and Environment (HSE) Commitment;
- TransCanada's HSE Management System;
- feedback obtained through consultation and engagement;
- results of the biophysical field programs;
- commitments made in the Environmental and Socio-economic Assessment (ESA);
- professional experience;
- results of the supplemental studies;
- commitments made during the regulatory review process including information requests (IRs);
- National Energy Board (NEB) Certificate Conditions; and
- engagement programs with aboriginal communities and other stakeholders.

Pending necessary regulatory approvals, delivery and stockpiling of materials is expected to begin in advance of construction and work on temporary infrastructure is expected to begin in Q3 2016. Construction of the proposed pipeline and associated infrastructure is anticipated to commence in Q4 2016 with scheduled in-service beginning April 1, 2017.

2.0 PURPOSE

The purpose of the EPP is to describe the environmental mitigation measures and commitments to be carried out by the Company, their Contractor and subcontractors during construction and post-construction phases of the Project to avoid or reduce potential effects. The EPP includes both general and site-specific environmental protection measures which have been developed based on past project experience, current industry best management practices, and input from stakeholders and regulators during public consultation where they are applicable to the Project activities.

Specifically, the EPP:

- outlines environmental protection measures related to Project activities;
- provides instructions for carrying out construction activities to reduce negative environmental effects; and
- serves as reference information to the construction staff and personnel to support decision making and provide links to more detailed information.

Following completion of construction, this EPP will be used as a guide during Project operation.

3.0 ENVIRONMENTAL PROTECTION PLAN ORGANIZATION

This section provides an overview of the organization and scope of the EPP.

3.1 Organization

The EPP addresses the environmental mitigation and reclamation of the Project. A large portion of environmental protection measures are standard across all TransCanada projects that are conducted in forested areas. Additional Project specific measures are identified in Section 7.0 of the EPP.

The EPP applies to all Project areas including the pipeline right-of-way, temporary workspace, temporary access roads and shoo-flies, staging areas, facility sites, construction yards and pipe storage areas.

Environmental protection measures are identified under the headings below in accordance with the progression of construction activities, and are intended to be read in conjunction with the Environmental Alignment Sheets. The Environmental Alignment Sheets identify specific locations where mitigation measures will be applied.

The EPP is intended to provide the Company and their Contractor(s) and subcontractors' personnel with an understanding of the general environmental setting of the Project, extent and limitations of the EPP, specific or unique mitigation measures of the Project, general mitigation measures or best management practices that are typically applied to a pipeline project, and generally reflect the sequences of construction of a pipeline project.

Sections 1-3 outline the purpose and organization of the EPP, and place the EPP in context with respect to geographic location, and where information can be found in the EPP.

Section 4 "Environmental Compliance", provides information about the tools and processes to facilitate compliance with all the regulatory approvals, permits, commitments and the specific requirements of the EPP.

Section 5 "Notification of Concerned Parties" provides details on specific activities to be followed so that relevant stakeholders are properly notified of Project activities before the commencement of construction.

Section 6 "Construction Preparation", outlines activities to clearly delineate the boundaries of approved work areas and to ensure environmentally sensitive features are properly identified before any ground disturbance occurs. Proper identification avoids potential effects to resource features and ensures that the Company and its Contractor are aware of the limits of the approved work areas.

Section 7 "Project Specific Protection Measures", outlines procedures to be undertaken to protect environmental and cultural features that were identified pursuant to the environmental assessment or that are unique to the Project. Information in Section 7 is documented and displayed on the Environmental Alignment Sheets.

Section 8 "Pipeline Construction" outlines the environmental protection measures associated with general pipeline construction, strippings salvage and grading, water crossings, pipe installation activities, backfill, pressure testing, and clean-up and reclamation activities that will be executed. These measures are applicable to the construction of the pipeline, access roads, and other Project-related facilities.

Section 9 "Post-Construction Monitoring" outlines activities to take place once construction and post-construction reclamation activities have been completed to evaluate the success of reclamation activities, compliance with commitments, and the stability of the disturbed lands.

Appendices to the EPP include drawings, Project contacts, contingency plans and management plans to support the specific mitigation measures identified in the EPP and provide guidance to decision making processes should conditions arise that require implementation of contingency measures.

3.2 Environmental Setting

The Project is located entirely within the Green Area of Alberta and traverses Crown-owned lands administered by Alberta Environment and Parks (AEP). The Project is located within the Fort McMurray County and crosses the Regional Municipality of Wood Buffalo (Figure 1). The Project will transport natural gas from the Leismer-Kettle Crossover located at NW 26-80-6 W4M to the Graham Lateral Loop 2 Junction located at NW 14-79-5 W4M and will have a maximum operating pressure of 9,930 kPa. The Project is located approximately 107 km southeast of Fort McMurray, AB.

The Project traverses approximately 2.8 km of provincially identified Environmentally Significant Areas (approximately 14.3% of the length of the route) (Fiera 2014b). Areas that contain focal species, species groups or their habitats and areas with rare, unique, or focal habitat are two of the four criteria considered in the assessment of Environmentally Significant Areas (Fiera 2014a). The proposed pipeline route crosses forest land, wetlands (marsh), anthropogenic development (e.g., roads) and industrial disturbances (e.g., cut blocks, existing facilities and rights-of-way). Detailed land use locations can be found on the accompanying Environmental Alignment Sheets.

The Project encounters 13 wetlands comprising approximately 7.5 km (37.4%) of the proposed pipeline route. Wetland types crossed by the pipeline route, classified according to the Canadian Wetland Classification System (National Wetland Working Group 1997) included 3 treed fens, 1 shrubby fen, 1 non-woody fen, 1 treed swamp, 1 mixedwood treed swamp, 1 needle-leaf treed swamp, 3 shrubby swamps, and 2 seasonal marshes.

Seven watercourse crossings are crossed by the proposed Project; all seven watercourses crossed by the Christina Lake Section are unmapped or mapped Class C watercourse with a restricted activity period of April 16 to July 15. The fish communities near the Project are mixed assemblages containing both coolwater (e.g., esocids and percids) and coldwater (e.g., salmonids) species. The fish species that may occur within the Fish and Fish Habitat RSA (Regional Study Area) are primarily spring or summer spawners, although one winter spawner occurs (i.e., burbot). There are no fish species listed with COSEWIC (i.e., Endangered, Threatened or Special Concern) or under SARA that are known to be found within the Fish and Fish Habitat RSA of the Project. Arctic grayling have been previously documented in the Christina River approximately 0.5 km downstream of CR-WC5. Although not currently listed by COSEWIC, Arctic grayling is on the high-priority candidate list for a detailed assessment (COSEWIC 2014). In addition, Alberta's Endangered Species Conservation Committee (ESCC) has identified Arctic grayling as a Species of Special Concern (AESRD 2014). The provincial status of pearl dace and finescale dace is Undetermined (ASRD 2012). All other fish species within the Project have a Secure provincial listing. Sampling for fish presence was not completed at all watercourses since sites were dry or lacked water at the time of assessment or fish were previously documented (FWIMT 2014, FWMIS 2014). No fish species were captured or observed at the watercourse crossings where fish sampling occurred.

An ACIMS-listed vegetation species, cat-tongue liverwort, was observed during the 2015 supplemental vegetation survey along the Christina River Section. Cat-tongue liverwort has been observed on numerous projects with a wide distribution in Alberta, has been seen to recolonize disturbance and is no longer considered to warrant mitigation (Appendix D of the Second Year (Final) Post-Construction Monitoring Program Report for the NGTL Kearl Extension Pipeline Project [NEB Filing ID A3T2U7]). Perennial sow-thistle density was low during the vegetation survey. A few individuals were observed in a cutblock located at SE 23-80-6 W4M.

The proposed Project crosses a Key Wildlife and Biodiversity Zone (KWBZ) associated within the Christina River for approximately 2.8 km from NE 35-79-6 W4M to NE 25-79-6 W4M. This KWBZ has a timing restriction of January 15 to April 30 (Government of Alberta 2013). Evidence of ungulate use (i.e., game trails, bedding sites) was observed along the Project during ground work conducted from September 22 to 24, 2014. One unoccupied stick nest was observed within an isolated, mature trembling aspen located at SW 24-80-6 W4M (approximately 240 m east of KP 3.2).

The Project is not located within or adjacent to any Parks or Protected Areas (APTR 2013), Migratory Bird Sanctuaries (Environment Canada 2013), Western Hemisphere Shorebird Reserves (Western Hemisphere

Shorebird Reserve Network 2013), Important Bird Areas (Bird Studies Canada and Nature Canada 2012) or Ramsar wetlands (The Ramsar Convention Secretariat 2014) crossed by the Project.

Pending necessary regulatory approvals, delivery and stockpiling of materials is expected to begin in advance of construction and work on temporary infrastructure is expected to begin in Q3 2016. Construction of the proposed pipeline and associated infrastructure is anticipated to commence in Q4 2016 with scheduled in-service beginning April 1, 2017.

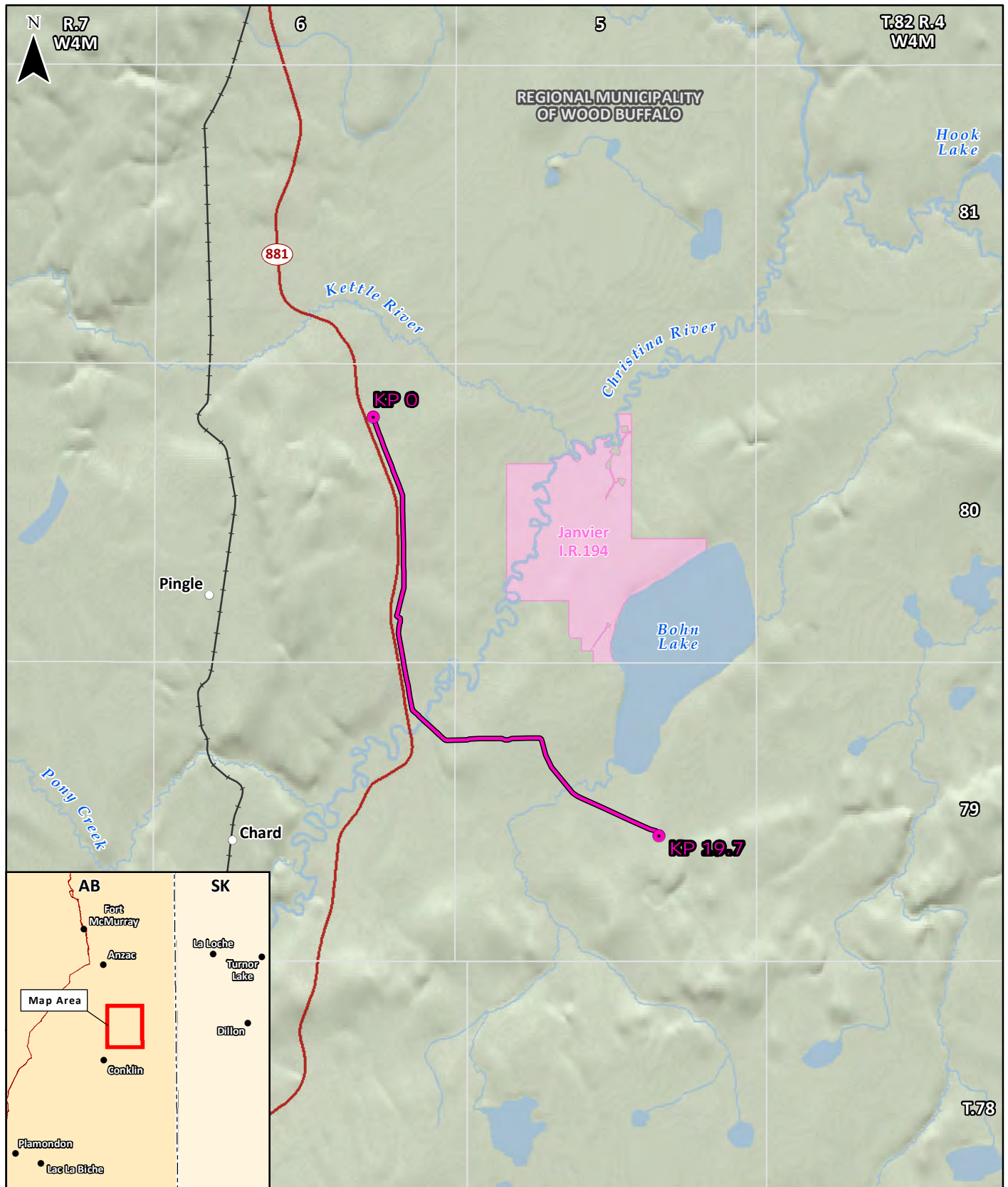
3.3 Non-routine Mitigation

Non-routine mitigation measures have been developed for areas which require special attention regarding the protection of environmental resources. All non-routine measures are identified on the Environmental Alignment Sheets and in Section 7.0 of the EPP.

3.4 Extent and Limits of the EPP

Contents of the EPP apply to construction and post-construction reclamation activities occurring under non-frozen and frozen ground conditions. There may be a need to revise or refine specific measures as a result of on-going consultation or to address unforeseen site-specific conditions that may arise during construction. If this were to occur, the Company will resolve the issue with the Project Manager, the Construction Manager, the Environmental Inspector and the Environmental Advisor in consultation with the responsible regulators, as required.

The Company confirms its commitment to take responsibility for potential environmental effects of the Project through informed environmental planning, assessment, mitigation and reclamation. Indefinite terms may be included in some environmental protection measures in order to provide the Company with the flexibility needed during construction and reclamation phases to accommodate unique circumstances where general environmental protection measures must be refined of site-specific environmental protection measures applied as part of the adaptive management process.



- | | |
|--|------------------|
| ○ Populated Place | —+—+— Railway |
| ● Kilometre Post (KP) | — Watercourse |
| — Proposed Kettle River Lateral Loop Christina River Section | ■ Waterbody |
| —881— Highway | ■ Indian Reserve |

FIGURE 1
REGIONAL LOCATION
ENVIRONMENTAL PROTECTION PLAN
FOR THE PROPOSED
2017 NGTL SYSTEM EXPANSION
KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION

4.0 ENVIRONMENTAL COMPLIANCE

Introduction

Environmental compliance is facilitated through sharing of information, providing orientations/training, hiring qualified staff, and providing on-site inspection of activities through a pro-active and adaptive inspection program.

Objective

The objective of these mitigation measures is to ensure that:

- the Company, its authorized representative, Contractor(s) and subcontractors are aware of relevant environmental regulatory requirements;
- processes are in place that allow the Company, its authorized representatives, Contractor(s) and subcontractors to access Project environmental information to aid in decision making at the field level; and
- Environmental Inspectors hired for the Project are qualified and properly trained.

Specific Measures

Activity	Preparation Measures
<i>Approvals and Licenses</i>	1. Obtain all necessary licenses and approvals before the commencement of construction. The Company, its authorized representatives, Contractor(s), and subcontractors, will comply with all conditions as presented to the Company on permits, approvals, licenses, certificates and Project-specific management plans. Resolve any inconsistencies between permit conditions and contract documents as they arise.
<i>Information Sharing</i>	2. The Environmental Inspector(s) and the Environmental Advisor will facilitate the transfer of environmental information and information updates to all Company field staff and the Contractor in a timely manner. 3. Keep a complete set of Environmental Alignment Sheets and documents at each construction field office.
<i>EPP and Distribution</i>	4. Provide controlled copies of the EPP and associated environmental documents to all key Project construction and Contractor staff members during construction. 5. The EPP serves as the construction guide for environmental issues and commitments and includes all pertinent environmental information from the ESA.
<i>Environmental Alignment Sheets</i>	6. The Environmental Alignment Sheets provide information regarding environmental requirements and serve as detail to the Construction Alignment Sheets.
<i>ESA Reports and Pre-construction Surveys</i>	7. Provide all Contractor and Project inspection staff with relevant results of pre-construction surveys to identify known locations of environmentally sensitive features. Indicate specific mitigation for these sites on the Environmental Alignment Sheets and/or corresponding tables, with reference to specific environmental information. Identify sites with suitable markers and/or record GPS locations for any post-construction monitoring (PCM) requirements.

Activity	Preparation Measures
<i>Industry Guidelines and Regulations</i>	<p>8. Regulations, Industry Guidelines, and Codes of Practice (COPs) have been considered in the creation of the EPP. This includes but is not limited to:</p> <ul style="list-style-type: none"> • <i>National Energy Board Act</i>, regulations, and guidelines; • <i>Navigation Protection Act</i>; • <i>Fisheries Act</i>, regulations, and guidelines; • Fisheries and Oceans Canada (DFO) <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i> (DFO 2013); • Pipeline Associated Watercourse Crossings, 4th Edition; • CSA Standard Z662; • <i>Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body</i>; • <i>Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines</i>; • <i>Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines</i>; • Code of Practice for Watercourse Crossings; • <i>Alberta Forests Act</i> Timber Management Regulation; • <i>Alberta Forest and Prairie Protection Act</i>; and • <i>Integrated Standards and Guidelines</i> (December 2013) for the Enhanced Approval Process (EAP).
<i>Environmental Inspector's Qualifications</i>	<p>9. The Environmental Inspector(s) hired for the Project is required to have experience in environmental inspection and/or planning. The Environmental Inspector(s) will have an understanding of pipeline construction techniques and take a preventative approach to environmental issues. In addition, the Environmental Inspector(s) will be supported by appropriate Resource Specialists who have expertise in the particular issues associated with the Project and who will be available on-site or consulted, as required.</p>
<i>Environmental Inspection Responsibilities</i>	<p>10. The Environmental Inspector's main responsibility is to ensure that all environmental commitments, undertakings and conditions of authorizations are met and that work is completed in compliance with applicable environmental regulations and Company policies, procedures and specifications in the most efficient and effective way possible.</p> <p>11. Other responsibilities of the Environmental Inspector(s) include:</p> <ul style="list-style-type: none"> • providing expert advice and guidance on major decisions or courses of action to deal with major environmental conditions; • reporting any spills in accordance with federal and/or provincial regulations and advising Company management on the clean-up and disposal of the material and any affected soils or vegetation; • monitoring delivery of environmental orientation presentations to the Company, regulatory, and Contractor staff, as directed by the Construction Manager and the Environmental Advisor; • preparing daily reports; • preparing, collecting, organizing, and disseminating all environmentally-related information and documentation that arises during construction;

Activity	Preparation Measures
<i>Environmental Inspection Responsibilities (cont'd)</i>	<ul style="list-style-type: none"> liaising with appropriate government agencies; supervising the environmental Resource Specialists that may be required to support the Project; organizing on-site meetings as requested by the Construction Manager as the need arises, to address site-specific issues; reviewing construction methodologies with the Project team; and collecting environmental information throughout construction for documentation and project reporting.
<i>Project Training and Orientation</i>	<ol style="list-style-type: none"> Develop and implement an environmental orientation program to ensure that all personnel working on the construction of the Project are informed of the environmental requirements and sensitivities. Hire the Environmental Inspector(s) before the commencement of construction with sufficient lead time to enable training and participation in the orientation of other construction staff, as well as sufficient on site time to facilitate review of environmentally sensitive aspects of the project. The Environmental Inspector(s) will be briefed by the Environmental Advisor on the environmentally sensitive aspects of the project, and the environmental processes and agreements that have taken place to date. The Environmental Inspector(s) will review all Project-related information. The Environmental Inspector(s) will ensure an environmental orientation program is presented to all Construction Activity Inspection Staff and Contractor staff.
<i>Non-Compliances and Resolution</i>	<ol style="list-style-type: none"> The Environmental Inspector(s) will be notified by the responsible person on-site when non-compliance is identified and it will be his/her responsibility to contact the Construction Manager. If the Construction Manager is not available during a non-compliance situation, the Environmental Inspector(s) has the authority to modify work procedures or initiate work stoppage. The Construction Manager will make a determination to either modify the work practice or shut the activity down until corrective actions are determined and implemented. The Environmental Inspector(s) will assist in this decision making process. If the work is shut-down, it will resume only when corrective actions have been developed and approved by the Company. Once approved by the Company, the Contractor will inform the work crew and work will proceed following the corrective action plan. The Environmental Inspector(s) are responsible for documenting all procedure modifications and environmental non-compliances.

Change Management

During the course of construction, it may be necessary to modify or create new procedures to address site conditions not anticipated in the EPP. This procedure outlines the process to be followed.

Activity	Preparation Measures
<i>Modifications</i>	<ol style="list-style-type: none"> 1. Contact the Environmental Inspector(s) if site conditions warrant a change in procedure that has environmental implications. 2. Develop the modification to the procedure in co-operation with the Construction Manager, Environmental Inspector(s), and the Company's Project Management Team. 3. The modification to the procedure will include the following: <ul style="list-style-type: none"> • description of the modification; • location; • rationale for change; • environmental criteria reviewed as part of modification request; • consideration of environmental objectives; • equivalent or approved standard of mitigation; • additional environmental protection measures required; • site sketch or photo documentation; and • sign-off by the Construction Manager, Environmental Inspector(s), Environmental Advisor and/or Project Manager. 4. Discuss changes to an existing procedure with the appropriate regulatory agencies, as necessary, and seek the appropriate authorization should the revised procedures require further regulatory approval. If the modification meets the environmental objectives, and there is no specific regulatory approval required for the change, no additional discussions with regulatory agencies are necessary. 5. Document the resolution and/or revision and communicate it to the appropriate parties.
<i>Issue Resolution and Escalation</i>	<ol style="list-style-type: none"> 6. Environmental issues or inquiries will be reviewed and resolved by the Environmental Inspector following consultation with construction personnel, and when additional expertise is required, the Environmental Resource Specialist (soils specialist, wildlife biologist, archaeologist, etc.). 7. Environmental issues or inquiries that arise that require escalation for resolution. The Environmental Inspector will review the issue and consult with the Construction Manager or designate to consider potential options and impacts to other aspects of the Project prior to making a decision. 8. Should complex issues arise that cannot be resolved at the field level the Construction Manager and Environmental Inspector will consult with the Project Manager and the Environmental Advisor or designate to fully consider the potential options and impacts to other aspects of the Project prior to making a decision. 9. Project commitments related to environmental compliance will not be compromised as a result of the issue resolution. Final decision making authority and accountability remains with the Project Manager.

5.0 NOTIFICATION OF CONCERNED PARTIES

Introduction

Notification of the construction schedule and timing of specific construction activities will facilitate awareness of upcoming activities, and allow regulatory agencies and other stakeholders to plan as appropriate for construction activities in their area.

Objective

The objective of these mitigation measures is to ensure:

- interruptions to other land use activities are reduced during construction of the Project;
- affected stakeholders are aware of Project activities; and
- communication is maintained with relevant regulatory agencies throughout construction.

Specific Measures

Contacts	Measures
<i>Federal, Provincial and Municipal Agencies</i>	1. Inform all appropriate federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted.
<i>Aboriginal communities</i>	2. Provide Aboriginal communities with the proposed construction schedule and pipeline route maps.
<i>Trappers</i>	3. Notify registered trappers at least two weeks prior to construction.

6.0 CONSTRUCTION PREPARATION

Introduction

The following measures will be implemented by the Contractor and subcontractor(s) before the initiation of ground disturbance activities.

Objective

The objective of these mitigation measures is to ensure:

- all resources are properly identified and marked in the field before the initiation of ground disturbance to avoid or reduce potential Project effects;
- right-of-way is properly delineated to prevent inadvertent trespass; and
- all access to and from the work sites are properly marked to maintain safety and environmental compliance.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Staking</i>	<ol style="list-style-type: none"> 1. To prevent inadvertent trespass, stake the right-of-way, staging areas and temporary workspace to clearly delineate all boundaries. 2. Mark and locate all foreign lines and cables using One-Call services before the start of construction to ensure the safety of the workers and public.
<i>Environmental Resource Delineation</i>	<ol style="list-style-type: none"> 3. Clearly mark all sensitive resources identified on the Environmental Alignment Sheets and environmental tables (Tables 1 and 2) within the immediate vicinity of the right-of-way before the start of clearing. Following clearing, marking will be installed to delineate the sensitive resources. 4. Supplement marking with signage after clearing. 5. The Environmental Inspector(s) will confirm the accuracy of all environmentally sensitive resource locations and will ensure marking is maintained during construction. 6. The Environmental Inspector(s) will identify and notify the Contractor of the appropriate locations for wildlife gaps.
<i>Access Delineation</i>	<ol style="list-style-type: none"> 7. Clearly delineate areas that have access restrictions. Restrict access to essential construction personnel only. Direct all other personnel to the right-of-way via alternate access routes.
<i>Hot Line Exposure/Hydrovac</i>	<ol style="list-style-type: none"> 8. Empty the hydrovac truck at approved locations. Ensure that hydrovac material is contained within the designated release area. Refer to the Hydrovac Slurry Handling Management Plan (Appendix 1F).
<i>Grade Plan</i>	<ol style="list-style-type: none"> 9. The Contractor shall provide a preliminary right-of-way grade plan prior to the commencement of construction. The grade plan will be reviewed by the Environmental Inspector(s). 10. Before the start of construction, the Environmental Inspector(s) shall review the Contractor's preliminary grade plan to ensure environmental resources are not compromised as a result of grading. 11. Obtain approval for additional temporary workspace required for storage of grade or ditch spoil during construction from the Environmental Inspector(s) and Construction Manager before disturbance.

7.0 PROJECT SPECIFIC PROTECTION MEASURES

7.1 Resource-Specific Protection Measures

Introduction

This section of the EPP describes the specific mitigation measures that will be used on the Project to protect sensitive environmental features as identified in the ESA. Specific resource protection measures are marked on the Environmental Alignment Sheets and entered in the Resource-Specific Mitigation Table (Table 1). Watercourse crossing requirements are provided in Table 2 and in Section 8.4 of the EPP, and are indicated on the Environmental Alignment Sheets.

Objective

The objective of these mitigation measures is to:

- ensure the identification and protection of biophysical and cultural resources identified in the ESA; and
- Where avoidance of wetlands is not technically or economically feasible, to implement construction and reclamation mitigation measures to minimize disturbance to wetlands and to allow affected wetlands to return to full functionality following temporary disturbances.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Signage</i>	1. Post signs to clearly identify sensitive environmental features to ensure they are protected. See the Environmental Alignment Sheets as well as Table 1 and Table 2 for a listing of sensitive environmental features located along the pipeline right-of-way.
<i>Hydrology</i>	2. If springs and ground water are encountered, the Company will review the area and determine the appropriate mitigation. 3. Leave gaps in windrows, at obvious drainages, on sidehill terrain and wherever seepage occurs to reduce interference with natural drainage patterns.
<i>Wildlife</i>	4. Discuss wildlife issues that are identified during construction as necessary between the Environmental Inspector(s), Wildlife Resource Specialists and the appropriate regulatory agencies. 5. If wildlife is discovered in the trench, or in association with any other activity or facility, report to the Environmental Inspector(s) who will contact the applicable regulatory agencies, as required. 6. In the event that clearing or construction activities occur within the migratory birds nesting period (May 1 to August 10), the Environmental Inspector(s) will engage Wildlife Resource Specialists who will use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of territorial males, alarm calls, distraction displays, adults carrying nesting material/food). In the even that an active nest is found, it will be subject to site-specific mitigation measures (e.g., clearly marked species-specific buffer around the nest or non-intrusive monitoring). 7. Project personnel are not permitted to hunt or fish on the work site.

Activity/Concern	Mitigation Measures
<i>Wildlife</i> (cont'd)	<p>8. Do not harass or feed wildlife. Do not permit construction personnel to have dogs on the right-of-way. Firearms are not permitted in project vehicles, on the right-of-way or at associated Project facilities. In addition, prohibit the recreational use of all-terrain vehicles (ATVs) or snowmobiles by construction personnel on the right-of-way. Report any incidents with wildlife or collisions with wildlife to provincial regulators and the local police detachment, if applicable.</p> <p>9. Leave gaps in windrows (<i>i.e.</i>, grubbing piles, strippings, grade spoil, rollback, strung pipe) at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s). Gaps should align.</p>
<i>Listed or Sensitive Species</i>	<p>10. If listed or sensitive species are identified during construction of the Project, implement the Wildlife Species of Concern Discovery Contingency Plan (Appendix 1E).</p> <p>11. Report sightings of sensitive or species at risk to the Environmental Inspector(s). Specific protection measures may be implemented and the sighting will be recorded.</p>
<i>Rare Plants / Rare Ecological Communities</i>	<p>12. If previously unidentified rare plants or rare ecological communities are found on the right-of-way prior to construction, implement the Plant Species and Ecological Communities of Concern Discovery Contingency Plan (Appendix 1E).</p> <p>13. Clearly mark identified rare plant locations before the start of right-of-way preparation and construction.</p> <p>14. Review mitigation for rare plants/rare ecological communities with Contractor personnel in advance of construction to ensure there is full understanding of the procedures involved.</p>
<i>Use of Herbicides</i>	<p>15. Restrict the general application of herbicide near rare plants or rare ecological communities. Spot spraying, wicking, mowing, or hand-picking are acceptable measures for weed control in these areas.</p> <p>16. Prohibit the use of herbicides within 30 m of an open body of water, unless the herbicide application is conducted by ground application equipment, or otherwise approved by the relevant regulatory agency.</p>
<i>Weeds</i>	<p>17. All equipment must arrive at the Project site clean and free of soil or vegetative debris. Equipment will be inspected by the Environmental Inspector(s), or designate, and if deemed to be in appropriate condition will be identified with a suitable marker or tag. Any equipment which arrives in a dirty condition shall not be allowed on the right-of-way until it has been cleaned.</p> <p>18. During nonfrozen conditions, post signs at areas identified as having Noxious weed infestations prior to start of construction.</p> <p>19. During nonfrozen conditions, conduct shovel and sweep or compressed air cleaning before moving equipment from any locations identified as having a Noxious weed infestation.</p> <p>20. Additional mitigation to reduce weed growth and spread may be warranted if grade/strippings replacement is delayed due to construction scheduling.</p>
<i>Wetlands</i>	<p>21. In Alberta, construct the shallow open water wetland crossings as per Code of Practice notifications.</p> <p>22. Reduce the removal of vegetation in wetlands to the extent possible.</p>

Activity/Concern	Mitigation Measures
<i>Wetlands (cont'd)</i>	<p>23. Conduct ground level cutting/mowing/mulching of wetland vegetation instead of grubbing. The method of removal of wetland vegetation is subject to approval by the Company.</p> <p>24. Direct grading away from wetlands.</p> <p>25. Reduce grading within wetland boundaries. Do not use temporary workspace within the boundaries of wetlands, unless required for site-specific purposes. Temporary workspace within the boundary of a wetland must be approved by the Environmental Inspector(s).</p> <p>26. Prevent ground disturbance by using a protective layer such as frost packing, snow, ice or matting, or biodegradable geotextile and clay ramps between wetland root/seed bed and construction equipment.</p> <p>27. Replace trench material as soon as possible, and re-establish pre-construction contours within wetland boundary to ensure cross right-of-way drainage.</p> <p>28. Install berms, cross ditches and/or silt fences between wetlands (non-peat) and disturbed areas when deemed necessary by the Environmental Inspector(s).</p> <p>29. Natural recovery is the preferred method of reclamation. Do not seed wetlands.</p>
<i>Historical and Palaeontological Resources</i>	<p>30. If historical or palaeontological features (e.g., arrow heads, modified bone, pottery fragments, fossils) not previously identified are found on the right-of-way or facility site during construction follow conditions outlined in the Heritage Resource Discovery Contingency Plan (Appendix 1E).</p> <p>31. Prohibit the collection of Historical Resources by Project personnel.</p>
<i>Traditional Land Use Resources</i>	<p>32. If traditional land use (TLU) sites not previously identified are found on the right-of-way during construction, follow conditions outlined in the Traditional Land Use Sites Discovery Contingency Plan (Appendix 1E).</p>

Table 1 summarizes unique resource-specific protection measures required on the Project.

TABLE 1

RESOURCE-SPECIFIC MITIGATION TABLE

Location	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
WILDLIFE – GENERAL				
Select locations along the route	Habitat Loss/ Alteration	N/A	<ul style="list-style-type: none"> Where required, conduct pre-construction wildlife surveys at selected locations to be determined by the Wildlife Resource Specialist based on final routing, consultation, construction schedule (<i>i.e.</i>, if during timing sensitive periods), previous field work and habitat suitability (<i>e.g.</i>, identify habitat features and implement the appropriate setbacks and/or timing windows). Refer to 8.8.3 and 8.8.23 for additional measures to be implemented. 	None.
Select locations along the route	Access Management and Line-of-Sight	N/A	<ul style="list-style-type: none"> Consider measures and plan implementation to control off-road vehicle use along the pipeline right-of-way and temporary access, such as using woody debris as rollback, mounding, placing boulders across the right-of-way, and planting woody vegetation at select locations along non-contiguous right-of-way. The locations of site-specific measures will be determined based on consultation with the appropriate regulatory agency. 	None.
Select locations along the route	Barriers/ Filters to Wildlife Movement	N/A	<ul style="list-style-type: none"> Restore habitat connectivity on non-contiguous right-of-way by placing roll back over selected locations (where material is available) to provide cover and facilitate movement of wildlife. Preliminary locations will be determined in the field by Environmental Inspectors and in consultation with wildlife specialists. Refer to 7.1.9 and 8.3.1 for additional measures to be implemented. 	None.
Entire Length of Route	Wildlife Disturbance and Attraction of Wildlife During Construction and Operation	See migratory bird nesting period (Section 7.1 and Appendix 1F) and Key Wildlife and Biodiversity Zone below.	<ul style="list-style-type: none"> Schedule clearing and construction activities to avoid sensitive wildlife timing windows to the extent feasible. In the event there is a timing conflict, develop practical options and mitigation measures and consult with the appropriate regulatory agency. Implement measures in the Bear-Human Conflict Management Plan (Appendix 1F). 	None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
WILDLIFE - SPECIFIC LOCATIONS				
KP 8.5 to KP 11.2 (16-35-79-6 W4M to 9-25-79-6 W4M)	Key Wildlife and Biodiversity Zone (associated with the Christina River)	January 15 to April 30	<ul style="list-style-type: none"> • NGTL has prepared a Key Wildlife and Biodiversity Zone Protection Plan, in consultation with AEP. • Implement mitigation measures listed in the specific rows within the "Issues" column of this table for Habitat Loss/Alteration, Access Management/Line-of-Sight and Barriers/Filters to Wildlife Movement. • To the extent feasible, schedule clearing, construction and clean-up activities within Key Wildlife and Biodiversity Zones to occur outside of the timing restriction of January 15 to April 30 (Government of Alberta 2013). If activity is to occur within this period, consult with AEP. • NGTL's Environmental Advisor and Environmental Inspector(s) will maintain an open line of communication with the appropriate regulator prior to and for the duration of the Project. NGTL will provide AEP with refined construction schedules as they become available, if requested by AEP. See Appendix 1B for a list of contacts. • All efforts will be made to conduct site preparation (<i>i.e.</i>, clearing and grading) prior to January 15. • No new permanent access is planned for the Project within the KWBZ. • Access into KWBZ will be restricted to essential Project staff and signs will be placed at the start and end of access roads to deter non-Project traffic. • Limit access to the right-of-way within the KWBZ during reclamation and operations, whenever possible, through the use of existing roads or aerial inspections on the right-of-way and facility sites as needed. 	None.
VEGETATION - SPECIFIC LOCATIONS				
KP 0.2 14-26-80-6 W4M UTM NAD 83 Zone 12 U 12U 510582 E 6202469 N	Noxious Weed – perennial sow-thistle (<i>Sonchus arvensis</i>)	N/A	<ul style="list-style-type: none"> • Refer to 7.1.17 to 7.1.20, and 8.8.24 to 8.8.25 for measures to be implemented. 	Perennial sow-thistle was observed at low density in a disturbed area on the existing right-of-way approximately 28 m east of centre line as programmed on a hand held GPS.
KP 2.9 to 3.2 SE 23-80-6 W4M UTM NAD 83 Zone 12 U 510859 E 6201653 N	Noxious Weed – perennial sow-thistle (<i>Sonchus arvensis</i>)	N/A	<ul style="list-style-type: none"> • Refer to 7.1.17 to 7.1.20, and 8.8.24 to 8.8.25 for measures to be implemented. 	Perennial sow-thistle was observed at low density in a cutblock.

TABLE 1 Cont'd

Location	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
WETLANDS – SPECIFIC LOCATIONS				
KP 3.19 to KP 3.21	Seasonal Marsh	N/A	<ul style="list-style-type: none"> COP Notification required. Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 5.07 to KP 5.18 KP 5.19 to KP 5.19	Seasonal Marsh	N/A	<ul style="list-style-type: none"> COP Notification required. Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 5.20 to KP 5.37	Shrubby Fen	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 5.36 to KP 5.74	Mixedwood Treed Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 5.73 to KP 6.29 KP 6.56 to KP 7.09 KP 8.18 to KP 8.44	Treed Fen	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 6.37 to KP 6.50	Treed Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 8.44 to KP 8.62	Needle-Leaf Treed Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 9.62 to KP 9.84	Shrubby Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 10.66 to KP 10.70	Shrubby Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
			<ul style="list-style-type: none"> 	
KP 11.61 to KP 11.70 KP 11.73 to KP 11.88 KP 12.24 to KP 13.04 KP 14.59 to KP 16.22	Treed Fen	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 16.20 to KP 16.45	Non-Woody Fen	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 16.43 to KP 17.18 KP 17.20 to KP 18.38	Treed Fen	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.
KP 17.17 to KP 17.22	Shrubby Swamp	N/A	<ul style="list-style-type: none"> Refer to Section 7.1 for general wetlands mitigation measures. 	None.

Note: - All locations are approximate. See Environmental Alignment Sheets for additional details.

8.0 PIPELINE CONSTRUCTION

8.1 General Environmental Protection Measures

Introduction

The general environmental protection measures provided below are applicable to all work areas throughout the construction phase. These general measures are followed by detailed specifications for each phase of new pipeline construction.

Objective

The objective of these mitigation measures is to avoid and reduce the potential environmental effects associated with general pipeline construction activities.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Regulatory Contact</i>	1. Document all field regulatory contacts and forward to the Construction Manager and the Environmental Advisor.
<i>Waste Disposal</i>	2. The Contractor will collect all construction debris and other waste materials and dispose of daily at an approved facility and in accordance with the Chemical and Waste Management Plan (Appendix 1F) and the Spill Contingency Plan (Appendix 1E) unless otherwise authorized by the Environmental Inspector(s).
<i>Contaminated soils</i>	3. In the event contaminated soils are encountered during construction, implement the Chemical and Waste Management Plan (Appendix 1F).
<i>Fire Prevention</i>	4. Ensure that personnel are made aware of the proper disposal methods for welding rods, cigarette butts and other hot or burning material. 5. Smoke only in designated areas. 6. Ensure the Contractor has the necessary fire-fighting equipment on hand that is capable of controlling any fire that may occur as a result of their activities, as regulated by provincial regulations and government agencies. 7. Only burn slash if permission is granted from the regulating authorities and if conditions permit. If burning is delayed, store slash along the right-of-way, in approved push-outs. All burning will be completed in accordance with the applicable regulations and permits. 8. In the event of a fire or highfire hazard conditions, follow the measures outlined in the Fire Suppression Contingency Plan (Appendix 1E).
<i>Use of Workspace</i>	9. Restrict all construction activities to the approved, surveyed right-of-way, and approved temporary workspace, existing roads and approved shoo-flies. All construction traffic will adhere to safety and road closure regulations.

Activity/Concern	Mitigation Measures
<i>Equipment Refuelling and Servicing</i>	<ol style="list-style-type: none"> 10. The Contractor will ensure equipment is well-maintained and free of fluid leaks. 11. Bulk fuel trucks, service vehicles, and pick-up trucks equipped with box-mounted fuel tanks shall carry spill prevention, containment, and clean-up materials that are suitable for the volume of fuels or oils carried. Spill contingency material carried on bulk fuel and service vehicles shall be suitable for use on land and water. 12. Do not allow fuel, oil, or hazardous material storage within 100 m of a watercourse or waterbody except where secondary containment is provided. <hr/> <ol style="list-style-type: none"> 13. Conduct refuelling at least 100 m away from any watercourse or waterbody when feasible. 14. Employ the following measures to reduce the risk of fuel spills in water. Where equipment refuelling is required within 100 m of a watercourse, ensure that: <ul style="list-style-type: none"> • all containers, hoses, nozzles are free of leaks; • all fuel nozzles are equipped with automatic shut-offs; and • always have operators stationed at both ends of the hose during fuelling. 15. In the event of a spill, refer to the Spill Contingency Plan (Appendix 1E). 16. Do not wash equipment or machinery in watercourses or waterbodies. 17. Equipment to be used in or adjacent to a watercourse or waterbody will be clean or otherwise free of external grease, oil or other fluids, mud, soil and vegetation, prior to entering the waterbody.
<i>Air Quality/Emissions</i>	<ol style="list-style-type: none"> 18. Reduce idling of equipment, where possible. 19. The Contractor will ensure equipment is well-maintained. 20. Where practical, use multi-passenger vehicles for the transport of crews to and from job sites.
<i>Noise</i>	<ol style="list-style-type: none"> 21. Ensure that noise abatement equipment on machinery is in good working order.
<i>Public Access</i>	<ol style="list-style-type: none"> 22. Discourage unauthorized public vehicle access along the right-of-way during construction through the use of signs.

8.2 Clearing and Disposal

Introduction

The following measures will be implemented by the Company's Contractor and subcontractor(s) during the clearing phase of pipeline construction.

Objectives

The objectives of these mitigation measures are to:

- restrict the Project Footprint to approved workspace;
- limit the disturbance to vegetation (*i.e.*, merchantable timber and native vegetation) to the extent practical;
- reduce surface disturbance to the extent practical; and
- promote the natural regeneration of vegetation.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Clearing</i>	<ol style="list-style-type: none"> 1. Clear timber, stumps, brush and other vegetation within the marked right-of-way and temporary workspace boundaries. 2. Remove off right-of-way trees that are a safety hazard during construction activity following notification to the Environmental Inspector(s). 3. Fell all trees damaged during clearing and construction immediately. A damaged tree is defined as one that has fractures or has bark loss for 50% of its circumference. 4. Conduct clearing near watercourses or wetlands as described in Section 7.0 and 8.4 of this EPP. 5. During clearing, fell trees towards the right-of-way, wherever possible. Recover trees that inadvertently fall into adjacent undisturbed vegetation. 6. Avoid disturbance to environmentally sensitive features during clearing as identified by the appropriate signage and/or fencing. The Environmental Inspector(s) and appropriate Resource Specialist will determine the size of avoidance buffer surrounding these features, if appropriate. 7. Where practical, leave stumps in place, particularly on streambanks, to provide surface stability. Dispose of stumps removed from the required work areas by burning or chipping.
<i>Known Archaeological Sites</i>	<ol style="list-style-type: none"> 8. Do not permit clearing in proximity to known archaeological sites unless otherwise approved by the appropriate regulatory agency (Alberta Culture and Tourism [ACT]).
<i>Rollback</i>	<ol style="list-style-type: none"> 9. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber of appropriate size is available. 10. In consultation with the appropriate regulatory agency, determine potential rollback locations, and material to be used. 11. Place rollback in a manner that does not create or enhance a fire hazard along the right-of-way.

Activity/Concern	Mitigation Measures
<i>Wet Terrain/Muskeg</i>	12. In the event that nonfrozen soils are encountered during construction, refer to the Wet Soils Contingency Plan (Appendix 1E). Install corduroy, subject to regulatory approval, wooden mats or equivalent in areas of wet soils to reduce terrain disturbance and soil structure damage. These materials will be removed during clean-up.
<i>Merchantable/ Salvageable Timber</i>	13. Salvage and deck timber as denoted in the Timber Salvage Plan. 14. Do not bulldoze salvageable timber. 15. Suspend timber skidding operations or implement alternative measures, if the potential exists for merchantable timber to be damaged through contact with wet or muddy soils.
<i>Decking Sites</i>	16. Locate deck sites in previously-disturbed areas, wherever practical. Avoid grading at deck sites. Do not salvage strippings at deck sites. Merchantable timber shall be skidded to the closest log deck (outside of log deck), where timber is to be processed (<i>i.e.</i> , de-limbed and topped) and then placed into log deck. Tops and limbs shall be burned on ditch line adjacent to the deck location.
<i>Nonmerchantable Timber</i>	17. To assist in maintaining an intact ground surface in areas where grading is not necessary, implement minimum surface disturbance (MSD) techniques such as, brushcutters, brushhogs, or other equipment. Non-merchantable timber shall be skidded to the closest burn pile location.
<i>Grubbing</i>	18. Grub tree roots, where required, with a hoe and thumb or alternate equipment to preserve surface organic material. 19. Use a stump mulcher rather than grubbing on areas where stripping and grading is not necessary. 20. Reduce grubbing near watercourses, muskeg, and other wet areas to facilitate the restoration of shrub communities.
<i>Disposal</i>	21. Timber and brush disposal options are subject to agreements with the appropriate regulatory agency. 22. Dispose of all timber material not salvaged for merchantability through burning or mechanical chipping, unless otherwise directed by the Environmental Inspector(s)/Construction Manager. 23. Obtain applicable permits prior to burning slash. Follow guidance in the applicable regulations (Alberta Reg. 310/72). 24. Do not undertake burning within 100 m of a waterbody, unless otherwise authorized by the Environmental Inspector(s). 25. Implement techniques to limit smoke production including limiting pile size, minimizing moisture content, and maintaining loose burning piles with minimal soil. 26. Avoid locating burn piles on peat rich areas where residual fires could persist after construction. Burn piles will be located on areas where strippings have been removed. 27. If timber and brush are disposed of by mechanical means (<i>i.e.</i> , mulching), the maximum depth of mulch is 5 cm or in accordance with the applicable provincial regulation, whichever depth is less.

8.3 Strippings Salvage and Grading

Introduction

Construction on forested lands is primarily completed under frozen conditions. Procedures for non-frozen conditions are included in the event that construction takes place in alternate seasons.

Objectives

The objectives of these mitigation measures are to:

- conserve surface material to facilitate reclamation of disturbed lands;
- reduce effects to soil capability, surface drainage patterns, land use, and wildlife habitat;
- comply with regulatory direction; and
- employ environmentally and economically responsible construction practices at all times and in accordance with applicable industry standards.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Snow Management</i>	<ol style="list-style-type: none"> 1. Leave periodic gaps in windrowed snow, if snow windrows are of sufficient height to interfere with wildlife movement. Locate gaps at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s). 2. In the event of excessive snow depths discuss snow management with the appropriate regulatory agency.
<i>Strippings Salvage</i>	<ol style="list-style-type: none"> 3. Do not conduct strippings salvage except where grading is required (Appendix 1D, Dwg. STDS-03-ML-05-445, STDS-03-ML-05-446,). The area stripped is to correspond to the area to be graded. 4. Salvage the organic layer (<i>i.e.</i>, leaf litter layer) where strippings salvage is required. 5. Stabilize exposed strippings and subsoil where potential for erosion exists. Refer to the Soil Erosion Contingency Plan (Appendix 1E) for additional information. 6. Ensure strippings storage areas are in approved right-of-way and temporary workspace. 7. If wet/thawed soil conditions occur, implement the Wet Soils Contingency Plan (Appendix 1E).
<i>Adverse Weather</i>	<ol style="list-style-type: none"> 8. In the event of adverse weather, that could result in rutting and/or compaction, the Environmental Inspector(s), in consultation with the Construction Manager may implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix 1E). Regulatory personnel may be consulted if warranted. 9. Following an adverse weather event, the Contractor is responsible for confirming the efficacy of sediment and erosion control measures and whether corrective action is required. The Environmental Inspector(s), in consultation with the Construction Manager will implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix 1E)

Activity/Concern	Mitigation Measures
<i>Grading</i>	<ol style="list-style-type: none">10. Undertake all grading with the understanding that original contours and drainage patterns will be re-established during clean-up unless otherwise authorized by the Environmental Inspector(s) or designate.11. Salvage the surface organic layer from areas to be graded. Avoid overstripping. The area stripped is to correspond to the areas graded.12. Ensure grade material does not spread off right-of-way.
<i>Known Archaeological Sites</i>	<ol style="list-style-type: none">13. Do not permit grading in proximity to known archaeological sites unless otherwise approved by ACT.

8.4 Watercourse Crossings

Introduction

At watercourse crossings, the method of vehicle crossing and pipeline crossing has taken into consideration engineering and constructability requirements, fisheries values, and protection of riparian habitats. The mitigation measures outlined in this section apply to all watercourses. Details on specific watercourse crossing information are provided in Table 2.

Objectives

The objectives of these mitigation measures are to:

- avoid or reduce adverse impacts;
- comply with the fisheries protection provisions of the *Fisheries Act* and its supporting Fisheries Protection Policy by applying DFO's Self-Assessment Process and *Measures to Avoid Causing Harm to Fish and Fish Habitat*;
- comply with all provincial and federal regulatory requirements;
- comply with all regulatory, permit, and approval conditions;
- employ environmentally and economically responsible construction practices at all times, and in accordance with applicable industry standards;
- maintain habitat quality at crossing locations;
- protect riparian areas in proximity to watercourse crossings; and
- maintain the ecosystem function of riparian areas.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Permits and Approvals</i>	1. The Company will obtain and follow all applicable federal and provincial permits or authorizations prior to the commencement of construction and in-stream activities.
<i>Notification</i>	2. The Company will notify an inspector, fishery officer or prescribed authority of any occurrence that results in serious harm to fish that is not authorized, or when there is an imminent risk of such an occurrence. 3. Ensure all notifications are completed in accordance with the Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body. 4. Install warning signs along the banks both upstream and downstream of navigable crossings to caution users of a navigational hazard, where appropriate.
<i>Signage</i>	5. Post signs immediately following clearing (including name, number and KP) for watercourses. Signs will be posted 100 m from the watercourse or at the top of the valley slope, whichever is greater, to alert the Contractor of the upcoming watercourse.
<i>Restricted Activity Periods</i>	6. Refer to Table 2 for the restricted activity periods (RAPs) associated with the watercourse crossings traversed by the Project.

Activity/Concern	Mitigation Measures
<i>Restricted Activity Periods (cont'd)</i>	<p>7. No construction activity will occur within the RAP for any watercourse crossing unless:</p> <ul style="list-style-type: none"> • it is dry or frozen to the bottom at the time of construction; • trenchless techniques are employed; or • approval from the appropriate regulatory agency is obtained.
<i>Riparian Buffers</i>	<p>8. Prohibit clearing of extra temporary workspace within 10 m of a watercourse to protect riparian areas. This area shall be clearly marked prior to clearing operations. The right-of-way will be narrowed through the riparian area, if possible.</p> <p>9. Limit clearing at watercourse crossings to the removal of trees and shrubs to the ditch line and work side areas required for vehicle crossings.</p> <p>10. Fell trees away from watercourses. Immediately remove trees, debris or soil inadvertently deposited below the high watermark of a watercourse.</p> <p>11. If the working surface is unstable, do not permit clearing equipment within the 10 m riparian buffer, unless approved by the Environmental Inspector(s). Following clearing, the 10 m riparian buffer will remain intact (<i>i.e.</i>, consisting of low-lying understory vegetation).</p>
<i>Grading</i>	<p>12. Delay grading of the primary banks of watercourses until immediately before construction of the crossing. If required, appropriate temporary erosion and sediment control structures shall be installed, at the discretion of the Environmental Inspector(s) upon initial disturbance of the vegetative mat and strippings.</p> <p>13. Direct grading away from waterbodies. Do not place fill material in a waterbody during grading.</p> <p>14. Ensure that grubbing, stripping and grading on approach slopes to watercourses is restricted to an amount required to allow the safe passage of equipment, excavation of the trench, and installation of the pipeline.</p> <p>15. Do not allow grading within the 10 m riparian buffer immediately adjacent to the water crossing until installation of the vehicle crossing.</p>
<i>Erosion Control</i>	<p>16. Install erosion and sediment control at all watercourses and/or waterbodies as directed by the Environmental Inspector(s). (Appendix 1D, Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-131, STDS-03-ML-05-132, STDS-03-ML-05-137)</p> <p>17. Where water erosion is evident, and there is potential for runoff from the right-of-way to flow into a watercourse, refer to the Soil Erosion Contingency Plan (Appendix 1E).</p>
<i>Vehicle Crossings – General</i>	<p>18. Do not permit fording of watercourses.</p> <p>19. Construct or install temporary vehicle access across waterbodies, shorelines, and riverbanks in a manner that protects the banks from erosion and maintains the flows in the waterway and follows the COP for Alberta as well as DFO's Self-Assessment Process (DFO 2014) and <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i> (DFO 2013).</p> <p>20. Construct/install all watercourse vehicle crossings as outlined in Table 2 and in accordance with the typical drawings (Appendix 1D, Dwgs. STDS-03-ML-05-104, STDS-03-ML-05-103 and STDS-03-ML-05-101).</p>

Activity/Concern	Mitigation Measures
<i>Vehicle Crossings – General (cont'd)</i>	<ol style="list-style-type: none"> 21. Construct all bridges (ice and snowfill bridges, or single span bridges) beyond the ends of the banks and with a minimum depth of 0.5 m of snowfill or fill material at each bank. Do not place fill within primary banks for bridge abutment construction, unless approved by the appropriate regulatory agency. 22. Bridge abutments with wings may require hauling in of fill material and placing geotextile fabric between the fill material and the surface layer. 23. Line single span bridges with impervious geotextile. All watercourse crossing structures must have a minimum of 30 cm high side boards. Side containment for single span bridges must be constructed of plywood. Snow bridges can use watered snow. 24. Install and remove any temporary vehicle crossings in a manner that protects the banks from erosion and maintains the flow in the waterway. These crossings will be returned to their pre-construction condition. 25. Consider alternate methods of vehicle crossings on a site-specific basis. The decision-making process will include the Contractor, Construction Manager and the Environmental Inspector(s). Decision criteria will include protection of the riparian vegetation and fisheries values associated with the crossing, and applicable legislation.
<i>Vehicle Crossings – Frozen Conditions</i>	<ol style="list-style-type: none"> 26. During winter construction, where conditions permit, employ ice and snowfill bridges as temporary crossing structures. Install ice and snowfill bridges using water drawn from an approved source and/or clean snow ploughed-in from surrounding areas or made. 27. If water withdrawal is necessary for the construction of a temporary crossing, ensure that necessary provincial approvals are in place and apply DFO's Self-Assessment Process as well as <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>. Do not withdraw more than 10% of the instantaneous stream flow at any given time. Pump intakes should not disturb the streambed. Pumps must be screened with a maximum mesh size of 2.54 mm and should have a maximum screen approach velocity of less than 0.038 m/s where fish habitat is present. Follow the design requirements of the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines. 28. Use only clean ice/snow for construction of an ice/snowfill or ice bridge. Construct approaches to the bridge with compacted snow and ice of sufficient thickness to protect the stream channel and banks. Do not use sand, gravel and soils for ice bridge approaches. 29. Ensure that ice bridges or snowfills do not interfere with or impede winter flows. 30. If conditions will not support the construction of snowfill/ice bridges, then employ other temporary crossing structures approved by regulatory agencies.
<i>Beaver Dams and Lodges</i>	<ol style="list-style-type: none"> 31. In the event that beaver dams or lodges will be disturbed, provide notification or obtain the necessary provincial permits prior to commencing activities. Engage the registered trapper(s). 32. Breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment and/or erosion of the bed and banks resulting in subsequent siltation of downstream waters.

Activity/Concern	Mitigation Measures
<i>Watercourse Crossing Plans</i>	33. The Contractor shall develop a detailed site-specific watercourse crossing plan and submit the plan to the Company prior to initiating watercourse crossing activities.
<i>Pipeline Installation</i>	<p>34. Before the installation of the water crossing and the commencement of instream activity, the Contractor will ensure that all necessary equipment and materials are available and are on-site.</p> <p>35. Construct/install all pipeline crossings as outlined in Table 2 and in accordance with the typical drawings (Appendix 1D).</p> <p>36. Develop water quality monitoring plans to monitor for sediment events during instream construction activities as required by the applicable regulatory approvals (<i>i.e.</i>, the DFO Self-Assessment Process and <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>). If monitoring reveals sediment values are approaching threshold values, the water quality monitors will alert the Environmental Inspector(s) and work with them to develop corrective actions. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified.</p> <p>37. The Contractor shall weld, coat, and weight the water crossing portion of pipe prior to starting instream ditching activities. To reduce the length of time of instream activity, the Contractor shall make every effort to ditch, lower-in, and backfill water crossings during the same working day.</p> <p>38. When implementing a trenched (<i>i.e.</i>, open cut or isolated) pipeline installation method, and where practical, salvage the upper 0.5 m (minimum) of granular material, if present. Stockpile separately from the remainder of the trench spoil so that the salvaged, native granular material can be used to cap the upper portion of the trench.</p> <p>39. If spoil is likely to be highly saturated, excavate a pit or construct berms of packed earth to prevent spoil from flowing back into the watercourse. Locate containment berms and spoil outside of the 10 m riparian area (Dwg. STDS-03-ML-05-131).</p> <p>40. Ensure no vehicles or equipment, which contain petroleum, oil, or lubricants are parked or stationed in a watercourse at anytime except for equipment that is required for that immediate phase of construction.</p>
<i>Typical Open Cut Crossings</i>	<p>41. Conduct typical open cut of seasonally dry or frozen to the bottom watercourses in accordance with DFO's Self-Assessment Process and <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>. Refer to Appendix 1D Dwg. STDS-03-ML-05-105.</p> <p>42. Store excavation material outside the watercourse during the open cut.</p>
<i>Isolated Open Cut Crossings</i>	<p>43. Refer to Table 2 for locations where an isolated crossing method is proposed. Refer to Appendix 1D, Dwgs. STDS-03-ML-05-111 and STDS-03-ML-05-112.</p> <p>44. Conduct isolated crossings of watercourses in accordance with DFO's Self-Assessment Process and <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>.</p> <p>45. Do not use earthen berms to isolate the crossing construction area.</p> <p>46. Ensure maintenance of downstream flow at all times when constructing an isolated crossing.</p>

Activity/Concern	Mitigation Measures
<i>Isolated Open Cut Crossings (cont'd)</i>	<ol style="list-style-type: none"> 47. Ensure water from flumes, dam and pumps, diversion or other methods do not cause erosion or introduce sediment into the channel. 48. Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils, or sedimentation of the watercourse. 49. Ensure pumps, generators and light towers used within 100 m of a watercourse crossing have secondary containment that can hold a capacity of 125% of the fuel tank. 50. Ensure water and pump intakes reduce or avoid disturbance of the streambed and are screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s. To accomplish this, where pumps larger than 15 cm diameter are used, place the intakes in a mesh cage (2.54 mm) to reduce the approach velocity that fish are exposed to and prevent them from being impinged on the intakes. Maintain the screens free of debris. If a deeper sump is required for success of the isolated crossing refer to Environmental Inspector(s).
<i>Fish Salvage</i>	<ol style="list-style-type: none"> 51. A Fish Research License (FRL) from AEP is required for fish salvage activities and must be applied for at least 10 working days in advance so it is received prior to isolation of the watercourse. 52. The Contractor shall notify the Company 72 hours before construction of any watercourse crossing or diversions to ensure fish salvage operations are conducted, where required. 53. If an isolated method is employed, and where recommended by an aquatics specialist (<i>i.e.</i>, Qualified Aquatic Environmental Specialist or provincial equivalent), conduct a fish salvage led by an aquatics specialist. 54. Conduct a fish salvage, in accordance with permit conditions, using appropriate methods and equipment. Release all captured fish to areas downstream of the crossing that provide suitable habitat.
<i>Trenchless Crossings</i>	<ol style="list-style-type: none"> 55. For pipeline crossings conducted using a trenchless crossing method, apply DFO's Self-Assessment Process and <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>. 56. Excavate entry and exit sites back from the ordinary high watermark and far enough from the watercourse to provide for containment of sediments and other deleterious substances above the high watermark. Vegetation removal for the entry and exit sites is only to occur within the approved construction right-of-way and temporary workspace. 57. Ensure that water from dewatering entry and exit sites with a high sediment load is not discharged or allowed to flow into any waterbody. Remove the sediment load (<i>e.g.</i>, filtered or discharged into a vegetated area) before discharge water is allowed to enter any watercourse. 58. Where warranted, develop a water quality monitoring plan with input from an aquatics specialist that includes monitoring for total suspended solids (TSS) and/or turbidity if trenchless methods are used. 59. Develop an emergency response plan that will be implemented in the event of sediment releases or spills of deleterious substances during the construction of the trenchless crossings.

Activity/Concern	Mitigation Measures
<i>Trenchless Crossings (cont'd)</i>	<p>60. In the event of sediment releases or spills of deleterious substances during the construction of the trenchless crossings implement the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan (Appendix 1E).</p> <p>61. Dispose of all waste drilling fluid and drilling solids according to and in conformance with pertinent regulatory requirements.</p>
<i>Contingency Plans</i>	<p>62. Postpone watercourse crossing construction if excessive flows or flood conditions exist or are anticipated, and if construction methods cannot be modified to cope with the increased flow, follow the Flood and Excessive Flow Contingency Plan (Appendix 1E).</p>
<i>Backfill Trench</i>	<p>63. Place only imported clean coarse material (gravel or rock) or native material removed from the trench as the final 0.5 m of backfill. Any imported material must be obtained from a Company approved offsite location.</p>
<i>Reclamation</i>	<p>64. Return the bed and banks of each watercourse to as close as possible to their original pre-construction contours. Do not realign or straighten watercourses or change their hydraulic characteristics.</p> <p>65. Implement permanent bank reclamation measures to re-establish riparian vegetation and fish habitat as a part of backfill operations (refer to Appendix 1D, Dwgs. STDS-03-ML-05-603, STDS-03-ML-05-604, STDS-03-ML-05-606 and STDS-03-ML-05-608).</p> <p>66. Seed disturbed banks and riparian areas with an approved native seed mixture. The Environmental Inspector(s) will determine on-site whether other restoration methods need to be applied to stabilize banks (e.g., soil wraps, brush layers, and matting).</p>

TABLE 2
SUMMARY OF PROPOSED WATERCOURSE CROSSINGS ALONG THE PROJECT

Site No.	Name, KP ¹	Legal Location, UTM Coordinates (NAD 83, Zone 12U)	Class, Restricted Activity Period ²	Survey Date, Open Water Mean Channel Morphology Results	Fish Species Captured or Observed During Open Water Aquatic Assessment (Previously Documented) ³	Beaver Activity Present	Planned Pipeline Crossing Method	Contingency Pipeline Crossing Method	Planned Vehicle/ Equipment Crossing Method (Frozen)	Planned Vehicle/ Equipment Crossing Method (Open Water)	Serious Harm Determination Results	Navigability Determination Results	QAES Recommendations
CR-WC1	Unnamed tributary to Kettle River KP 1.03	SE 26-80-6 W4M 510858E, 6201644N	Unmapped Class C April 16 to July 15	September 10, 2014 Bankfull Width: 0.9 m Wetted Width: 0.1 m Bankfull Depth: 0.22 m Flow: Negligible	No fish sampling (No fish have been previously documented).	None	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Snowfill/ice bridge/clear span bridge	Clear span bridge/culvert	Sensitivity: Low Pipeline: Low Contingency: n/a Vehicle: Low	• Watercourse is not considered navigable.	• Implement mitigation measures as per Section 8.4. • Fish salvage required for isolated crossing methods.
CR-WC2	Unnamed tributary to Kettle River KP 2.35	NE 23-80-6 W4M 511349E, 6200374N	Unmapped Class C April 16 to July 15	September 10, 2014 Bankfull Width: 1.0 m Wetted Width: 0.8 m Bankfull Depth: 0.27 m Flow: Negligible	No fish captured or observed (Brook stickleback, finescale dace, pearl dace and white sucker known to occur in the unnamed tributary to Kettle River).	None	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Snowfill/ice bridge/clear span bridge	Clear span bridge/culvert	Sensitivity: Low Pipeline: Low Contingency: n/a Vehicle: Low	• Watercourse is not considered navigable.	• Implement mitigation measures as per Section 8.4. • Fish salvage required for isolated crossing methods.
CR-WC3	Unnamed tributary to the Christina River KP 5.26	NE 11-80-6 W4M 511515E, 6197535N	Unmapped Class C April 16 to July 15	September 11, 2014 Bankfull Width: 2.1 m Wetted Width: 1.2 m Bankfull Depth: 0.36 m Flow: Negligible	No fish captured or observed (No fish have been previously documented at the proposed crossing).	None	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Snowfill/ice bridge/clear span bridge	Clear span bridge	Sensitivity: Low Pipeline: Low Contingency: n/a Vehicle: Low	• Watercourse is not considered navigable.	• Implement mitigation measures as per Section 8.4.
CR-WC4	Unnamed tributary to the Christina River KP 8.60	NE 35-79-6 W4M 511602E, 6194314N	Unmapped Class C April 16 to July 15	September 12, 2014 Bankfull Width: 1.3 m Wetted Width: 0.3 m Bankfull Depth: 0.21 m Flow: Negligible	No fish sampling (No fish have been previously documented at the proposed crossing).	None	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Snowfill/ice bridge/clear span bridge	Clear span bridge/logfill	Sensitivity: Low Pipeline: Low Contingency: n/a Vehicle: Low	• Watercourse is not considered navigable.	• Implement mitigation measures as per Section 8.4.
CR-WC5	Christina River KP 10.54	NW 25-79-6 W4M 512387E, 6192672N	Mapped Class C, April 16 to July 15	September 14, 2014 Bankfull Width: 48.0 m Wetted Width: 30.8 m Bankfull Depth: 1.65 m Flow: 7.00 m ³ /s	No fish sampling (Arctic grayling, lake chub, longnose sucker, northern redbelly dace, trout-perch, pearl dace and white sucker, brook stickleback, burbot, flathead chub, fathead minnow, goldeye, longnose dace, northern pike, slimy sculpin, spottail shiner, walleye and yellow perch known to occur in the Christina River).	None	Trenchless	Isolate if water present/open cut if dry or frozen to the bottom	Snowfill/ice bridge/ existing bridge/access from both sides	Clear span bridge/ existing bridge/access from both sides	Sensitivity: Moderate Pipeline: Low Contingency: Moderate Vehicle: Low	• Navigable	• Implement mitigation measures as per Section 8.4. • Water quality monitoring during construction. • Fish salvage if isolation contingency method required.

TABLE 2 Cont'd

Site No.	Name, KP ¹	Legal Location, UTM Coordinates (NAD 83, Zone 12U)	Class, Restricted Activity Period ²	Survey Date, Open Water Mean Channel Morphology Results	Fish Species Captured or Observed During Open Water Aquatic Assessment (Previously Documented) ³	Beaver Activity Present	Planned Pipeline Crossing Method	Contingency Pipeline Crossing Method	Planned Vehicle/ Equipment Crossing Method (Frozen)	Planned Vehicle/ Equipment Crossing Method (Open Water)	Serious Harm Determination Results	Navigability Determination Results	QAES Recommendations
CR-WC6	Unnamed tributary to the Christina River KP 11.07	NE 25-79-6 W4M 512801E, 6192390N	Unmapped Class C, April 16 to July 15	September 13, 2014 Bankfull Width: 1.1 m Wetted Width: 0.7 m Bankfull Depth: 0.26 m Flow: Negligible	No fish captured or observed (No fish have been previously documented at the proposed crossing).	None	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Culvert/existing bridge/clear span bridge	Culvert/existing bridge	Sensitivity: Low Pipeline: Low Contingency: n/a Vehicle: Low	• Watercourse is not considered navigable.	• Implement mitigation measures as per Section 8.4.
CR-WC7	Unnamed tributary to Bohn Lake KP 16.30	SW 21-79-5 W4M 516907E, 6190581N	Unmapped Class C, April 16 to July 15	September 13, 2014 Bankfull Width: 15.0 m Wetted Width: 15.0 m Bankfull Depth: 2.32 m Flow: Negligible	No fish captured or observed (Brook stickleback, lake chub, longnose sucker, northern redbelly dace, pearl dace and white sucker known to occur in the unnamed tributary to Bohn Lake).	Yes (not expected to influence the crossing)	Isolate if water present/open cut if dry or frozen to the bottom	N/A	Snowfill/ice bridge/clear span bridge	Clear span bridge	Sensitivity: Low Pipeline: Moderate Contingency: n/a Vehicle: Low	• Navigable	• Implement mitigation measures as per Section 8.4. • Fish salvage required for isolated crossing methods. • Water quality monitoring during construction.

Notes: N/A: not applicable.

1 KPs are based on August 2016 routing revisions.

2 Determined from the Code of Practice Management Area Map for Fort McMurray (AENV 2006).

3 Results from FWMIS 2014, FWIMT 2014.

8.5 Pipe Activities (Trenching, Stringing, Welding, Coating, Lowering-In)

Introduction

The following mitigation measures will be implemented during mainline construction, including trenching, stringing, bending, coating and lowering-in.

Objectives

The objectives of these mitigation measures are to:

- prevent impacts to watercourses and waterbodies;
- reduce interference with other land uses; and
- prevent harming wildlife.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Wet Soils</i>	1. Implement the Wet Soils Contingency Plan (Appendix 1E) as required.
<i>Trenching</i>	2. To facilitate the free movement of wildlife, trenching operations will be followed as closely as possible by lowering-in and backfill operations, unless for construction purposes there is a need to have the trench open for an extended period of time. 3. Minimize the amount of open trench at any one time. 4. The Contractor will monitor the open trench for trapped wildlife. Should any wildlife be identified, the Contractor will contact the Environmental Inspector(s) and Construction Manager. The Environmental Inspector(s) will contact the appropriate provincial regulatory agency or a Wildlife Resource Specialist, where required, for direction.
<i>Spoil Handling</i>	5. Do not mix snow with spoil material. 6. At locations where the organic layer has been stripped, place spoil in a manner that allows the spoil to be replaced separately from the organic material. 7. Ensure spoil material does not spread off right-of-way.
<i>Water Management</i>	8. Monitor water levels in all open trenches. 9. Where practical, grade the right-of-way to divert surface water away from the open trench. 10. Where the open trench has the potential to dewater a wetland, undertake trenching in a manner that prevents the flow of water along the trench. 11. The location of all discharge areas shall be approved by the Environmental Inspector(s). 12. If the trench requires dewatering, pump water onto stable, well-vegetated areas, tarpaulins, sheeting, rocks, sand bags, or into settling ponds, filter bags or other appropriate sediment filtering devices. Ensure dewatering is completed in a manner that does not cause erosion or allow sediment to re-enter a watercourse. 13. Do not permit pumped trench water to flow directly into any watercourse.

Activity/Concern	Mitigation Measures
<i>Water Management (cont'd)</i>	<ol style="list-style-type: none">14. The Contractor will ensure the pump intake is elevated from the bottom of the trench to reduce the pumping of sediment.15. The Contractor will ensure hoses and pumps are of sufficient length and capacity to transfer trench water to the desired location.16. The Contractor will ensure hoses are in good working condition, and hoses with tears or ruptures will be repaired or replaced.
<i>Welding Waste</i>	<ol style="list-style-type: none">17. Use magnets to collect the bevel shavings on a daily basis. Collect all welding refuse as generated by each welding rig and dispose of at an approved waste facility.
<i>Coating</i>	<ol style="list-style-type: none">18. Where spray or paint-on coatings are applied, use a tarp or alternative devices of sufficient size to block over spray from contacting the ground. Clean-up any over spray that comes in contact with the ground.

8.6 Backfill

Introduction

The following mitigation measures will be implemented during backfill operations.

Objectives

The objectives of these mitigation measures are to:

- protect the pipeline and prevent subsidence of the trench;
- ensure excavated materials from the trench are properly replaced;
- properly re-establish subsurface drainage; and
- facilitate cross right-of-way drainage.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Backfill Trench</i>	<ol style="list-style-type: none">1. Backfill the trench as soon as practical following lowering-in to minimize hazards to wildlife.2. Do not mix snow with spoil material during backfill.3. To reduce the potential for ditch line subsidence, roach all available spoil over the ditch line to allow for settlement. If necessary, rework spoil material to breakup frozen clumps prior to ditch backfill.4. Ensure that all backfill is complete prior to spring breakup.
<i>Drainage Patterns</i>	<ol style="list-style-type: none">5. Leave openings in the trench crown and all windrows at appropriate locations to allow for temporary and permanent cross right-of-way drainage.

8.7 Pressure Testing

Introduction

Hydrostatic testing is the use of water to pressure test sections of pipeline. Water is typically withdrawn from nearby dugouts, lakes, watercourses, or municipal sources in accordance with applicable permits for withdrawal of water.

Objectives

The objectives of these mitigation measures are to:

- ensure pressure testing activities are conducted in accordance with all approval conditions, and permits; and
- reduce effects to watercourses and wetlands.

Specific Measures

Activity/Concern	Contingency Mitigation Measures
<i>Permits and Approvals</i>	<ol style="list-style-type: none"> Conduct all hydrostatic testing activities in accordance with the <i>NEB Onshore Pipeline Regulations</i>, provincial regulations, as well as the latest version of CSA Z662. The Company must authorize the water withdrawal sources for testing purposes (<i>i.e.</i>, must have sufficient quantity and quality of water) as well as the Contractor's test plan, including discharge locations, no less than 30 days prior to testing. Submit notification to AEP under both the <i>Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines</i>, and the <i>Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines</i>. If withdrawal amounts exceed 30,000 m³, obtain a separate water diversion license. If the volume of water to be released is greater than 1,000 m³, obtain a registration number from AEP for the release of the hydrostatic test water. Abide by applicable provincial or federal approval conditions.
<i>Withdrawal</i>	<ol style="list-style-type: none"> Restrict water withdrawal for hydrostatic testing to less than 10% of the stream flow of the watercourse at the time of withdrawal or as otherwise specified by the appropriate regulatory agency.
<i>Water Trucks</i>	<ol style="list-style-type: none"> Ensure water hauling trucks for test water, if used, are clean and inspected prior to use.
<i>Isolate Pumps</i>	<ol style="list-style-type: none"> Ensure pumps, generators, and light towers used at water intake locations have secondary containment that can hold 125% of the fuel tank. Ensure any leaks in the fill and discharge lines are controlled to prevent erosion.
<i>Screen Intake</i>	<ol style="list-style-type: none"> Screen all water intakes in accordance with the <i>Freshwater Intake End-of-Pipe Fish Screen Guideline</i> published by DFO. Maintain screens so they are clear of debris.
<i>Dewatering</i>	<ol style="list-style-type: none"> Shunt test water ahead from test section to test section to the extent possible to reduce water hauling, water usage and number of dewatering points.

Activity/Concern	Contingency Mitigation Measures
<i>Dewatering (cont'd)</i>	<ol style="list-style-type: none">11. Prior to discharge of hydrostatic test water, ensure that the appropriate testing and treatment measures are implemented in accordance with local regulatory requirements.12. Discharge hydrostatic test water into the same drainage basin from which it was withdrawn, unless otherwise approved by the appropriate authority.13. Discharge water into a well-vegetated area. Provide scour protection or an energy diffuser at the discharge site as directed by the Company.14. Preserve water quality, including preventing the introduction of foreign material (debris, sediment, etc.) into the receiving waterbody/watercourse.15. Monitor the discharge area for erosion.

8.8 Clean-up and Reclamation

Introduction

Clean-up and reclamation are important steps in returning construction sites to a condition similar to pre-construction. For winter construction, clean-up is generally a two-phase process, with rough clean-up being completed immediately following construction, and final clean-up occurring the following winter. For summer construction, clean-up is generally completed immediately following construction, or as soon as conditions permit.

Objectives

The objectives of these mitigation measures are to:

- effectively use reclamation techniques that prevent surface material loss from wind and water erosion;
- establish a vegetative cover compatible with surrounding vegetation and land uses;
- comply with approval conditions, including all permits;
- re-establish the right-of-way or Project site in a stable condition acceptable for operational requirements; and
- maintain equivalent land capability, ensuring the ability of the land to support various land uses similar to the uses that existed before construction, but not necessarily identical.

Specific Measures

Activity/Concern	Mitigation Measures
<i>Scheduling</i>	<ol style="list-style-type: none"> 1. Complete machine clean-up immediately following construction, prior to spring breakup. If machine clean-up cannot be completed prior to spring breakup, ensure cross right-of-way drainage is re-established, and sedimentation and erosion controls are installed to protect the right-of-way and sensitive environmental features. Final clean-up and reclamation will generally occur during the following fall and/or winter, or as soon as conditions permit. 2. Contact the relevant regulatory agencies before the initiation of the clean-up and reclamation activities and notify upon completion, as required. 3. In the event that clearing or construction activities occur within the migratory birds nesting period (May 1 to August 10), the Environmental Inspector(s) will engage Wildlife Resource Specialists who will use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of territorial males, alarm calls, distraction displays, adults carrying nesting material/food). In the event that an active nest is found, it will be subject to site-specific mitigation measures (e.g., clearly marked species-specific buffer around the nest or non-intrusive monitoring).
<i>Staking</i>	<ol style="list-style-type: none"> 4. Remove all flagging from the Project area and dispose of it at an approved facility following the completion of construction.
<i>Corduroy/Subsoil Ramping</i>	<ol style="list-style-type: none"> 5. During final clean-up, remove subsoil, if used, overlying corduroy or geotextile and return the material to its pre-construction location unless otherwise requested or approved by the applicable government agency. 6. Dispose of corduroy, slash and any remaining leaning trees or incorporate into rollback, where required.

Activity/Concern	Mitigation Measures
<i>Matting</i>	7. Remove all matting and non-biodegradable geotextile from all locations on the right-of-way.
<i>Grade Replacement</i>	8. Replace grade material to pre-construction contours, except if otherwise authorized by the Environmental Inspector(s) or designate. 9. Re-establish surface drainage patterns; install drainage and erosion control measures, and complete the installation of sedimentation control measures at all watercourse crossings.
<i>Strippings Replacement</i>	10. Replace strippings evenly over all portions of the right-of-way that have been stripped. 11. Postpone replacement of strippings during wet conditions to prevent erosion and/or damage to the soil structure.
<i>Access Removal</i>	12. Remove bar ditch ramps and reclaim all temporary access trails and shooflies to stable conditions. Recontour to pre-construction conditions and seed accordingly. 13. Remove all mats and ramps used so that they do not impede the restoration of natural drainage patterns. 14. Remove all temporary vehicle crossing structures prior to spring breakup. Remove or breach snow or ice bridges to ensure they do not impede flow. Ensure that removal of access does not disturb the bed or banks of the crossing.
<i>Sedimentation/ Erosion Control</i>	15. Remove unnecessary silt fence or other temporary erosion control measures not required, as specified by the Environmental Inspector(s) or designate. 16. Install permanent sedimentation and erosion control measures, where required, in accordance with Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-132, STDS-03-ML-05-604, STDS-03-ML-05-606 and STDS-03-ML-05-608 in Appendix 1D, unless otherwise approved by the Environmental Inspector(s) or designate to adjust for site conditions and suitability. 17. The Environmental Inspector(s) or designate will determine the location of sedimentation and erosion control measures. 18. Install cross ditches and berms on moderately steep and steep slopes in order to prevent runoff along the right-of-way and subsequent erosion. Install berms immediately downslope of all trench breakers (Appendix 1D, Dwgs. STDS-03-ML-12-221 and STDS-03-ML-12-222). 19. Install stub berms, as required by the Company, in high groundwater areas to prevent ditch line surface water flows.
<i>Natural Recovery</i>	20. Natural recovery is the preferred method of reclamation on level terrain where erosion is not expected. 21. Use natural recovery in peatland and non-peatland wetlands. 22. Use cover crops, where required, to prevent erosion of disturbed areas prior to final clean-up and reclamation.
<i>Seeding</i>	23. Seed riparian and erosion prone areas with a native cover crop and seed mix that has been approved by the applicable regulatory agency. Seeding will follow as close as possible to rough clean-up and surface material replacement pending seasonal or weather conditions.

Activity/Concern	Mitigation Measures
<i>Seeding (cont'd)</i>	24. Use only Certified No. 1 seed, unless Certified No. 1 is not available for select reclamation seed species (<i>i.e.</i> , native species). 25. Acquire Certificates of Analysis for all seed mixes. 26. The primary method of seed application in forested lands is broadcast seeding with an application rate of 15 kg/ha, unless otherwise specified by the Environmental Inspector(s) or designate.
<i>Rollback</i>	27. Install rollback as specified by the Environmental Inspector(s) and approved by the applicable regulatory agency. 28. Rollback coarse woody debris and small diameter, non-merchantable timber on erosion prone slopes when deemed necessary by the Environmental Inspector. Walk down erosion control rollback with a dozer. (Refer to Appendix 1D, Dwg. STDS-03-ML-05-312). 29. Install rollback to prevent access along portions of the right-of-way as indicated on the Environmental Alignment Sheets or directed by the Environmental Inspector(s) and Construction Manager. Spread evenly over right-of-way. Do not walk over access control rollback. (Refer to Appendix 1D Dwg. STDS-03-ML-05-313).
<i>Burn Piles</i>	30. Confirm burn piles are properly extinguished. Conduct infrared scanning of burn pile locations to locate any hot spots.
<i>Weed Control</i>	31. Implement Post-Construction Monitoring and treat weed infestation on the right-of-way and facility sites as needed.

9.0 POST-CONSTRUCTION MONITORING

Objectives

The objectives of post-construction monitoring are to:

- assess the success of mitigation measures implemented during construction;
- document opportunities for procedural learnings and improvement;
- reviewing the success of re-establishing equivalent land capability; and
- compare the predicted effects (including cumulative effects) and mitigation measures with actual documented effects.

Process

The Project will follow the Company's Post-Construction Monitoring Program (PCMP), which ensures compliance with specific reclamation performance expectations and conditions, as well as addresses the requirements of a follow-up program under the Canadian Environmental Assessment (CEA) Agency. Mitigation methods will be based on the principle that success of land reclamation is measured against adjacent representative site conditions while taking into consideration the status of reclamation at the time of assessment.

Preliminary assessments are conducted during the most appropriate time of the season, which depends on the various biophysical resources and their growth stage or life cycle. This is usually in the spring/summer, and involves identifying deficiencies and proposing recommendations for corrective actions.

The program may entail specifically designed evaluation criteria depending on the concerns and issues that were highlighted through the ESA, or encountered during the construction process. Seasonal influences and/or species life cycle or habitat periods may require evaluations to be conducted during specific periods throughout the year.

Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside this timing window due to environmental timing restrictions (reproductive periods, migration periods), field and weather conditions, or social and public concerns. A final assessment would then be scheduled for the fall, or as deemed appropriate to ensure the remedial actions are stable and successful.

Areas of potential terrain instability will be monitored for five years following construction. Slope stability will be inspected on a routine basis for the life of the pipeline. Remedial work will be conducted where warranted to protect pipeline integrity.

The right-of-way will be inspected during operations with regular aerial patrols after heavy snow melt or heavy, persistent rainfall to identify areas of erosion. Remedial work will be conducted where warranted to protect pipeline integrity in a timely manner.

Areas that are susceptible to erosion or difficult to revegetate (e.g., due to high salinity) will be identified, and records maintained of remedial measures implemented and the success of these measures. This information will be made available to construction Contractors and supervisors prior to and during operation and maintenance activities to allow implementation of adaptive mitigation strategies to reduce impacts on soil and soil productivity.

The Company will record locations of concerns identified during construction related to weeds, vegetation establishment, general right-of-way conditions, water crossing stability, and reclamation success. This issues list will be used to measure success of mitigation measures used during construction of the Project, and to ensure outstanding issues are investigated, resolved, and reported during the operation of the Project.

10.0 REFERENCES

10.1 Literature Cited

- Alberta Environment and Sustainable Resource Development. 2014. Species Assessed by Alberta's Endangered Species Conservation Committee. Updated July 4, 2014. Fish and Wildlife Policy Branch. Edmonton, AB. 2 pp.
- Alberta Environment. 2006. Fort McMurray Management Area. *Water Act* Code of Practice Management Area Maps.
- Alberta Sustainable Resource Development. 2012. Alberta Wild Species General Status Listing - 2010. Fish and Wildlife Division. Edmonton, AB. 242 pp.
- Alberta Tourism, Parks and Recreation. 2013. Parks and Protected Areas (including Crown Reservations). 1:1,000,00 map. Parks Division.
- Bird Studies Canada and Nature Canada. 2012. Important Bird Areas in Canada. Retrieved Accessed: December 2014, from Website: <http://www.ibacanada.com>.
- Committee on the Status of Endangered Wildlife in Canada. 2014. Wildlife Species Search: Database of Wildlife Species Assessed by the Committee of Endangered Wildlife in Canada. Website: http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm. Accessed: August 2016.
- Environment Canada. 2013. Map of Environment Canada's Protected Areas in Alberta. Website: <http://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=E6CF894D-1>. Accessed: August 2016.
- Fiera Biological Consulting Ltd. 2014a. Environmentally Significant Areas in Alberta: 2014 Update. Report prepared for the Government of Alberta. Fiera Biological Consulting Report Number 1305. Edmonton, AB. 51 pp.
- Fiera Biological Consulting Ltd. 2014b. Environmentally Significant Areas in Alberta: 2014 Update (digital files). Prepared by: S. Clare, G. Holloway, and S. Vukicevic. Prepared for the Government of Alberta. Fiera Biological Consulting Report Number 1305. Edmonton, AB. Pp. 51. Available: <http://albertaparks.ca/albertaparksca/library/environmentally-significant-areas-report.aspx>. Acquired: October 2014. Last Update Check: October 8, 2014.
- Fisheries and Wildlife Management Information System. 2013. Fish and Wildlife Division, Alberta Sustainable Resource Development. Area-specific search request and website.
- Fisheries and Wildlife Management Information System. 2014. Fish and Wildlife Division, Alberta Sustainable Resource Development. Area-specific search request and website: http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub. Accessed: August 2016.
- Government of Alberta. 2013. Integrated Standards and Guidelines – Enhanced Approval Process. December 1, 2013. 94 pp.
- National Wetland Working Group. 1997. The Canadian Wetland Classification System. Edited by B.G Warner and C.D.A. Rubec. Wetlands Research Centre, University of Waterloo. Waterloo, ON.
- The Ramsar Convention Secretariat. 2014. The Ramsar List: The List of Wetlands of International Importance. Gland, Switzerland. pp.47.
- Western Hemisphere Shorebird Reserve Network. 2013. Sites in the Western Hemisphere Shorebird Reserve Network. Retrieved Accessed: December 2014, from Website: <http://www.whsrn.org/sites/map-sites/sites-western-hemisphere-shorebird-reserve-network>.

10.2 GIS Data and Mapping References

This subsection includes citations from the figures accompanying this report.

Alberta Tourism, Parks and Recreation. 2012. Protected Areas (pashape_ocsites_10tm) (digital file). Edmonton, AB. Available: <http://albertaparks.ca/albertaparksca/library/downloadable-data-sets.aspx>. Acquired: February 2013. Last Update Check: November 7, 2014

Government of Canada. 2014. Aboriginal Lands, Canada (digital file). Edmonton, AB. Available: <http://www.geobase.ca>. Acquired: November 2014. Last Update Check: November 19, 2014.

IHS Inc. 2004. IHS Hydro Line Data (digital file). Calgary, AB. Received: via DVD, visit <http://www.ihs.com> for more info. Acquired: June 2011. Last Update Check: April 21, 2014.

IHS Inc. 2004. IHS Hydro Region Data (digital file). Calgary, AB. Received: via DVD, visit <http://www.ihs.com> for more info. Acquired: June 2011. Last Update Check: April 21, 2014.

Natural Resources Canada. 2014. National Road Network – Alberta (digital file). Sherbrooke, QC. Available: <http://www.geobase.ca/geobase/en/data/nrn/index.html>. Acquired: September 2014. Last Update Check: September 24, 2014.

Nova Gas Transmission Ltd. (NGTL). 2014. KP, Proposed routing (digital files). Calgary, AB. Received November 11, 2014.

NRCan. 2012. CanVec -Transportation - 1020009 Railway (digital file). Sherbrooke, QC. Available: <http://geogratis.cgdi.gc.ca/geogratis/en/download/topographic.html>. Acquired: June 2012. Last Update Check: November 2012.

TERA Environmental Consultants. 2008. Hillshade. Derived from Natural Resources Canada, Earth Sciences Sector, Centre for Topographic Information. 2000-2008. Canadian Digital Elevation Data 250k (digital files). Sherbrooke, QC. Available: <http://www.geobase.ca/geobase/en/data/cded/index.html>. Acquired: 2008. Last Update Check: December 2010.

APPENDIX 1A
EMERGENCY CONTACTS

Contact	Contact Information
Royal Canadian Mounted Police (RCMP) (Lac La Biche, AB)	911 or (780) 623-4012
Ambulance (Lac La Biche, AB)	911 or (780) 623-7640
Hospital (Lac La Biche, AB)	(780) 623-4404
Fire (Lac La Biche, AB)	(780) 623-6767
Alberta Energy Regulator (AER) – Bonnyville	(780) 826-5352
AEP Compliance Branch	(780) 422-4505
AEP Emergency/Complaint Hotline (24 hours)	1-800-222-6514 (24 hr) or 7378 (Telus mobile)
Alberta Forest Fire Reporting	310-3473
STARS Emergency Link Centre	1-888-888-4567 or *4567 (cell phone)
Environment Canada – General Inquiries	1-800-668-6767
DFO Fisheries Protection Program Contacts	
Alberta/Saskatchewan/Manitoba/Ontario/Nunavut/NWT	1-855-852-8320 FisheriesProtection@dfo-mpo.gc.ca
Provincial Wildlife Biologist - Christa McNevin	780-623-5365
Provincial Forest Officer - Jeff Bleach	780-623-5254
National Energy Board	1-800-899-1265
Transport Safety Board Emergency/Incident Line	1-819-997-7887

APPENDIX 1B

CONTACTS

Christa Kilbourne
Kettle River Lateral Loop Christina River Section
Project Manager
TransCanada PipeLines Limited
450 - 1st Street S.W.
Calgary, Alberta T2P 5H1
Phone: (587) 933-3151
Email: christa_kilbourne@transcanada.com

(TransCanada Project Manager)

Mike Wilfley
NGTL Lead Environmental Advisor
TransCanada PipeLines Limited
450 - 1st Street S.W.
Calgary, Alberta T2P 5H1
Phone: (403) 920-7731
Email: barbara_taylor@transcanada.com

(TransCanada Environmental Contact)

Joanne Berezan
CH2M
1100, 815 – 8th Avenue S.W.
Calgary, Alberta, T2P 3P2
Phone: (403) 930-8813
Fax: (403) 266-6471
Email: Joanne.Berezan@ch2m.com

(Environmental Consultant)

Steve Kasstan
Archaeology and Regulatory Reporting Manager
CH2M1100, 815 – 8th Avenue S.W.
Calgary, AB T2P 3P2
Phone: (403) 930-8653
Fax: (403) 266-6471
Email: Steve.Kasstan@ch2m.com

(Heritage Resource Contact)

Environment Canada – Alberta Office
4999 - 98th Avenue, Room 200
Edmonton, Alberta T6B 2X3
Phone: (780) 951-8600
Fax: (780) 495-2615
Email: enviroinfo@ec.gc.ca

(General Environment Canada Contact)

Fisheries and Oceans Canada – Edmonton Office
1028 Parsons Road S.W.
Edmonton, Alberta T6X 0J4
Phone: (780) 495-4220
Fax: (780) 495-8606
Email: ReferralsEdmonton@dfo-mpo.gc.ca

(DFO Representative: Notify in event that
Contingency Water Crossing Measures or
Emergency works are to be implemented)

Martina Purdon
Head, Archaeological Information and Regulatory
Approvals
Alberta Culture and Tourism
2nd floor, Provincial Building
Old St. Stephens College
8820 – 112th Street N.W.
Edmonton, Alberta T6G 2P8
Phone: (780) 431-2331:
Email: martina.purdon@gov.ab.ca

(In Case of Discovery of Archaeological,
Palaeontological or Historical Site)

Jeff Bleach
Forest Officer
Alberta Environment and Parks
Box 450
2nd Floor – 9503 Beaverhill Road
Lac La Biche, Alberta T0A 2C0
Phone: (780) 623-5254
Email: jeff.bleach@gov.ab.ca

(Public Lands Representative - Alberta)

Christa MacNevin
Senior Wildlife Biologist
Regional Resource Management
Alberta Environment and Parks
Box 959
2nd fl Provincial Building
9503 Beaverhill Road
Lac La Biche, Alberta
Phone: 780-623-5365
Email: Christa.MacNevin@gov.ab.ca

(Fish and Wildlife Representative - Alberta)

Leland Stone
Agricultural Fieldman
Regional Municipality of Wood Buffalo
9099 Franklin Avenue
Fort McMurray, Alberta T9H 2K4
Phone: (780) 592-0032

(In the event of weed or disease concerns)

Alberta Environmental Hotline
Phone: 1-800-222-6514

(In the Event of a Spill)

APPENDIX 1C

APPROVALS/PERMITS POTENTIALLY REQUIRED FOR PIPELINE DEVELOPMENT

FEDERAL Approval/Permit

Issuing Agency

Certificate of Public Convenience and Necessity/Leave to Construct/Leave to Open	NEB
Water Crossings	
<i>Navigation Protection Act</i> approval (vehicle crossings of all navigable watercourses or pipeline crossings of large watercourses only)	TC (NEB)
Authorization under Section 35 under the <i>Fisheries Act</i>	DFO (NEB)

ALBERTA Permit/License

Issuing Agency

Surface Rights	LFD
- Pipeline Agreement (PLA)	
Water Crossings	WM
- Notification under the <i>Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body</i>	
- Notification under the <i>Code of Practice for Watercourse Crossings</i>	WM
- Notification or Registration under the Codes of Practice for withdrawal of water for hydrostatic testing and release of water following hydrostatic testing	RS, WM
- Fish Collection Permit for salvage of fish at isolated crossings	F&W
<i>Historical Resources Act</i> Clearance	ACT
Road Crossing Permit	AT/MD/FMA
Burning Permit	LFD/CTY
Wildlife Damage Permit (beaver and beaver dam removal)	F&W
Master Land Withdrawal and Consent Agreement	FMA Holder

For more information, see *Environmental Operating Practices for the Upstream Petroleum Industry Alberta Operations - Pipelines Volume* by the Canadian Association of Petroleum Producers (1999).

ACT	=	Alberta Culture and Tourism
AT	=	Alberta Transportation
CTY	=	County of Fort McMurray
DFO	=	Fisheries and Oceans Canada
F&W	=	Fish and Wildlife, Alberta Sustainable Resource Development
FMA Holder	=	Alpac Forest Products Incorporated
LFD	=	Public Lands and Forests Division, Alberta Environment and Parks
MD	=	Municipal District of Wood Buffalo
NEB	=	National Energy Board
TC	=	Transport Canada
RS	=	Regional Services, Alberta Environment and Parks
WM	=	Water Management, Regional Services, Alberta Environment and Parks

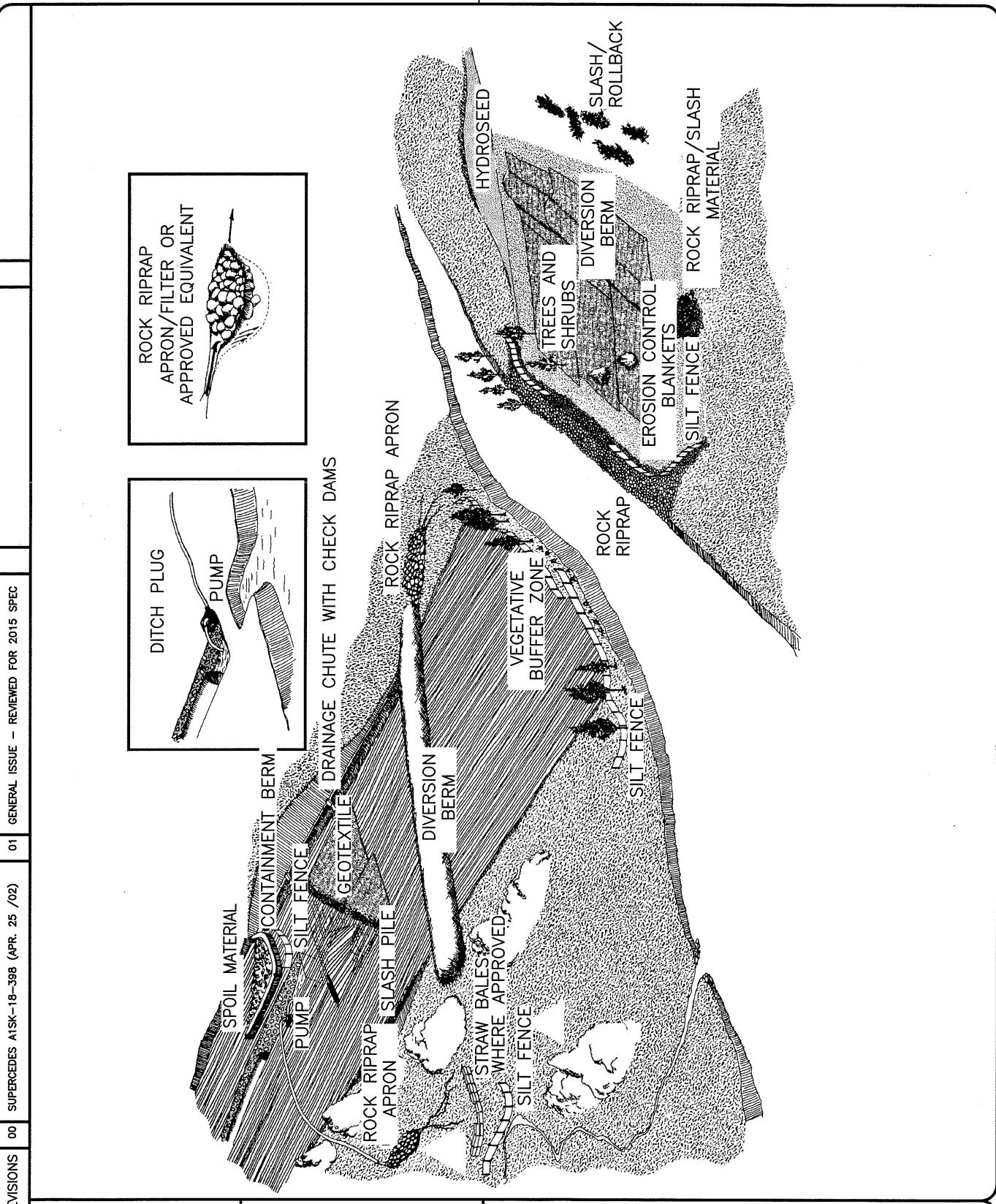
APPENDIX 1D

TYPICAL DRAWINGS

<u>Drawing Number</u>	<u>Title</u>
STDS-03-ML-05-001	Typical Erosion and Sediment Control Measures
STDS-03-ML-05-101	Temporary Clear Span Bridge Crossing
STDS-03-ML-05-103	Pipeline Vehicle Crossing – Culvert with Native Fill Material
STDS-03-ML-05-104	Temporary Snowfill/Ice Bridge Crossing
STDS-03-ML-05-105	Typical Open Cut Watercourse Crossings
STDS-03-ML-05-111	Flume Water Course Crossings
STDS-03-ML-05-112	Dam and Pump Water Course Crossings
STDS-03-ML-05-131	Soil Retaining Berm
STDS-03-ML-05-132	Sediment Control – Silt Fence Construction
STDS-03-ML-05-137	Sediment Control – Check Dam / Filter
STDS-03-ML-05-301	Timber Salvage Quality and Defects
STDS-03-ML-05-302	Salvage of Merchantable Timber
STDS-03-ML-05-312	Typical Rollback for Access Control
STDS-03-ML-05-313	Typical Rollback for Erosion Control
STDS-03-ML-05-445	Frozen Forested Lands Right-of-Way Preparation (Minimal Surface Disturbance)
STDS-03-ML-05-446	Non-Frozen Forested Lands Surface Materials/Stripping Conservation
STDS-03-ML-05-603	Streambank Reclamation – Logwall
STDS-03-ML-05-604	Streambank Reclamation – Brush Layer in Cross Cut Slope
STDS-03-ML-05-606	Streambank Reclamation – Vegetated Geotextile Installation
STDS-03-ML-05-608	Streambank Reclamation – Erosion Protection
STDS-03-ML-12-202	Typical Bentonite Ditch Plug
STDS-03-ML-12-203	Typical Bentonite Ditch Plug Using Nudrain or Equivalent
STDS-03-ML-12-204	Typical Polyurethane Foam Breaker
STDS-03-ML-12-211	Typical Subdrain Using Gravel
STDS-03-ML-12-212	Typical Subdrain
STDS-03-ML-12-221	Typical Diversion Berm
STDS-03-ML-12-222	Typical Diversion Berm with Flow Channel

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FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE		TYPICAL EROSION AND SEDIMENT CONTROL MEASURES	
SCALE N.T.S.	DWG No	STDS-03-ML-05-001	REV 01

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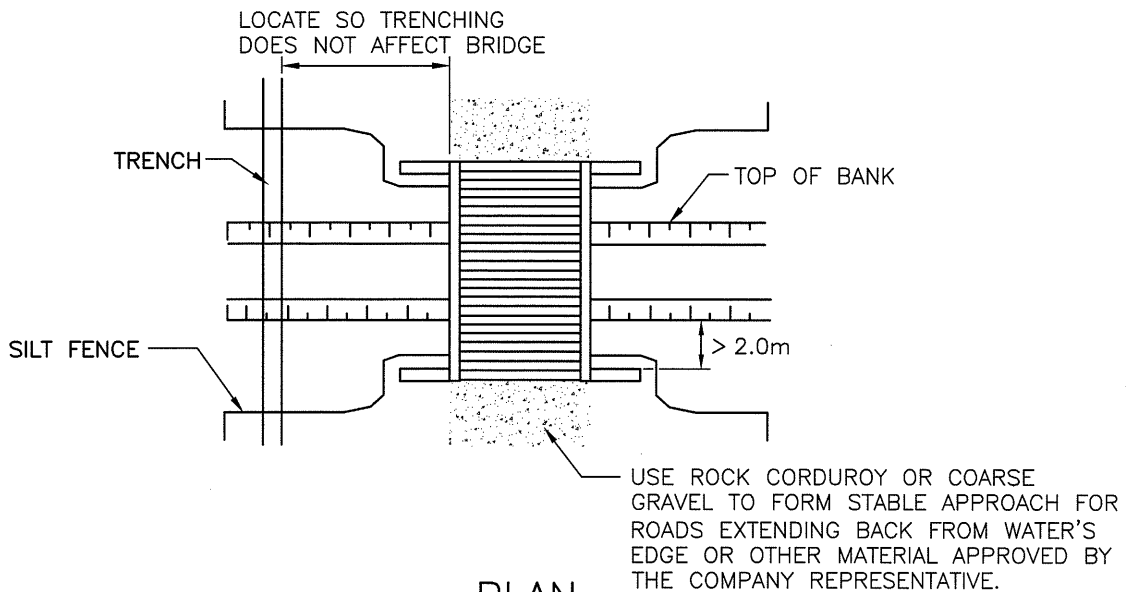
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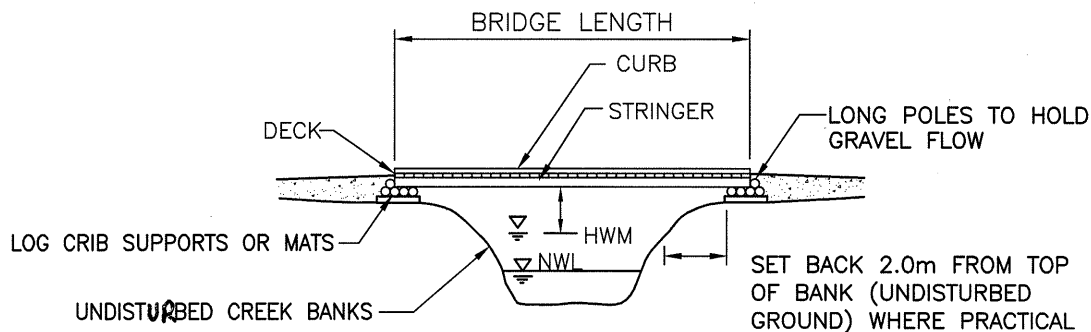
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BRIDGE PROFILE
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STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TEMPORARY CLEAR SPAN BRIDGE CROSSINGS
(SHEET 1 OF 3)

SCALE

N.T.S.

DWG No

STDS-03-ML-05-101

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TITLE

TEMPORARY CLEAR SPAN BRIDGE CROSSINGS
(SHEET 2 OF 3)

SCALE

N.T.S.

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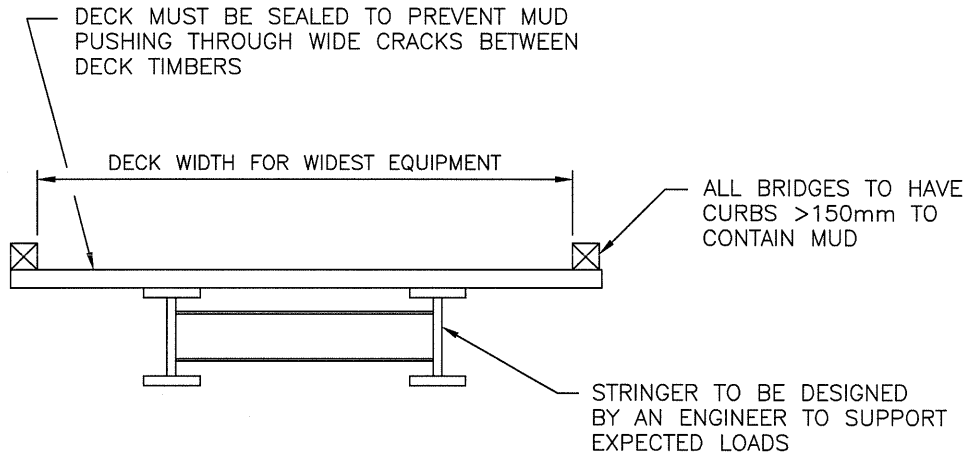
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TYPICAL STEEL BRIDGE SECTION

SCALE: N.T.S.

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DETAILED CONSTRUCTION SEQUENCE – TEMPORARY BRIDGES

THE FOLLOWING SEQUENCE OF CONSTRUCTION AND MITIGATION MEASURES WILL BE FOLLOWED AT ALL TEMPORARY CLEAR SPAN BRIDGES:

1. MEASURE THE APPROXIMATE BRIDGE LENGTH REQUIRED TO SPAN FROM BANK TO BANK. A MINIMUM 2.0m SETBACK FROM TOP OF BANK MUST BE PRESERVED AS A "NO DISTURBANCE AREA, WHERE PRACTICAL.
2. INSTALL THE BRIDGE TO MINIMIZE DISTURBANCE TO STREAMBANK AND VEGETATION WITHIN THE MINIMAL DISTURBANCE AREA. STRINGERS MUST BE ENGINEERED TO SUPPORT THE LOADS EXPECTED ON THE BRIDGE. CURBS MUST BE INSTALLED WITH A MINIMUM OF 150mm HIGH ALONG THE EDGE OF THE DECK TO CONTAIN MUD ON THE BRIDGE. FASTENERS CONNECTING COMPONENTS MUST BE STRONG TO HOLD THEM IN POSITION DURING THE LIFE OF THE BRIDGE. CRIBS ARE TO BE FILLED WITH ROCK OR COBBLE. RIP RAP EROSION PROTECTION IS TO BE PLACED AROUND THE CRIBS AND ON THE FILL SLOPES PROJECTING INTO THE WATER, WHERE INSTREAM WORK IS APPROVED BY THE COMPANY.
3. AN IMPERMEABLE MEMBRANE SUCH AS PLASTIC SHEETING, GEOTEXTILE AND OR PLYWOOD SHALL BE REQUIRED TO PREVENT DIRT AND DEBRIS FROM ENTERING INTO THE WATER BODY.
4. ROAD APPROACHES LEADING TO BRIDGE AND FLUME VEHICLE CROSSINGS MUST BE RAISED AND STABLE SO EQUIPMENT LOADS ARE SUPPORTED A SUFFICIENT DISTANCE BACK FROM THE WATER TO REDUCE MUD ENTERING THE STREAM FROM EQUIPMENT TRACKS. THIS MAY REQUIRE USING MATERIALS SUCH AS GRAVEL, ROCK OR CORDUROY. IF CUTS ARE NEEDED TO OBTAIN A SATISFACTORY GRADE, THEY ARE TO BE DUG WITH SIDE DITCHES AND STABLE SLOPES, AND ONLY WHERE APPROVED BY THE COMPANY. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED TO KEEP SEDIMENT ON LAND (E.G., CHECK DAMS, FILTER CLOTH, RIP RAP, SEED AND MULCH, SEDIMENT TRAPS, ETC.)
5. WHILE THE BRIDGE IS IN USE, ANY BUILDUP OF MUD ON THE BRIDGE DECK OR APPROACHES THAT IS AFFECTING WATER QUALITY IS TO BE SCRAPED OFF AND DISPOSED OF MORE THAN 30m FROM THE WATER.
6. TEMPORARY CROSSINGS SHALL BE REMOVED AS QUICKLY AS POSSIBLE WHEN NO LONGER REQUIRED. REMOVAL SHALL NOT OCCUR OUTSIDE THE CONSTRUCTION WINDOWS. WHERE APPROVED BY THE COMPANY, SURPLUS GRAVEL IS TO BE SPREAD ON THE RIGHT-OF-WAY AS GRAVEL SHEETING, IF GRADATION IS SUITABLE, OR MOVED MORE THAN 30m FROM WATER FOR DISPOSAL. BRIDGE MATERIALS ARE TO BE REMOVED FROM THE CROSSING AREA. THE CREEK BED AND BANKS ARE TO BE RESTORED TO A STABLE SLOPE AND PROTECTED WITH EROSION RESISTANT MATERIAL COMPATIBLE WITH FLOW VELOCITY

SIZING OF WATER OPENING

IT IS IMPORTANT THAT THE SIZE OF THE WATER OPENING BE SELECTED SO THE STRUCTURE CAN SAFELY PASS FLOOD FLOWS THAT CAN REASONABLY BE EXPECTED TO OCCUR DURING THE LIFE OF THE CROSSING.

- (a) INSTALL A BRIDGE THAT CLEAR SPANS THE CREEK FROM TOP OF BANK TO TOP OF BANK (AS SHOWN) AND WITH A CLEARANCE ABOVE THE ANNUAL HIGH WATER MARK.
- (b) A HYDROLOGY ANALYSIS MAY BE REQUIRED TO DETERMINE THEORETICAL OPENING SIZE. REFER TO APPLICABLE DRAWINGS FOR REQUIREMENTS.

GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF THE PORTABLE BRIDGE OR OTHER STRUCTURE BASED ON REGULATORY CONDITIONS, COMPANY DRAWINGS AND OTHER APPLICABLE REQUIREMENTS.
2. MATS MAY BE USED IN THE PLACE OF A LOG CRIB TO PROPERLY SUPPORT BRIDGE ENDS AND TO CONTAIN RAMP MATERIAL.



DESIGNER:

David R. King June 15, 2015
NAME DATE

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FIA # STDS CHAINAGE: DISCIPLINE # 03

TITLE

TEMPORARY CLEAR SPAN BRIDGE CROSSINGS
(SHEET 3 OF 3)

SCALE N.T.S.

DWG No

STDS-03-ML-05-101

REV 01

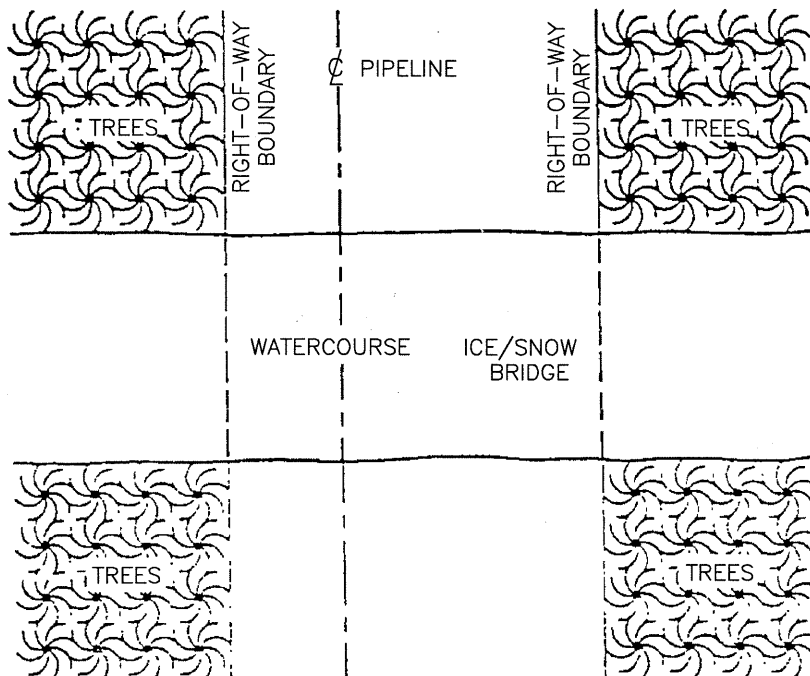
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PLAN VIEW

NOTES:

1. INSTALL ICE/SNOW BRIDGES ON WINTER PROJECTS WHEN A SAFE ICE THICKNESS CAN BE MAINTAINED.
2. LOCATE BRIDGES AT SITES WITH GENTLY SLOPING BANKS TO MINIMIZE CUTS IN WATERCOURSE BANKS. USE SNOW AND ICE TO SLOPE APPROACHES, RATHER THAN CUT BANKS.
3. FLOOD ICE SURFACE WITH WATER AND COVER WITH SNOW TO INCREASE LOAD BEARING CAPACITY. BREACH ICE BRIDGE BY PHYSICAL MEANS PRIOR TO SPRING BREAK-UP.
4. ICE/SNOW BRIDGE SHALL BE CONSTRUCTED WITH A MINIMUM OF 150mm ICE/SNOW CURB TO PREVENT MATERIAL FROM ENTERING THE WATERCOURSE. THE CURB MUST BE MAINTAINED THROUGH OUT CONSTRUCTION.
5. ICE BRIDGES SHOULD NOT INTERFERE OR IMPEDE WITH FLOW OF WATERCOURSE.
6. MAINTAIN ICE REGULARLY AND REMOVE ALL DEBRIS FROM ICE SURFACE.
7. RESTORE AND STABILIZE BANKS AND APPROACHES PRIOR TO SPRING RUN-OFF, AS REQUIRED.



DESIGNER:

David B. King June 16, 2015
NAME DATE

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FIA # STDS

CHAINAGE:

DISCIPLINE # 03

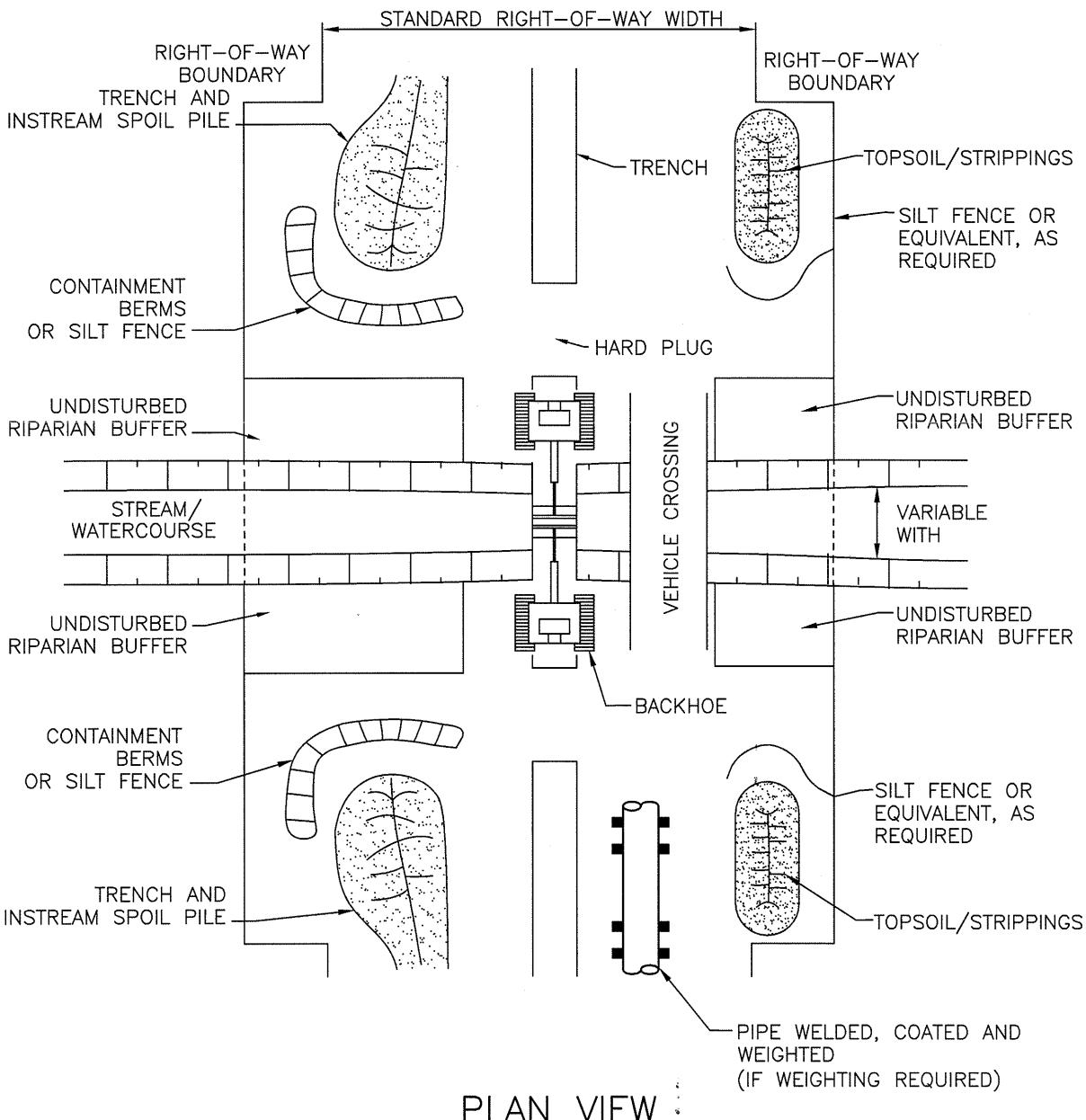
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SCALE N.T.S.

DWG No

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PLAN VIEW

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TITLE		TYPICAL OPEN CUT WATERCOURSE CROSSINGS (SHEET 1 OF 2)	
SCALE N.T.S.	DWG No	STDS-03-ML-05-105	REV 00

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TIME DESIGNFILE

NOTES:

1. SCHEDULE INSTREAM ACTIVITY FOR LOW FLOW PERIODS AND FOR THE APPROPRIATE TIMING WINDOW.
2. INSTALL APPROVED VEHICLE CROSSING.
3. LEAVE HARD PLUGS AT END OF STANDARD TRENCH.
4. COMPLETE FABRICATION OF THE INSTREAM PIPE SECTION WEIGHT AND PRETEST PIPE IF REQUIRED PRIOR TO COMMENCEMENT OF INSTREAM ACTIVITY.
5. TRENCH THROUGH WATERCOURSE RETAINING HARD PLUGS AT EACH BANK UNTIL JUST PRIOR TO PIPE INSTALLATION.
6. STOCKPILE ALL INSTREAM SPOIL ON BANKS WITHIN DESIGNATED AREA. IF NECESSARY TO CONTROL WATER FLOW AND TRENCH SLOUGHING, INSTALL TEMPORARY SOFT PLUGS AND DEWATER TRENCH ONTO STABLED VEGETATED LAND, NOT DIRECTLY TO WATERCOURSE.
7. CONSTRUCT BERM TO PREVENT SATURATED SPOIL FROM FLOWING BACK INTO STREAM. MAINTAIN STREAMFLOW, IF PRESENT, THROUGHOUT CROSSING CONSTRUCTION.
8. INSTALL PIPE AND BACKFILL IMMEDIATELY. RESTORE STREAM CHANNEL TO APPROXIMATE PRECONSTRUCTION PROFILE.
9. ATTEMPT TO COMPLETE ALL INSTREAM ACTIVITY WITHIN 24 HOURS, UNLESS OTHERWISE APPROVED BY THE COMPANY.
10. RESTORE AND STABILIZE STREAM BANKS AND APPROACHES TO AS CLOSE TO ORIGINAL GRADE AS POSSIBLE. INSTALL BANK PROTECTION, AS REQUIRED.
11. IN ALL WATERCOURSES, EXCAVATED MATERIALS SHALL BE REMOVED TO A POINT OUT OF WATER, EXCEPT WHERE OTHERWISE APPROVED BY THE COMPANY.
12. RIPARIAN BUFFER WIDTH MAY VARY BASED ON APPROVALS. THE BUFFER SHALL REMAIN UNDISTURBED, UNLESS APPROVED BY THE COMPANY.
13. THE CONTRACTOR SHALL PROVIDE A DETAILED WATERCOURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

STANDARD ISSUE 2015-06-03

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REVISIONS



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DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TYPICAL OPEN CUT
WATERCOURSE CROSSINGS
(SHEET 2 OF 2)

SCALE N.T.S.

DWG No

STDS-03-ML-05-105

REV 00

TC_A4_EE.DWG 210X280

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REVISIONS	00	STANDARD ISSUE, SUPERCEDES SK-1396 (1)	01	GENERAL ISSUE - REVIEWED FOR 2015 SPEC
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RIGHT-OF-WAY
BOUNDARY

TRAVELSIDE
OF ROW

TO APPROVED
VEGETATED AREA OR
WATER CONTAINMENT SUMP
(EITHER SIDE OF ROW)

FLUME SEALS
CONSTRUCTED WITH
APPROVED MATERIAL

FLUME WITH
FLANGE WINGS

BRIDGE
SPAN

WING WALL

TO APPROVED
VEGETATED AREA OR
WATER CONTAINMENT SUMP
(EITHER SIDE OF ROW)

RIGHT-OF-WAY
BOUNDARY

EXCAVATION

DITCH PUMP

HOSE

TO APPROVED
VEGETATED AREA OR
WATER CONTAINMENT SUMP
(EITHER SIDE OF ROW)

FLUME WITH
FLANGE WINGS

BRIDGE
SPAN

WING WALL

TO APPROVED
VEGETATED AREA OR
WATER CONTAINMENT SUMP
(EITHER SIDE OF ROW)

EXCAVATION

DITCH PUMP

HOSE

FLUME SEALS
CONSTRUCTED WITH
APPROVED MATERIAL

FLUME WITH
FLANGE WINGS

BRIDGE
SPAN

WING WALL

TO APPROVED
VEGETATED AREA OR
WATER CONTAINMENT SUMP
(EITHER SIDE OF ROW)

FRONT VIEW OF FLUME FACE (UPSTREAM)

2.4m (8')-TYPICAL

VARIABLE LENGTH
AND ANGLE

FLANGE
WING

AT LEAST
1.5 TIMES
DIAMETER
OF PIPE

VARIABLE DIAMETER
MINIMUM OF 25cm BETWEEN
BOTTOM OF FLANGE
AND BOTTOM OF PIPE

NORMAL RIGHT-OF-WAY
BOUNDARY

SPOIL
RETAINING
BERM/AND
FENCE
(IF
REQUIRED)

SPOIL
CONTAINMENT SUMP
(EITHER SIDE OF ROW)

SUBSOIL

RIPARIAN BUFFER
10m MINIMUM

BANK

FLANGE WITH
FLANGE
WINGS

BANK

RIPARIAN BUFFER
10m MINIMUM

SUBSOIL

SPOIL
CONTAINMENT SUMP
(EITHER SIDE OF ROW)

SUBSOIL

SPOIL
RETAINING
BERM

VARIABLE
DIMENSIONS



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FIA # STDS CHAINAGE: DISCIPLINE # 03

TITLE
FLUME WATERCOURSE CROSSINGS
(SHEET 1 OF 3)

SCALE N.T.S. DWG No STDS-03-ML-05-111 REV 01

APPLICATION:

FLUME OPERATIONS WILL BE REQUIRED ON STREAMS WHERE FLOW MUST BE MAINTAINED AND SILTATION MUST BE MINIMIZED TO PREVENT IMPACT ON FISH POPULATIONS AND DOWNSTREAM USERS. FLUME INSTALLATIONS WILL ALSO BE CONSIDERED WHERE MAINTENANCE OF FLOW IS THE ONLY REQUIREMENT.

THE FOLLOWING SPECIFICATIONS AND PROCEDURES ARE GENERAL REQUIREMENTS FOR INSTALLATION OF FLUMED WATERCOURSE CROSSINGS WHICH ARE TO BE APPLIED UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.

SPECIFICATIONS:

1. FLUMING OPERATIONS WILL BE COMBINED WITH A BRIDGED VEHICLE CROSSING. CULVERT AND GRADE INSTALLATIONS WILL BE CONSIDERED FOR STREAMS HAVING A LOWER SENSITIVITY.
2. FLUME LENGTH WILL SPAN FROM THE SPOIL SIDE EDGE OF THE RIGHT-OF-WAY TO THE SPOIL SIDE EDGE OF THE VEHICLE CROSSING, OR TO THE WORK SIDE EDGE OF THE RIGHT-OF-WAY IN THE CASE OF A GRADE MATERIAL VEHICLE
3. BASED ON EXPECTED STREAM FLOWS; FLUME CAPACITY WILL BE RECOMMENDED BY THE CONTRACTOR FOR DIAMETER AND NUMBER OF PIPES REQUIRED. THE REQUIREMENTS MAY BE ADJUSTED BY THE COMPANY IN THE FIELD IN CONSULTATION WITH THE CONTRACTOR AND AUTHORITIES.
4. FLANGES WILL BE REQUIRED ON BOTH ENDS OF THE FLUME. THE FLANGES WILL BE CONSTRUCTED OUT OF STEEL AND MUST BE OF A THICKNESS AND DIMENSION TO WITHSTAND SITE BED AND BANK CONDITIONS, AS WELL AS FLUCTUATIONS IN WATERCOURSE FLOW CONDITIONS. REQUIREMENTS FOR LARGER FLANGES OR FLANGE WINGS WILL BE PRE-SPECIFIED OR DETERMINED BY THE COMPANY IN THE FIELD DURING CONSTRUCTION. CONTRACTOR MUST BE PREPARED TO CONSTRUCT THE FLUME ON SITE.
5. FLUMES MUST BE CONSTRUCTED OF STEEL PIPE OR OTHER MATERIAL APPROVED BY THE COMPANY. CORRUGATED CULVERT IS UNACCEPTABLE.
6. BOTH ENDS OF THE FLUME WILL BE SEALED USING APPROVED COMBINATIONS OF WASHED ROCK, PLASTIC SHEETING, FILTER CLOTH, AND SANDBAGS. IF LOOSE MATERIALS ARE USED TO CREATE THE SEALS, THE FLUME SEALS MUST BE A MINIMUM OF 2 METRES THICK AND EXTEND FROM BANK TOP TO BANK TOP, OR A MINIMUM OF 1 METRE ABOVE WATER LEVEL. IF SANDBAGS ARE USED THE FLUME SEALS MUST BE A MINIMUM OF 1 METRE THICK AND EXTEND FROM BANK TOP TO BANK TOP. IF PLASTIC SHEETING OR FILTER CLOTH ARE SPECIFIED THEY MUST BE LAID OVER BOTH SIDES OF BOTH FLUME SEALS. THE GOAL IS TO PREVENT CLEAN SURFACE WATER FROM ENTERING THE EXCAVATION AND PREVENT SILTED WATER FROM LEAVING THE EXCAVATION.
7. CONTRACTOR SHALL CONSTRUCT SUMPS WHEN DIRECTED BY THE COMPANY TO CONTAIN EXCAVATED MATERIAL AND/OR SILT LADEN WATER PUMPED FROM THE TRENCH. TOPSOIL OR ORGANICS SHALL BE REMOVED AND CONSERVED PRIOR TO EXCAVATION OF SUMPS. THE SUMPS SHALL BE SIZED TO CONTAIN ALL EXCAVATED MATERIAL, AND ALLOW PUMPING OF THE TRENCH WITHOUT ANY DOWNSTREAM SILTATION.
8. THE CONTRACTOR MUST HAVE PUMPS OF SUFFICIENT CAPACITY ON SITE TO PUMP OUT THE EXCAVATION TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. BACK UP PUMPS TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR MUST HAVE SUFFICIENT LEAK FREE HOSE ON SITE TO PUMP THE EXCAVATION WATER TO ANY LOCATION IN PROXIMITY TO THE FLOODPLAIN OF THE CROSSING SPECIFIED BY THE COMPANY. THIS IS TO FACILITATE SETTLEMENT AND FILTRATION OF THE SILTED WATER BEFORE IT RE-ENTERS THE STREAM. FLOW DISSIPATERS WILL BE REQUIRED AT THE DISCHARGE END OF ALL HOSES TO PREVENT FURTHER SILTATION AND EROSION.
9. CONTRACTOR WILL BE RESPONSIBLE FOR SUPPLY AND DELIVERY OF ALL MATERIALS TO THE SITE.
10. FISH SALVAGE WILL BE CONDUCTED AS REQUIRED IN ISOLATED AREA AFTER FLUME IN PLACE, AND PRIOR TO DEWATERING AND TRENCHING.
11. SIGNAGE WILL BE INSTALLED PER NAVIGATION PROTECTION ACT, AND OTHER REGULATIONS AND PROGRAMS, WHERE APPLICABLE.

GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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STANDARD ISSUE, SUPERCEDES SK-1396 (1)

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03

TITLE

FLUME WATERCOURSE CROSSINGS
(SHEET 2 OF 3)

SCALE N.T.S.

DWG No

STDS-03-ML-05-111

REV 01

PROCEDURES:

1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE OF THE RIGHT-OF-WAY TO ALLOW FOR A WIDE EXCAVATION.
2. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.
3. GRADE THE BANKS OF THE WATER CROSSING AND PREPARE THE SPOIL CONTAINMENT AREAS.
4. CONSTRUCT THE FLUME WITH CORRECT FLANGES AND FLANGE WINGS. COMPLETE WELDING, COATING, AND WEIGHTING (PRESSURE TESTING OF DRAG SECTION, IF APPLICABLE) OF THE WATERCOURSE PIPE SECTION.
5. BEGINNING IN THE EARLY MORNING, INSTALL THE FLUME IN THE STREAM CHANNEL USING APPROVED SEALING TECHNIQUES. PERFORM FISH SALVAGE AS DIRECTED, THEN DEWATER THE AREA BETWEEN THE FLANGE WINGS.
6. EXCAVATE THE TRENCH AS QUICKLY AS POSSIBLE PLACING SPOIL OUT OF THE STREAM CHANNEL. CREATE SPOIL CONTAINMENT SUMPS IF NECESSARY TO KEEP SPOIL FROM FLOWING BACK INTO THE STREAM CHANNEL.
7. PUMP EXCAVATION AS REQUIRED TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. DIRECT THE PUMPED WATER INTO VEGETATED AREAS WELL BACK FORM THE WATERCOURSE. CONSTRUCT WATER CONTAINMENT SUMPS.
8. INSTALL PIPE.
9. BACKFILL THE STREAM CHANNEL FIRST PUSHING THE SILTED WATER INTO THE BANK EXCAVATIONS, WHERE PRACTICAL. PUMP OR DRAIN THE EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING AS REQUIRED. CONSTRUCT WATER CONTAINMENT SUMPS IF NECESSARY.
10. COMPLETE BACKFILL
11. RE-ESTABLISH THE BED AND BANKS OF THE STREAM CHANNEL.
12. REMOVE THE DOWNSTREAM SEAL MATERIALS.
13. REMOVE THE UPSTREAM SEAL MATERIALS.
14. REMOVE THE FLUME.

NOTE:

THE CONTRACTOR SHALL PROVIDE A DETAILED WATERCOURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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STANDARD ISSUE, SUPERCEDES SK-1396 (1)

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03

TITLE

FLUME WATERCOURSE CROSSINGS
(SHEET 3 OF 3)

SCALE N.T.S.

DWG No

STDS-03-ML-05-111

REV 01



APPLICATION:

DAM AND BYPASS PUMPING OPERATION WILL BE APPLIED ON STREAMS HAVING A LOW FLOW RATE. THE PRIME CONSIDERATION WILL BE MAINTENANCE OF DOWNSTREAM FLOW.

DAM AND PUMP INSTALLATIONS MAY ALSO BE CONSIDERED FOR ANY STREAM WHERE FLUMES ARE PREVENTED BY PIPE BEND AND TIE-IN CONSTRAINTS. THE FOLLOWING SPECIFICATION AND PROCEDURES ARE GENERAL REQUIREMENTS FOR DAM AND PUMP INSTALLATIONS AND SHOULD TO BE APPLIED UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENT.

SPECIFICATIONS:

1. DAM AND BYPASS OPERATIONS MAY BE COMBINED WITH CULVERT AND GRADE VEHICLE CROSSINGS. OTHER APPROVED BRIDGING TECHNIQUES WILL BE USED IN PLACE OF CULVERT AND GRADE ON STREAMS HAVING GREATER SENSITIVITY.
2. BYPASS PUMPING UNIT MUST BE CAPABLE OF HANDLING 150% OF MAXIMUM SPECIFIED STREAM FLOW DURING THE PERIOD OF INSTALLATION FOR SUMMER CONSTRUCTION, AND 110% FOR WINTER CONSTRUCTION. A BACKUP UNIT OF EQUAL CAPACITY MUST BE INSTALLED IN CASE OF MAIN PUMP FAILURE.
3. PUMPS MUST BE MANNED CONTINUOUSLY UNTIL OPERATION IS COMPLETE (24 HRS/DAY).
4. PUMPS AND FUEL SUPPLY MUST BE PLACED IN A PLASTIC/IMPERMEABLE LINED BERMED AREA TO CONTAIN ACCIDENTAL SPILLS.
5. BYPASS PUMP INTAKE MUST HAVE A 2.54mm SIEVE TO PROTECT FISHERIES RESOURCES.
6. DAMS WILL BE CONSTRUCTED AS REQUIRED USING APPROVED COMBINATIONS OF AQUA DAM, STEEL PLATES, SHEET PILING, WASHED ROCK, PLASTIC SHEETING, FILTER CLOTH AND SANDBAGS. IF LOOSE MATERIALS ARE USED TO CREATE THE DAMS, THE DAMS MUST BE A MINIMUM OF 2 METERS THICK, UNLESS OTHERWISE APPROVED, AND EXTEND FROM BANK TOP TO BANK TOP. IF SANDBAGS ARE USED TO CREATE THE DAMS, THE DAMS MUST BE A MINIMUM OF 1 METER THICK AND EXTEND FROM BANK TOP TO BANK TOP, OR AS APPROVED BY THE COMPANY. IF PLASTIC SHEETING OR FILTER CLOTH ARE SPECIFIED, THEY MUST BE LAID OVER BOTH SIDES OF BOTH DAMS. THE GOAL IS TO PREVENT CLEAN SURFACE WATER FROM ENTERING THE EXCAVATION AND TO PREVENT SILTED WATER FROM LEAVING THE EXCAVATION. THE LEVEL OF EXISTING WATER COURSE SILTATION WILL BE CONSIDERED/MEASURED AT THE START OF CONSTRUCTION.
7. CONTRACTOR MUST HAVE SUFFICIENT LEAK FREE HOSE OR PIPE ON SITE AND INSTALLED TO BYPASS PUMP AROUND THE EXCAVATION AND/OR THROUGH THE EXCAVATION. THE CONTRACTOR SHALL ALSO INSTALL BACK-UP HOSES AND/OR PIPE TO ENSURE FLOW IS MAINTAINED IN THE EVENT OF A BYPASS FAILURE.
8. THE BYPASS PUMP DISCHARGE HOSE MUST BE EQUIPPED WITH FLOW DISSIPATORS AND PLACED IN SUCH A MANNER THAT PREVENTS FURTHER EROSION AND SILTATION DOWNSTREAM OF THE DAM AND PUMP INSTALLATION.
9. THE CONTRACTOR MUST HAVE AT LEAST TWO PUMPS ON SITE OF SUFFICIENT CAPACITY TO PUMP OUT THE EXCAVATION TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. BACKUP PUMPS MUST BE SUPPLIED BY THE CONTRACTOR. SUFFICIENT LEAK FREE HOSE MUST BE ON SITE TO PUMP THE EXCAVATION WATER TO ANY LOCATION IN PROXIMITY TO THE FLOODPLAIN OF THE CROSSING. THIS IS TO FACILITATE SETTLEMENT AND FILTRATION OF THE SILTED WATER BEFORE IT RE-ENTERS THE STREAM. CONTRACTOR MUST ALSO BE PREPARED TO CREATE SUMPS FOR SILTATION SETTLING. FLOW DISSIPATORS WILL BE REQUIRED AT THE DISCHARGE END OF ALL HOSES TO PREVENT FURTHER SILTATION AND EROSION DOWNSTREAM OF THE DAM AND PUMP INSTALLATION.
10. CONTRACTOR WILL BE RESPONSIBLE FOR SUPPLY AND DELIVERY OF ALL MATERIALS TO THE SITE.
11. FISH SALVAGE WILL BE CONDUCTED AS REQUIRED IN ISOLATED AREA AFTER DAM AND PUMP IN PLACE, AND PRIOR TO TRENCHING.
12. SIGNAGE WILL BE INSTALLED AS PER NAVIGATION PROTECTION ACT AND OTHER REGULATIONS AND PROGRAMS WHERE APPLICABLE.



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03

TITLE

TYPICAL DAM AND PUMP
WATER COURSE CROSSING
(SHEET 2 OF 3)

SCALE N.T.S.

DWG No

STDS-03-ML-05-112

REV 01

PROCEDURE:

1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE OF THE RIGHT-OF-WAY TO ALLOW FOR A WIDE EXCAVATION.
2. COMPLETE WELDING, COATING, AND WEIGHTING (PRESSURE TESTING OF DRAG SECTION, IF APPLICABLE) OF THE WATERCOURSE PIPE SECTION.
3. PERFORM THE BANK GRADE AND PREPARE SPOIL CONTAINMENT SUMPS AS CIRCUMSTANCES DICTATE.
4. PRIOR TO INSTREAM WORKS, THE LENGTH OF TRENCHING SHALL BE SHORTENED UP AS MUCH AS TERRAIN AND PIPE SECTION LENGTH ALLOW TO DECREASE THE DURATION OF INSTREAM WORKS.
5. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.
6. INSTALL PUMPS AND CHECK OPERATION TO EQUALIZE FLOW. INSTALL CLEAN WATER BYPASS AND GRAY WATER HOSES AND ASSOCIATED SEDIMENTATION AND/OR EROSION CONTROLS.
7. BEGIN THE ISOLATION IN THE EARLY MORNING TO ALLOW FOR SAME DAY INSTALLATION
8. INITIATE PUMPING AND CHECK OPERATION TO EQUALIZE FLOW.
9. CONSTRUCT THE UPSTREAM DAM USING SPECIFIED DAM BUILDING TECHNIQUES. DAM SHOULD BE CONSTRUCTED TO ALLOW FOR A WIDE EXCAVATION. CONTINUE TO MONITOR UPSTREAM AND DOWNSTREAM WATER LEVEL.
10. PLUG THE VEHICLE CROSSING CULVERT OR CONSTRUCT THE DOWNSTREAM DAM USING SPECIFIED DAMMING TECHNIQUES. WHERE A BRIDGE IS USED, THE DAM SHOULD BE CONSTRUCTED TO ALLOW FOR A WIDE EXCAVATION. CONTINUE TO MONITOR UPSTREAM AND DOWNSTREAM WATER LEVEL.
11. FISH SALVAGE TO BE DONE AFTER DAM AND PUMP INSTALLATION, AND PRIOR TO TRENCHING EXCAVATION.
12. EXCAVATE TRENCH AS RAPIDLY AS POSSIBLE WITH TWO HOES EXCAVATING FROM MID CHANNEL WORKING OUTWARDS, UNLESS OTHERWISE APPROVED.
13. INSTALL PIPE.
14. BACKFILL THE STREAM CHANNEL FIRST PUSHING THE SILTED WATER BACK INTO THE BANK EXCAVATIONS, WHERE PRACTICAL. PUMP OR DRAIN THE EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING AS REQUIRED. CONSTRUCT WATER CONTAINMENT SUMPS IF NECESSARY.
15. RESTORE BED AND RECLAIM BANKS OF THE STREAM CHANNEL.
16. REMOVE GREY WATER AND SEDIMENT CREATED BY INSTREAM WORK FROM THE ISOLATED AREA.
17. REMOVE THE DOWNSTREAM DAM OR VEHICLE CROSSING PLUG.
18. REMOVE UPSTREAM DAM OR VEHICLE CROSSING PLUG.
19. REMOVE BYPASS PUMPS.

NOTE:

THE CONTRACTOR SHALL SUBMIT A DETAILED WATER COURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.



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TITLE

TYPICAL DAM AND PUMP
WATER COURSE CROSSING
(SHEET 3 OF 3)

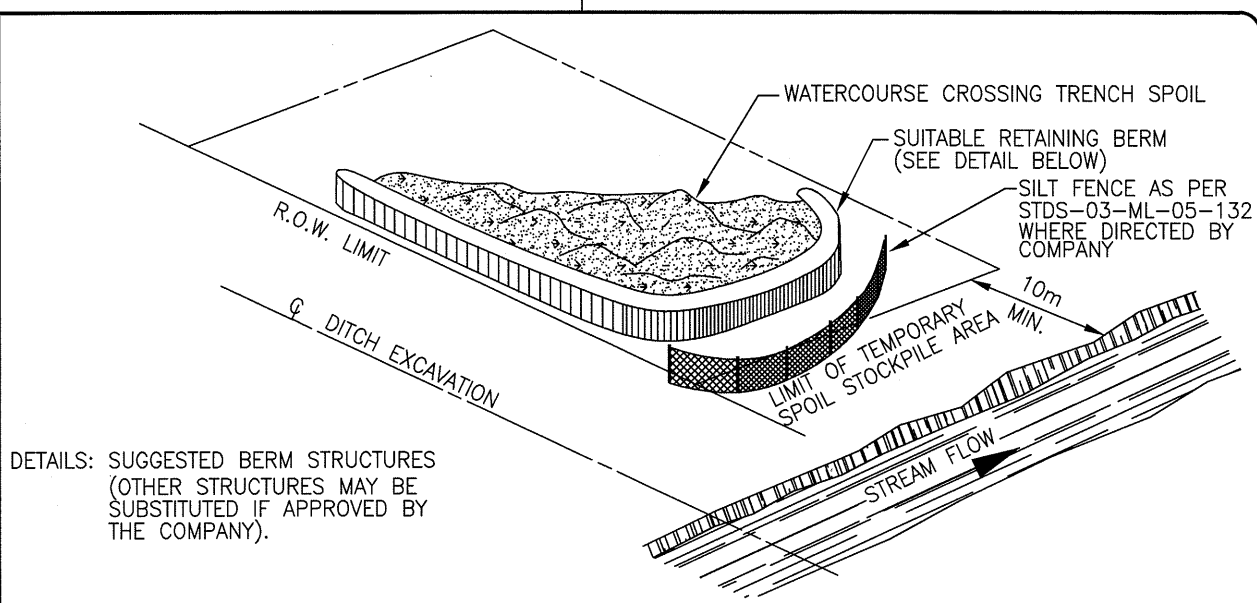
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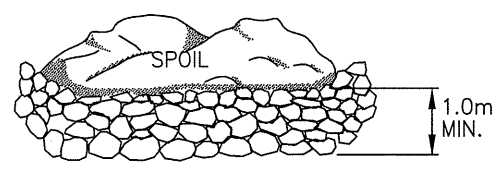
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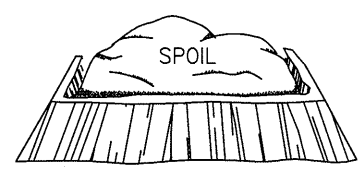
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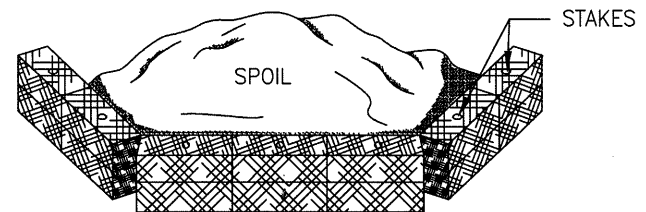
DETAILS: SUGGESTED BERM STRUCTURES (OTHER STRUCTURES MAY BE SUBSTITUTED IF APPROVED BY THE COMPANY).



1. WINDROW BOULDERS/SHOT ROCK



2. DIRT BERM



4. STAW BALES (STAKED) (IF APPROVED BY COMPANY)

NOTES:

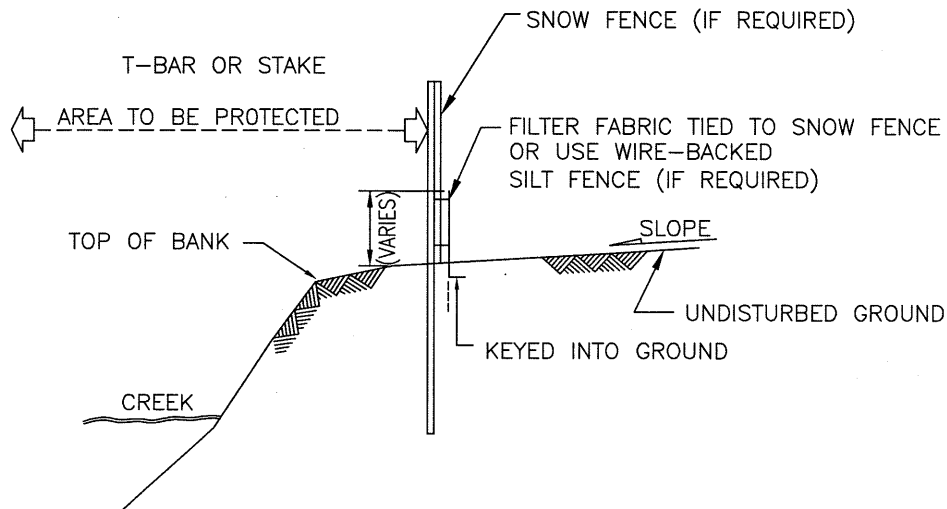
1. CONTAINMENT BERMS ARE TO BE USED WHERE STREAM OR CREEK SPOIL COULD RE-ENTER THE WATERCOURSE DIRECTLY OR INDIRECTLY.
2. TRENCH SPOIL WHICH IS SLURRIED MUCK OR DEBRIS, SHALL BE HAULED AWAY AND NOT STOCKPILED FOR BACKFILLING. AS DIRECTED BY THE COMPANY.
3. MATERIAL USED FOR THE CONTAINMENT BERM SHALL BE A MINIMUM OF 10m FROM THE TOP OF BANK OR OTHERWISE SPECIFIED BY THE COMPANY.
4. CONSTRUCT BERM WITH SUFFICIENT HEIGHT AND WIDTH TO ENSURE ADEQUATE CONTAINMENT DURING THE CONSTRUCTION PERIOD.
5. BERMS MUST BE MAINTAINED.
6. STAGED MOVEMENT OF SOIL MAY BE REQUIRED IF QUANTITIES ARE EXCESSIVE.
7. WHERE POSSIBLE, RIPARIAN VEGETATION TO BE MAINTAINED.
8. THE CONTAINMENT BERM SHALL BE DISMANTLED AND THE SITE RESTORED TO THE ORIGINAL CONDITION UPON COMPLETION OF THE WATER CROSSING.



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FIA # STDS	CHAINAGE:	DISCIPLINE # 03
TITLE		
SOIL RETAINING BERM		
SCALE N.T.S.	DWG No	STDS-03-ML-05-131
		REV 01

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SIDE VIEW OF SILT FENCE

NOTES:

1. INSTALL SILT FENCES AS PER THE MANUFACTURES SPECIFICATIONS, UNLESS OTHERWISE DIRECTED BY THE COMPANY.
2. SILT FENCING SHALL BE KEYED INTO THE GROUND, UNLESS APPROVED BY THE COMPANY.
3. SILT FENCES ARE TO BE USED IN AREAS WHERE SHEET FLOW OR RELATIVELY SMALL VOLUMES OF WATER CAN BE EXPECTED TO OCCUR.
4. T-BAR OR STAKES ARE TO BE PLACED EVERY 3m OR CLOSER AS CONDITIONS REQUIRE.
5. WHERE POSSIBLE, RIPARAN VEGETATION IS TO BE LEFT UNDISTURBED.
6. SILT FENCE ARE TO BE CHECKED AND MAINTAINED ON A REGULAR BASIS AND TRAPPED SEDIMENT REMOVED.
7. MATERIAL TO BE EITHER A WOVEN GEOTEXTILE FABRIC SUCH AS MIRAFI 600X OR 700X OR TERRAFIX 400W, OR EQUIVALENT. BIO-DEGRADABLE MATERIALS MAY BE UTILIZED WHERE APPROVED BY THE COMPANY.
8. WHERE A SITE SPECIFIC APPLICATION OR ASSESSMENT DICTATES THE REQUIREMENT TO UTILIZE REINFORCED MATERIALS, WIRE-BACKED SILT FENCE CAN BE USED IN PLACE OF SNOW FENCE.

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DISCIPLINE #

03

TITLE

SEDIMENT CONTROL-
SILT FENCE CONSTRUCTION

SCALE N.T.S.

DWG No STDS-03-ML-05-132

REV 01

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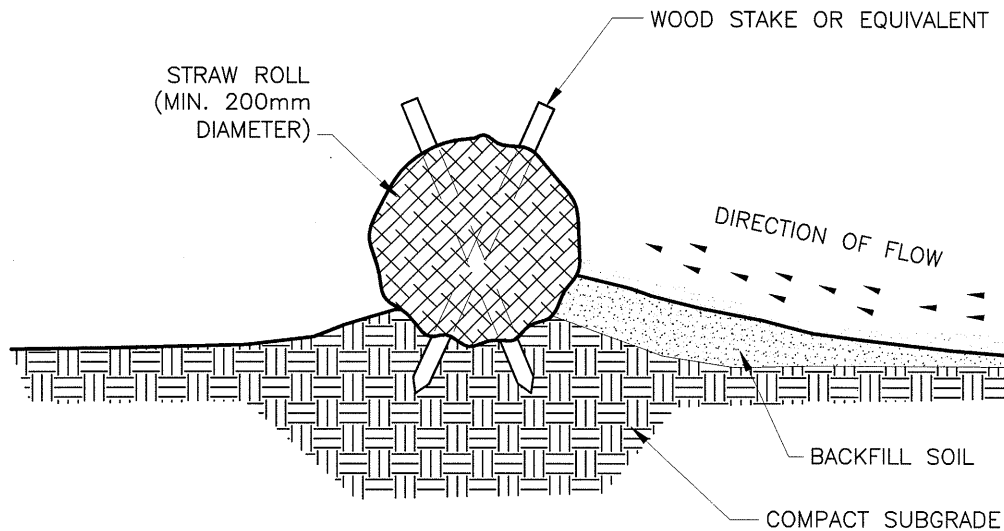
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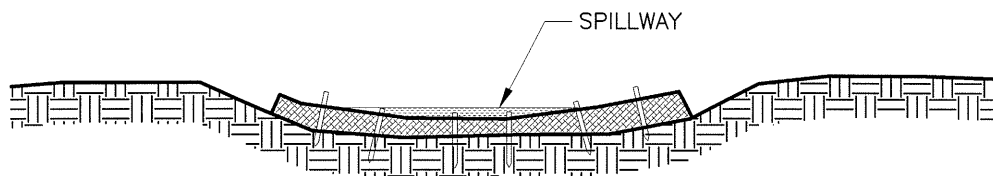
STANDARD ISSUE, SUPERCEDES A-SK-18-392

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REVISIONS



SIDE VIEW
N.T.S.



PROFILE
N.T.S.

NOTES:

1. SEDIMENT CONTROL DEVICES CAN BE USED TO CONTROL EROSION IN LOCATIONS WHERE NO CHANNEL/SWALE EXISTS; OR WHERE A DEFINITE CHANNEL/SWALE EXISTS, AND ARE USEFUL IN AREAS OF LOW FLOW. WHERE LARGE VOLUMES OF WATER CAN BE EXPECTED, A MORE EXTENSIVE CHECK DAM MAY BE REQUIRED (I.E. SANDBAGS; CLEAN ROCK FILL.)
2. THE CENTER SECTION OF SANDBAGS, STRAW ROLLS, GEO-RIDGE, SILT FENCE, CLEAN ROCK OR EQUIVALENT APPROVED MATERIAL FILL WILL BE SLIGHTLY LOWER THAN THE ADJACENT SECTIONS TO PROVIDE A NATURAL SPILLWAY FOR ANY OVERFLOW.
3. INSTALL THE SEDIMENT CONTROL DEVICES (I.E. STRAW ROLL, GEO-RIDGE, SILT FENCE, ROCK, SANDBAGS OR EQUIVALENT APPROVED MATERIAL) AS PER MANUFACTURES SPECIFICATIONS AND THE COMPANY AUTHORIZED REPRESENTATIVE. SEDIMENT CONTROL DEVICES CAN BE USED IN LOCATIONS THAT ARE PARALLEL OR PERPENDICULAR TO THE FLOW (DEPENDING ON SLOPE DIRECTION).



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03

TITLE

SEDIMENT CONTROL
CHECK DAM/FILTER

SCALE N.T.S.

DWG No STDS-03-ML-05-137

REV 01

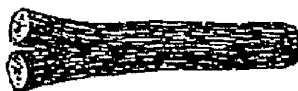
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REVISIONS 00 01 GENERAL ISSUE - REVIEWED FOR 2015 SPEC DRAWING SUPERSEDES SK-1564

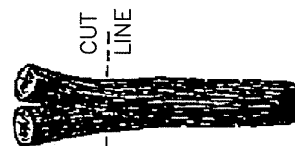
FORK



IMPROPER CUT



IMPROPER CUT



CUT BEHIND FORK

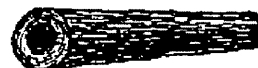
PISTOL BUTT, BUTT FLARE, BUTT ROT



CUT BEHIND DEFECT



CUT BEHIND FLARE

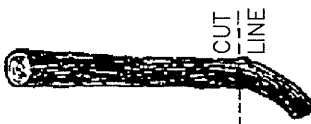


MUST BE <50% BUTT ROT

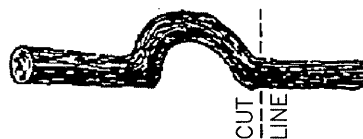
CROOK, DOG LEG



SORT TO PULP



CUT OUT EFFECT



CUT OUT EFFECT

SWEEP



UNACCEPTABLE IF > 6" IN 12' OR
>18" IN TREE LENGTH



ACCEPTABLE IF <6" IN 12' OR
<18" IN TREE LENGTH

SPIRAL CHECK, LIMBS, RAT TAIL



SORT TO PULP



CUT FLUSH WITH STEM



MUST BE > 4" TOP

NOTES:

1. ALL OF THE ABOVE DEFECTS MUST BE REMOVED FROM SALVAGE WOOD UNLESS OTHERWISE SPECIFIED BY THE COMPANY'S DOCUMENTS.
2. TREE STEMS WILL BE DELIMBED INDIVIDUALLY. MULTIPLE STEMS WILL NOT BE FED THROUGH MECHANICAL DELIMBERS.



DESIGNER:

Douglas June 16, 2015
NAME DATE

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DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TIMBER SALVAGE
QUALITY AND DEFECTS

SCALE N.T.S.

DWG No STDS-03-ML-05-301

REV 01

GENERAL ISSUE -- REVIEWED FOR 2015 SPEC

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STANDARD ISSUE, SUPERCEDES A-SK-18-392

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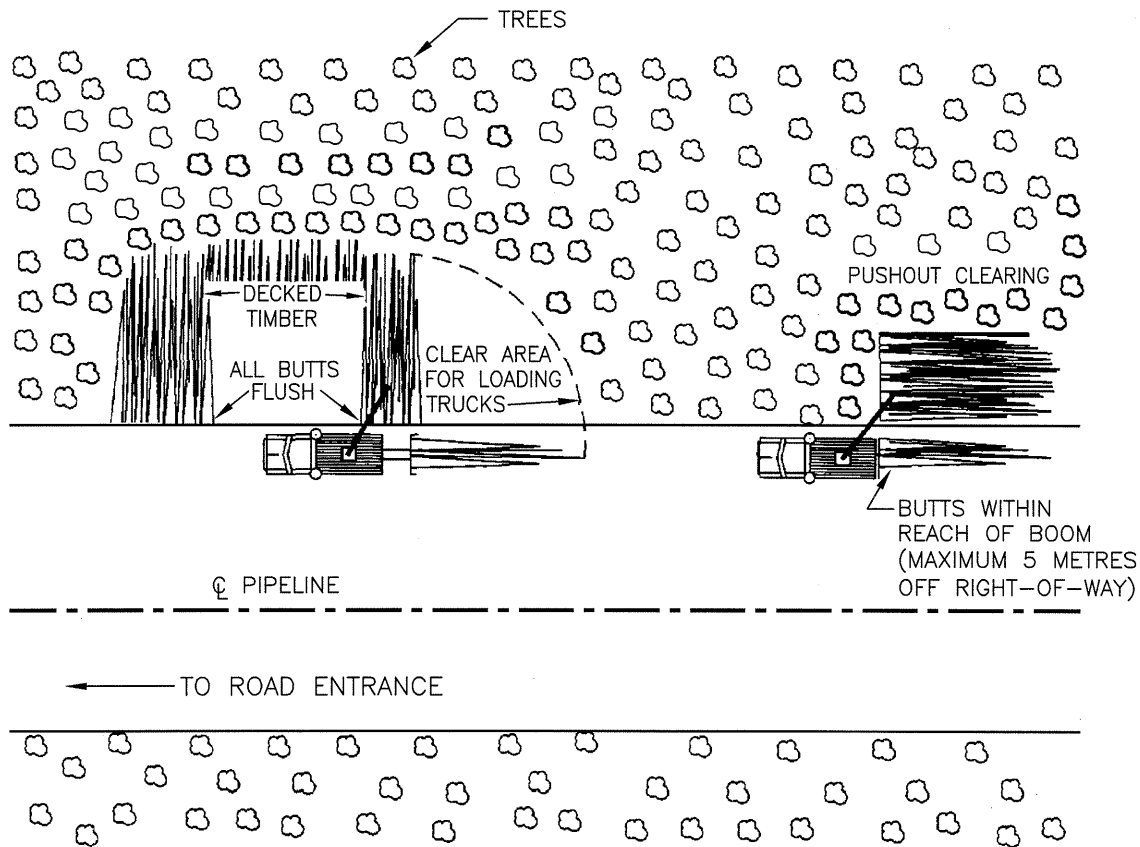
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PLAN VIEW
N.T.S.

NOTES:

1. SALVAGE MERCHANTABLE TIMBER AS DIRECTED BY THE COMPANY USING CUTOFF TYPE SAW EQUIPMENT. DO NOT BULLDOZE MERCHANTABLE TIMBER.
2. LOGS SHALL NOT BE SKIDDED ACROSS WATERCOURSES, UNLESS A SUITABLE CROSSING STRUCTURE HAS BEEN INSTALLED.
3. TIMBER IS TO BE SKIDDED TO THE PROCESSOR OR DELIMBER OUTSIDE OF THE LOG DECK. LIMBS AND TOPS SHALL NOT BE STORED INSIDE THE LOG DECK, UNLESS APPROVED BY THE COMPANY. SALVAGE LOGS SHALL HAVE LIMBS TRIMMED FLUSH WITH THE STEMS. TIMBER SHALL NOT BE SKIDDED THROUGH MUD OR GRAVEL.
4. DECK FACES MUST BE KEPT STRAIGHT AND FLUSH.
5. PERPENDICULAR DECK FACE MUST BE WITHIN 3 METERS OF THE RIGHT-OF-WAY OR ROAD. PARALLEL DECKS MUST BE WITHIN 5 METERS OF THE RIGHT-OF-WAY OR ROAD.
6. PRIME CONTRACTOR SHALL MAINTAIN ACCESS ALONG THE RIGHT-OF-WAY AND SALVAGED TIMBER SHALL BE REMOVED FROM THE PROJECT PRIOR TO PIPE STRINGING ACTIVITIES, WHERE POSSIBLE.
7. CONIFEROUS AND DECIDUOUS TIMBER SALVAGE WILL BE DECKED IN SEPARATE PILES.



DESIGNER:

Douglas B. June 15, 2015
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FIA #STDS

CHAINAGE:

DISCIPLINE # 03

TITLE

SALVAGE OF MERCHANTABLE
TIMBER

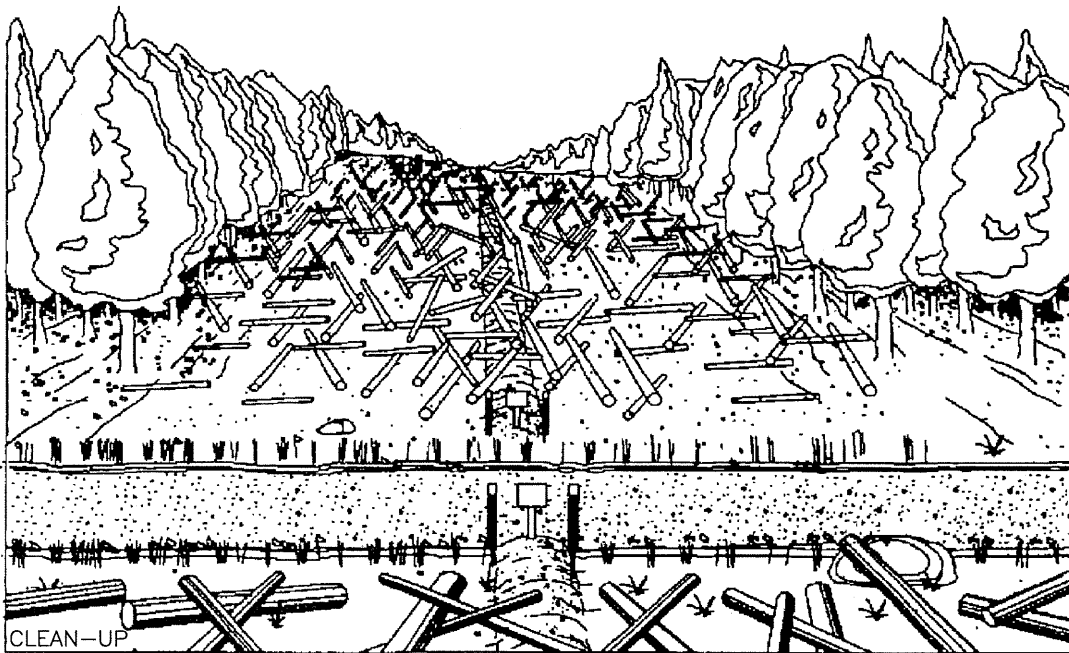
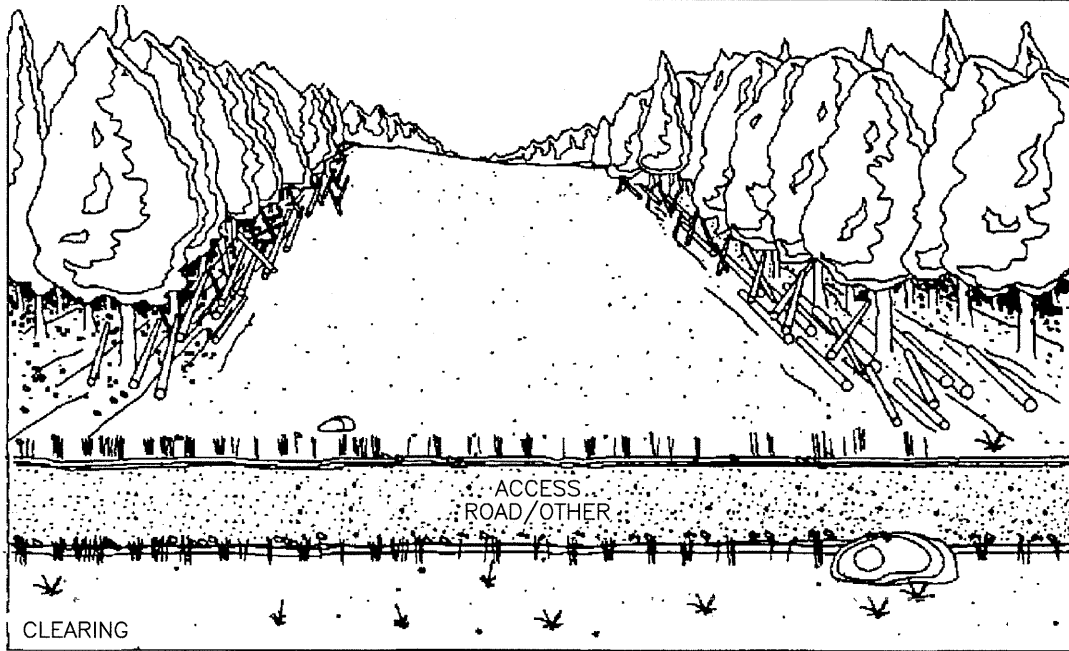
SCALE N.T.S.

DWG No

STDS-03-ML-05-302

REV 01

01 GENERAL ISSUE - REVIEWED FOR 2015 SPEC
 00 DRAWING SUPERSEDES SK-1543
 REVISIONS



NOTES:

1. WINDROW ROW SLASH ON SIDES OF THE RIGHT-OF-WAY, OR WHERE APPROVED BY THE COMPANY.
2. DISCONTINUE ROLLBACK AT CROSS RIGHT-OF-WAY. ACCESS LOCATIONS AS DIRECTED BY COMPANY.
3. ROLLBACK SLASH AND EVENLY DISTRIBUTE OVER THE RIGHT-OF-WAY TO DETER ACCESS.



DESIGNER:

June 16, 2015
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 NAME DATE

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DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TYPICAL ROLLBACK
 FOR ACCESS CONTROL

SCALE N.T.S.

DWG No

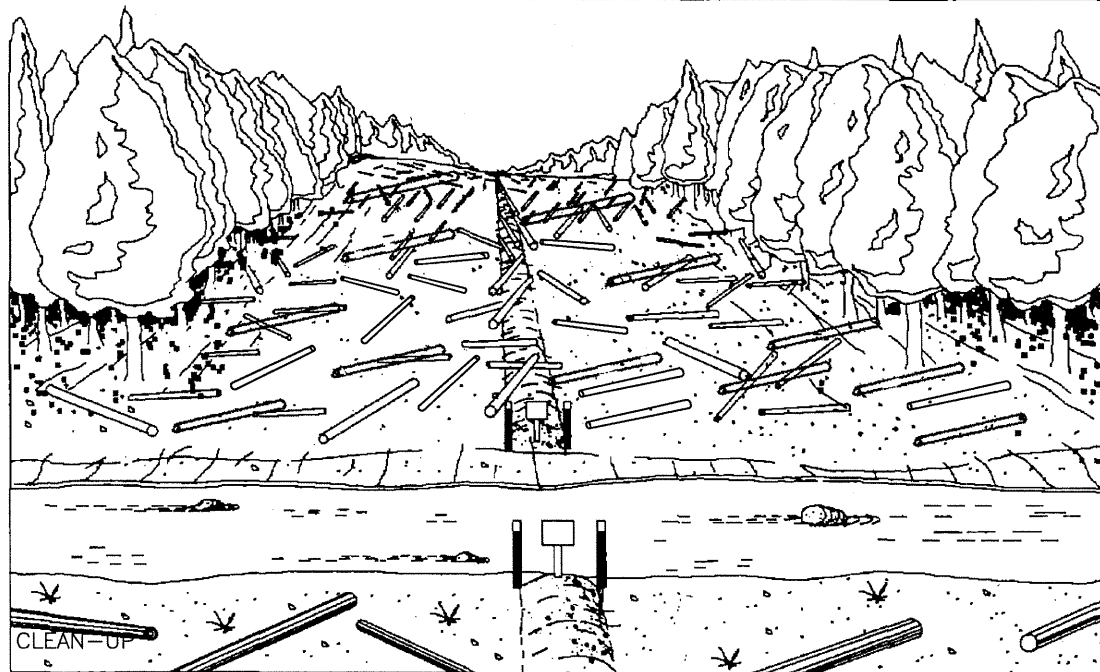
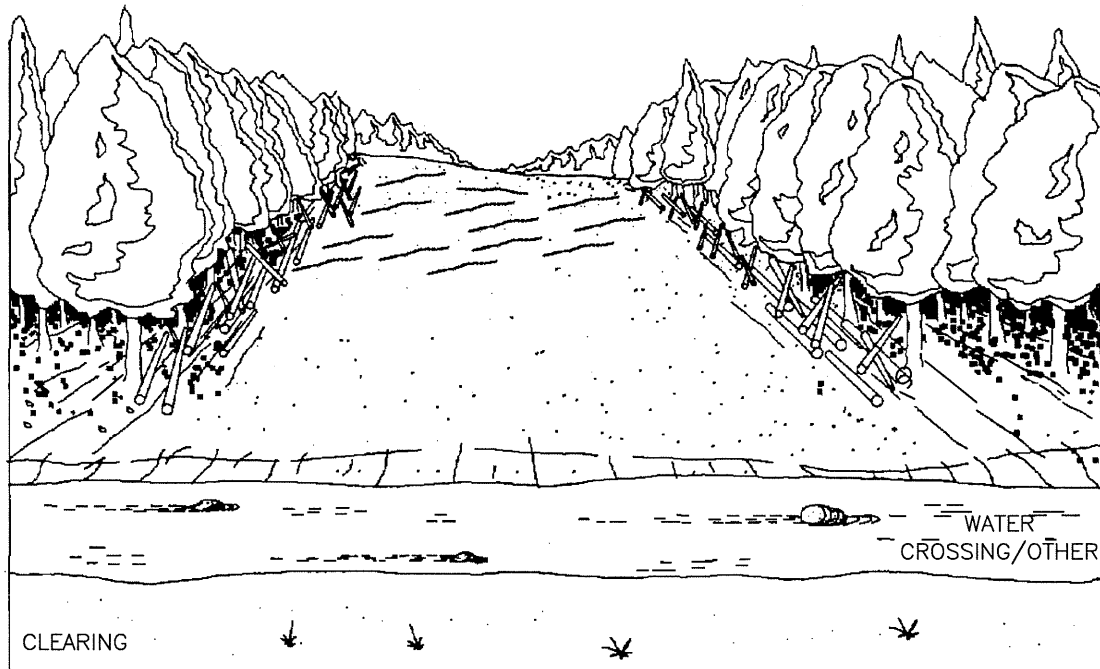
STDS-03-ML-05-312

REV 01

01 GENERAL ISSUE - REVIEWED FOR 2015 SPEC

DRAWING SUPERSEDES SK-1555

REVISIONS 00



NOTES:

1. WINDROW WOODY DEBRIS ON SIDES OF RIGHT-OF-WAY, OR WHERE APPROVED BY THE COMPANY.
2. MAINTAIN EXISTING ACCESS RIGHTS-OF-WAY THROUGH ROLLBACK (i.e. TRAILS, SEISMIC LINES).
3. ROLLBACK SHOULD BE EVENLY DISTRIBUTED OVER RIGHT-OF-WAY AND COMPACTED WITH A DOZER, OR OTHER APPROVED EQUIPMENT.



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June 16, 2015
NAME DATE

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DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TYPICAL ROLLBACK
FOR EROSION CONTROL

SCALE N.T.S.

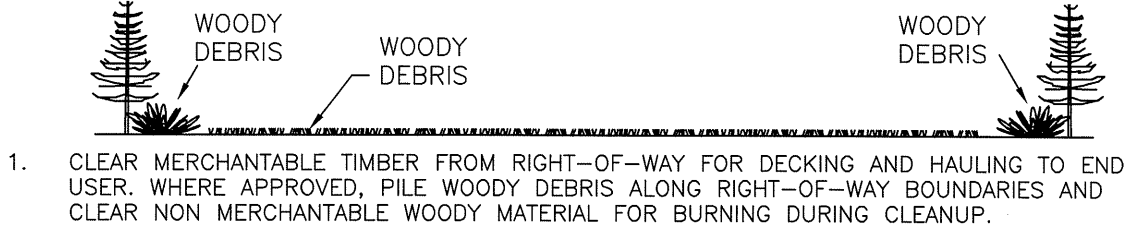
DWG No STDS-03-ML-05-313

REV 01

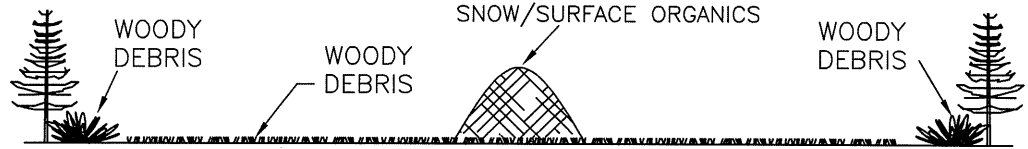
STANDARD ISSUE 2015-06-03

REVISIONS

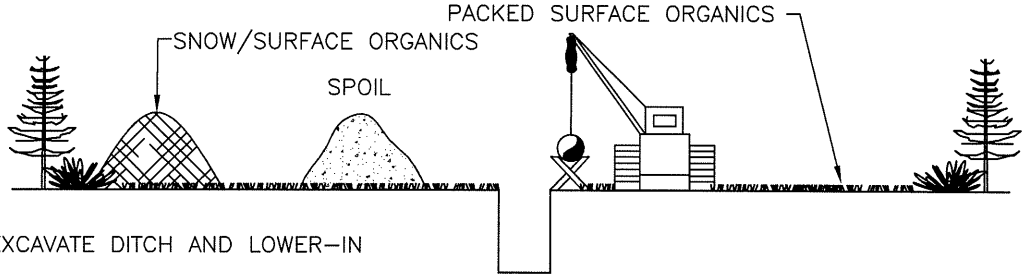
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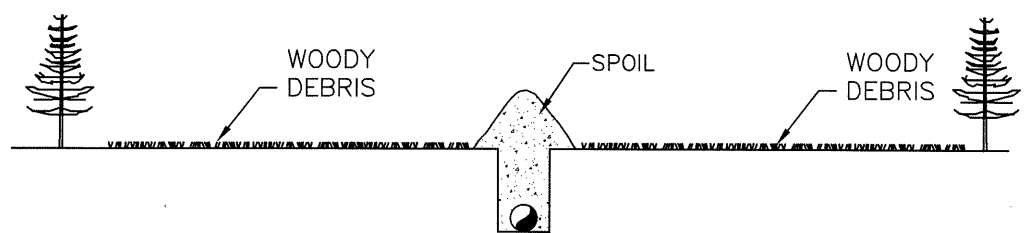
1. CLEAR MERCHANTABLE TIMBER FROM RIGHT-OF-WAY FOR DECKING AND HAULING TO END USER. WHERE APPROVED, PILE WOODY DEBRIS ALONG RIGHT-OF-WAY BOUNDARIES AND CLEAR NON MERCHANTABLE WOODY MATERIAL FOR BURNING DURING CLEANUP.



2. USE SUITABLE EQUIPMENT (e.g. MULCHER) TO MULCH NON MERCHANTABLE TIMBER STUMPS AND ROOTS LEVEL WITH THE SURFACE TO MINIMIZE GROUND DISTURBANCE. THE DEPTH OF WOODY DEBRIS FOLLOWING MULCHING SHALL NOT EXCEED 5cm.
3. LEVEL THE REMAINING SURFACE MATERIAL TO CREATE A WORKING SURFACE. SNOW/SURFACE ORGANIC MATERIAL MIXTURE MAY BE USED TO CONSTRUCT A SNOW ROACH OVER THE PROPOSED DITCH TO PREVENT FREEZING OF THE DITCHLINE.
4. WHERE GRADING IS REQUIRED, STRIP SURFACE ORGANIC MATERIAL AND STORE IN TEMPORARY WORKSPACE OR OTHER APPROVED LOCATIONS FOR REPLACEMENT



5. EXCAVATE DITCH AND LOWER-IN



6. BACKFILL AND ROACH THE DITCHLINE WITH DITCH MATERIAL.
7. REPLACE SNOW/SURFACE ORGANICS EVENLY OVER THE AREAS WHERE IT WAS REMOVED DURING RIGHT-OF-WAY PREPARATION. REPLACE WOODY DEBRIS ACROSS THE RIGHT-OF-WAY, WHERE APPROVED.

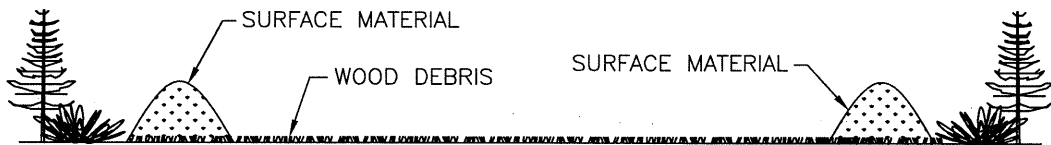
NOTE: APPLIES TO CROWN, AND/OR NON-AGRICULTURAL DESIGNATED AREAS. UNLESS GRADING IS REQUIRED, STRIPPING OF SURFACE MATERIALS SHOULD NOT BE CONDUCTED WHEN USING THE MINIMAL SURFACE DISTURBANCE PROCEDURE.

	DESIGNER:	DESIGN STANDARD		
	NAME: <i>Danish B</i> DATE: <i>June 15, 2015</i>	FIA #	STDS	CHAINAGE:
	CHECKED BY: <i>L</i> DESIGN CHECKER: <i>MJS</i>	TITLE		DISCIPLINE # 03
		FROZEN FORESTED LANDS RIGHT-OF-WAY PREPARATION (MINIMAL SURFACE DISTURBANCE)		
		SCALE N.T.S.	DWG No	STDS-03-ML-05-445
			REV	00

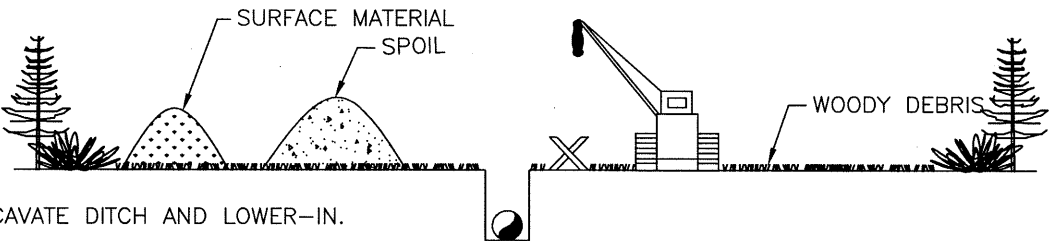
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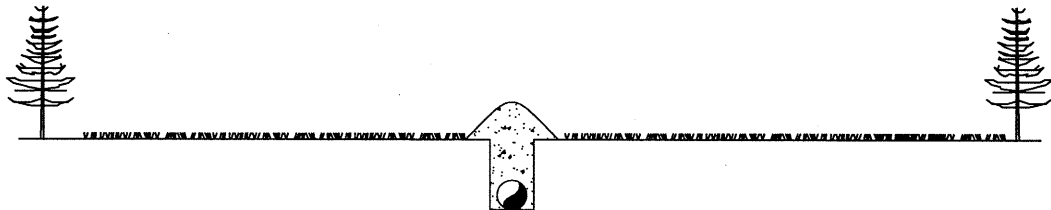
1. CLEAR MERCHANTABLE TIMBER FROM RIGHT-OF-WAY FOR DECKING AND HAULING TO END USER. WHERE APPROVED, PILE WOODY DEBRIS ALONG RIGHT-OF-WAY BOUNDARIES. CLEAR NON MERCHANTABLE WOODY MATERIAL FOR BURNING DURING CLEANUP.



2. USE SUITABLE EQUIPMENT (e.g. HOE WITH THUMB) TO REMOVE STUMPS AND ROOTS
3. SALVAGE STRIPPINGS AND STORE IN TEMPORARY WORKSPACE OR OTHER APPROVED LOCATIONS FOR REPLACEMENT DURING CLEANUP.



4. EXCAVATE DITCH AND LOWER-IN.



5. BACKFILL AND ROACH THE DITCHLINE WITH DITCH MATERIAL.
6. REPLACE STRIPPINGS EVENLY OVER THE AREAS WHERE IT WAS REMOVED DURING RIGHT-OF-WAY PREPARATION. REPLACE WOODY DEBRIS ACROSS THE RIGHT-OF-WAY, WHERE APPROVED.

NOTE:

APPLIES TO CROWN, AND/OR NON-AGRICULTURAL DESIGNATED AREAS.

STANDARD ISSUE 2015-06-03

REVISIONS



DESIGNER:

David B. June 16, 2015
NAME DATE

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DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

NON-FROZEN FORESTED LANDS
SURFACE MATERIALS/STRIPPING CONSERVATION

SCALE

N.T.S.

DWG No

STDS-03-ML-05-446

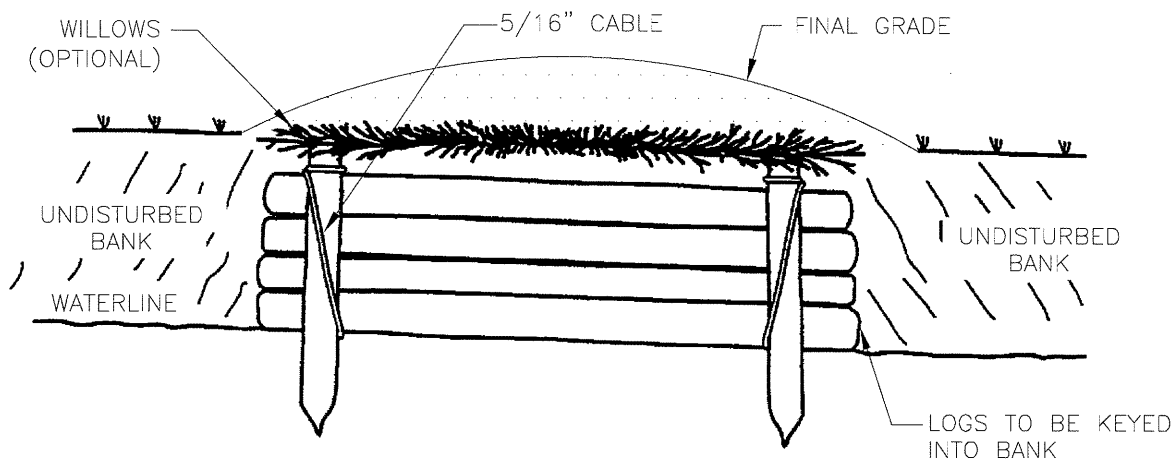
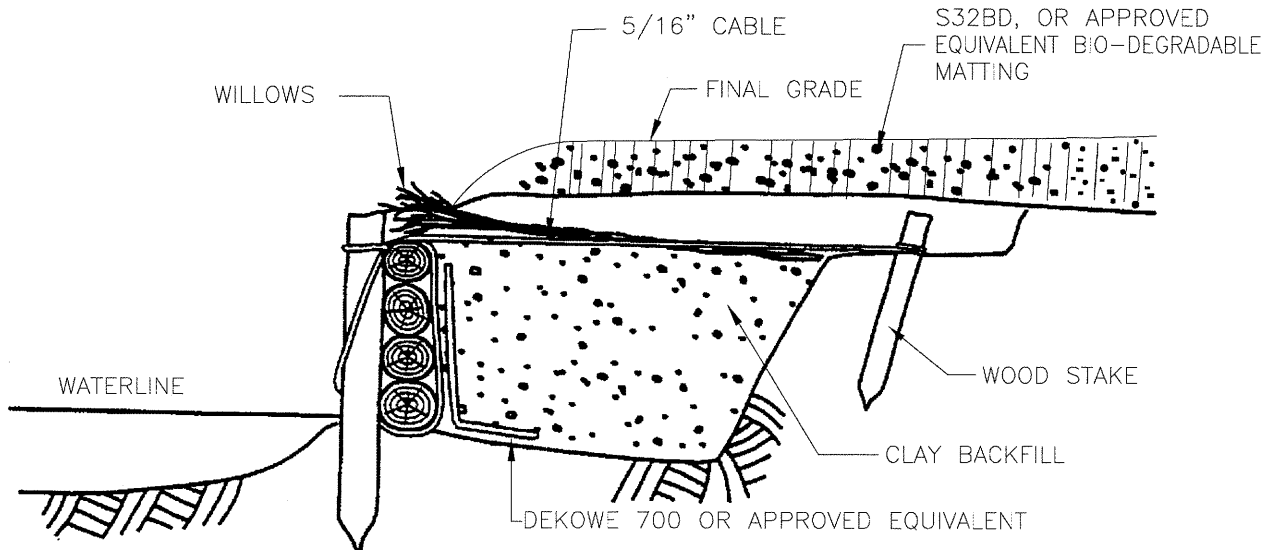
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TIME
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NOTES:

1. LOG WALLS TO BE CONSTRUCTED USING CONIFEROUS MATERIAL.
2. UNFROZEN BACKFILL OR LOOSE GRADE MATERIAL SHOULD BE USED AS FILL MATERIAL.
3. ANCHOR PILINGS OR DEADMAN ANCHORS TO BE USED TO SECURE CABLE IN BANK.
4. REFER TO STDS-03-ML-05-606 FOR DETAIL ON WILLOWS INSTALLATION.



DESIGNER:

David B. [Signature] June 3, 2015
NAME DATE

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DISCIPLINE #

03

TITLE

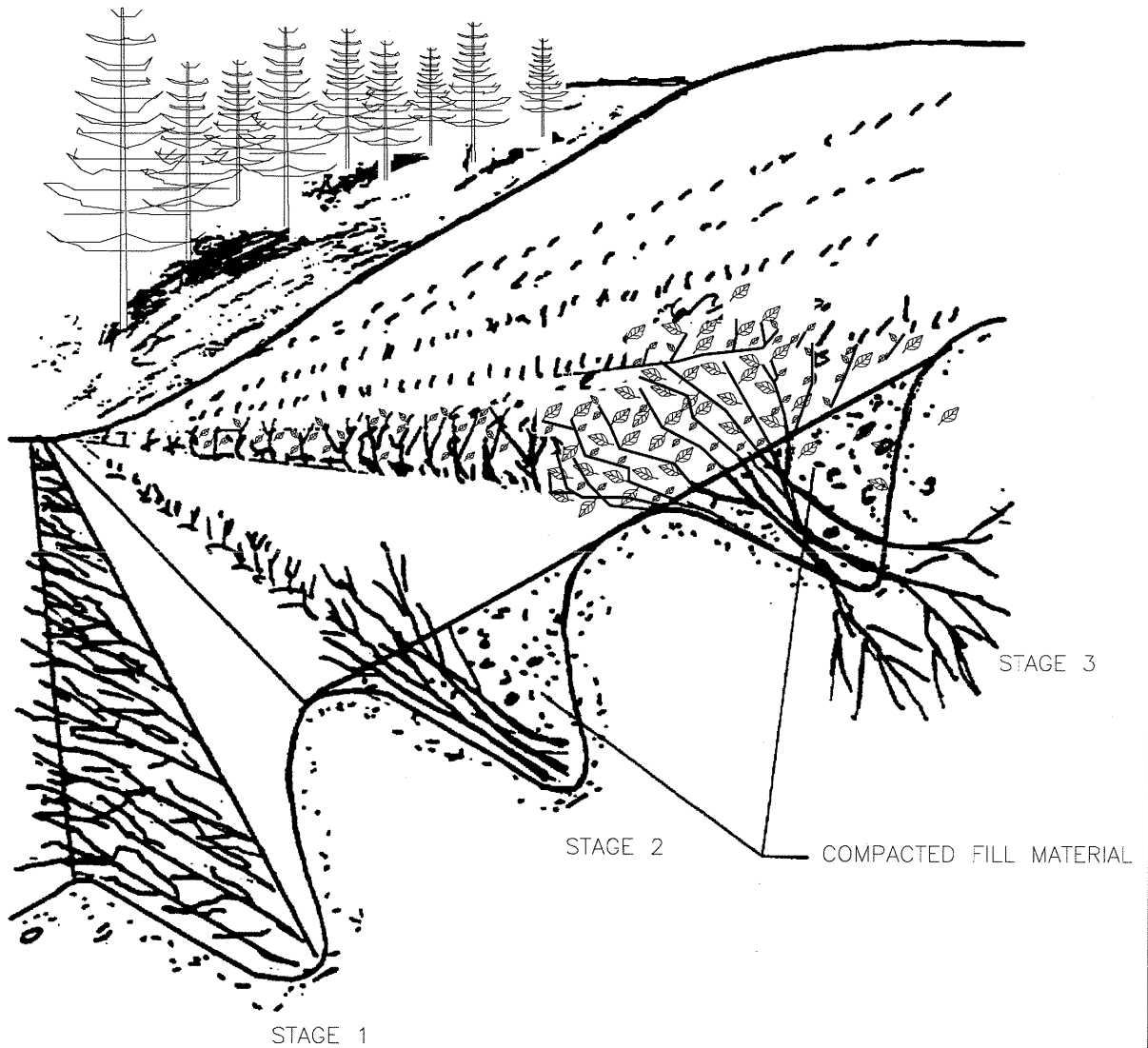
STREAMBANK RECLAMATION
LOG WALL

SCALE N.T.S.

DWG No

STDS-03-ML-05-603

REV 01



STAGE 1. CUT TRENCH ACROSS SLOPE. FILL WITH DORMANT WOODY PLANT MATERIAL.
 STAGE 2. FILL IS PLACED ON TOP OF BRANCH AND COMPACTED LAYER.
 STAGE 3. POTENTIAL GROWTH AFTER 2 - 3 GROWING SEASONS.
 REFER TO STDS-03-ML-05-606 FOR DETAIL ON WILLOWS INSTALLATION.



DESIGNER:

Douglas By June 3, 2015
 NAME DATE

CHECKED BY:

R *MS*
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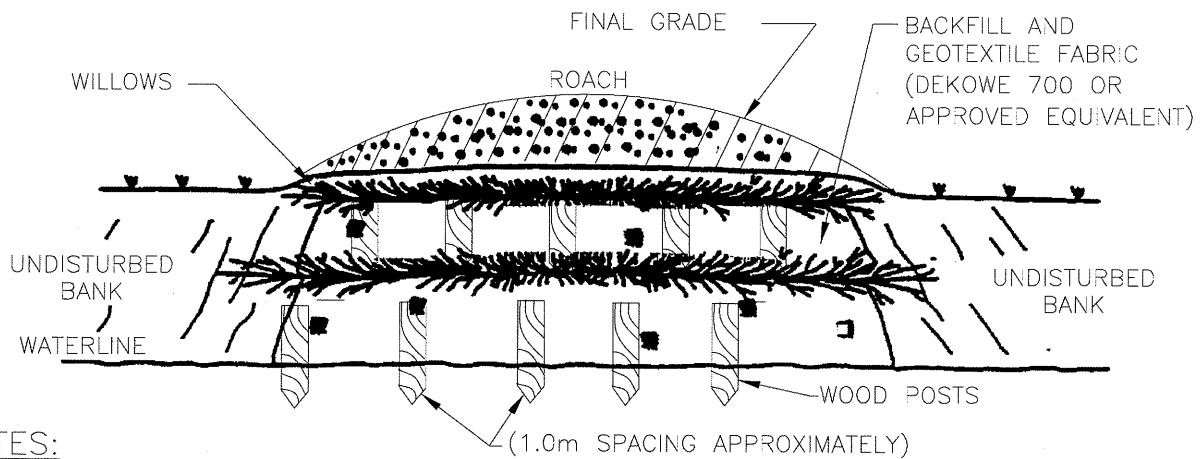
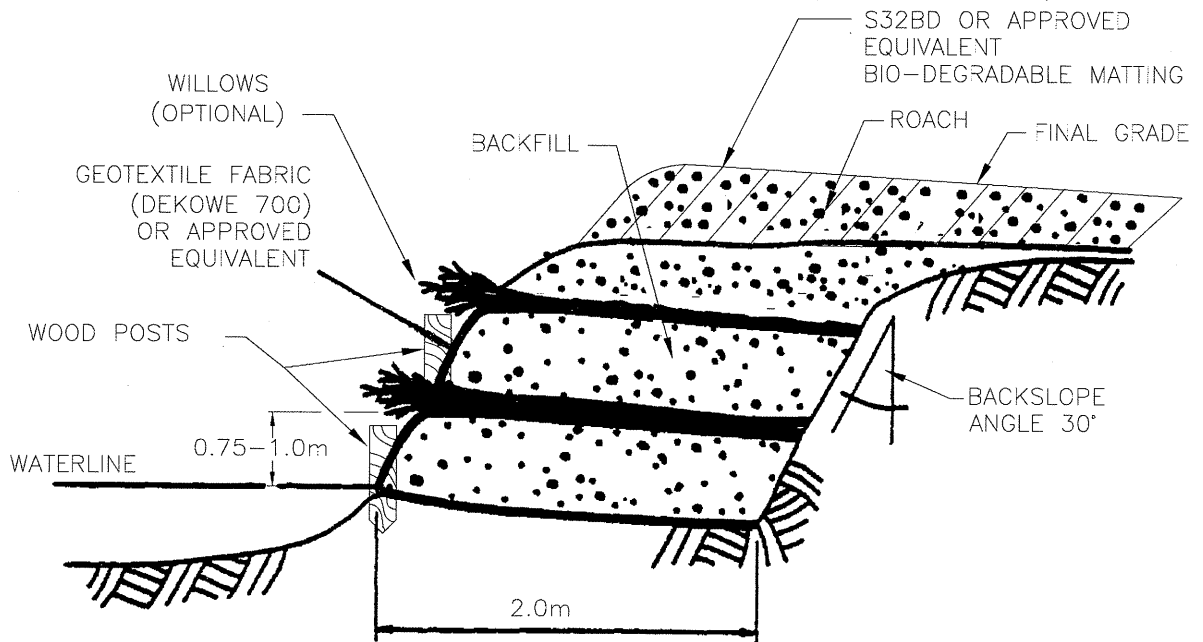
FIA # STDS CHAINAGE: DISCIPLINE # 03

TITLE STREAMBANK RECLAMATION -
 BRUSH LAYER IN CROSS CUT SLOPE

SCALE N.T.S.

DWG No STDS-03-ML-05-604

REV 01



NOTES:

1. DURING WINTER CONSTRUCTION, VEGETATED GEOGRIDS MUST BE INSTALLED IN CONJUNCTION WITH DITCH BACKFILLING AND BANK RECONSTRUCTION.
2. UNFROZEN BACKFILL (OR LOOSE GRADE MATERIAL) SHOULD BE USED TO MINIMIZE AIR SPACES. THIS ALLOWS PROPER SOIL FABRIC CONTACT, WHICH MINIMIZES SCOURING DURING RUNOFF AND INCREASES SURVIVAL OF THE WILLOW CUTTINGS.
3. PLYWOOD FORMS (8x2 FEET) AND WOOD POSTS ARE REQUIRED TO HELP RECONSTRUCT VERTICAL BANKS. GRID LAYERS SHOULD NOT EXCEED 1.0m IN HEIGHT (0.75m OPTIONAL) WITH A MINIMUM OF 2.0m SET IN BANK.
4. WILLOWS SHOULD BE HARVESTED AS CLOSE TO INSTALLATION AS POSSIBLE, PREFERABLY THE PREVIOUS DAY BUT NO MORE THAN 2 DAYS EARLY. WILLOWS SHOULD BE 1.5cm TO 2.5cm IN DIAMETER AND 2.0m TO 3.0m LONG WITH NO MORE THAN 25cm LEFT EXPOSED.
5. PLANTING RATE SHOULD BE APPROXIMATELY 1 STEM PER 15.0cm.



DESIGNER:

Douglas K *June 3, 2015*
NAME DATE

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K *MS*

DESIGN STANDARD

FIA # STDS

CHAINAGE:

DISCIPLINE # 03

TITLE

STREAMBANK RECLAMATION
VEGETATED GEOTEXTILE
INSTALLATION

SCALE N.T.S.

DWG No

STDS-03-ML-05-606

REV 01

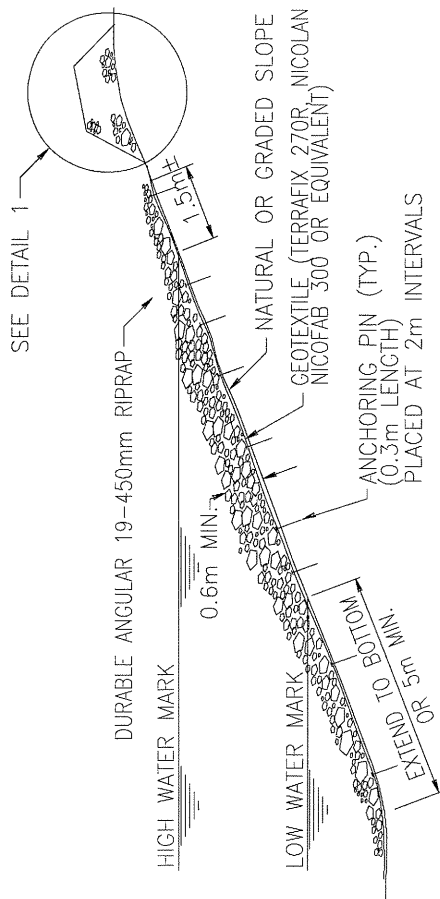
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REVISIONS 00 STANDARD ISSUE, SUPERSEDES A-SK-18-379 01 GENERAL ISSUE - REVIEWED FOR 2015 SPEC.

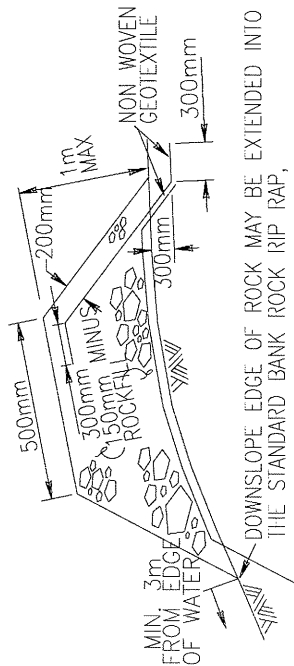


DESIGNER: *Douglas King* June 3, 2015
NAME DATE
CHECKED BY: *R* DESIGN CHECKER: *MJS*

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FIA # STDS CHAINAGE: D/SCIENCE # 03
TITLE WATERCROSSING BANK EROSION PROTECTION
SCALE N.T.S. DWG No STDS-03-VL-05-608 REV 01



DETAIL 1 FILTER BERM



NOTES:

1. REMOVE ALL STUMPS, ORGANIC MATERIAL AND PREPARE BANKS TO A MAXIMUM SLOPE OF 2 HORIZ. : 1 VERTICAL IF PRACTICAL.

2. INSTALL FILTER CLOTH (GEOTEXTILE) UNDER ROCK RIPRAP AS DIRECTED BY THE COMPANY.

3. SIZE OF RIPRAP IS DEPENDENT ON SLOPE OF BANK AND WATER VELOCITY.

4. INSTALL RIPRAP TO A DEPTH OF APPROXIMATELY 1.5 TO 2 TIMES THE MAXIMUM EQUIVALENT DIAMETER OF THE RIPRAP.

5. KEY IN EDGES OF RIPRAP & FILTER CLOTH TO NATURAL GROUND CONTOURS SO THAT UNDERMINING DOES NOT OCCUR.

6. RIPRAP IS TO BE INSTALLED TO 0.5m ABOVE HIGH WATER MARK OR 1.5m± ALONG THE SLOPE, WHICHEVER IS LESS.

7. FILTER BERM TO BE CONSTRUCTED ON AN AS REQUESTED BASIS BY THE COMPANY REPRESENTATIVE.

8. BANK PROTECTION SHALL NOT CHANGE PRE-EXISTING NATURAL FLOW CONDITIONS OR BANK PROFILE WIDTHS, UNLESS OTHERWISE APPROVED BY THE COMPANY.

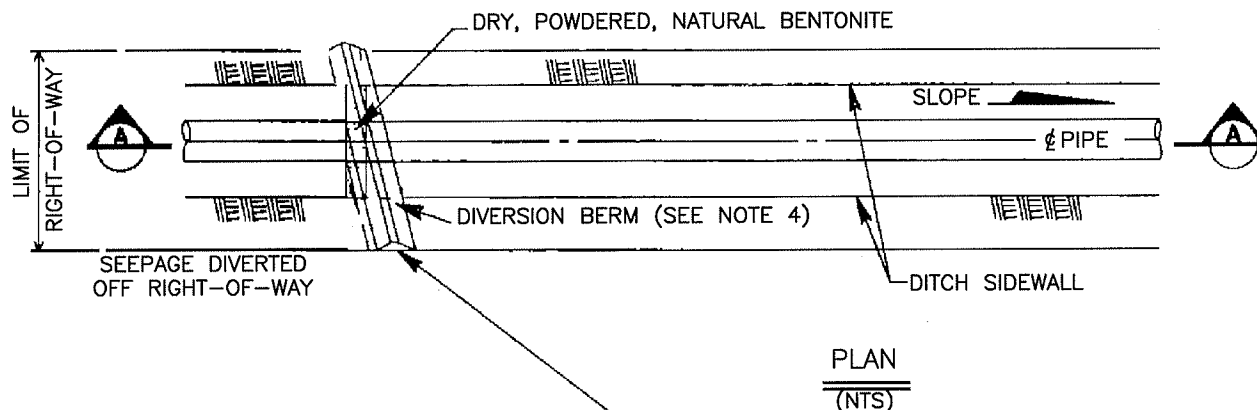
NOTES:

1. GEOTEXTILE TO BE A NON WOVEN FABRIC SUCH AS MIRAFIX P250 OR TERRAFIX 300R.

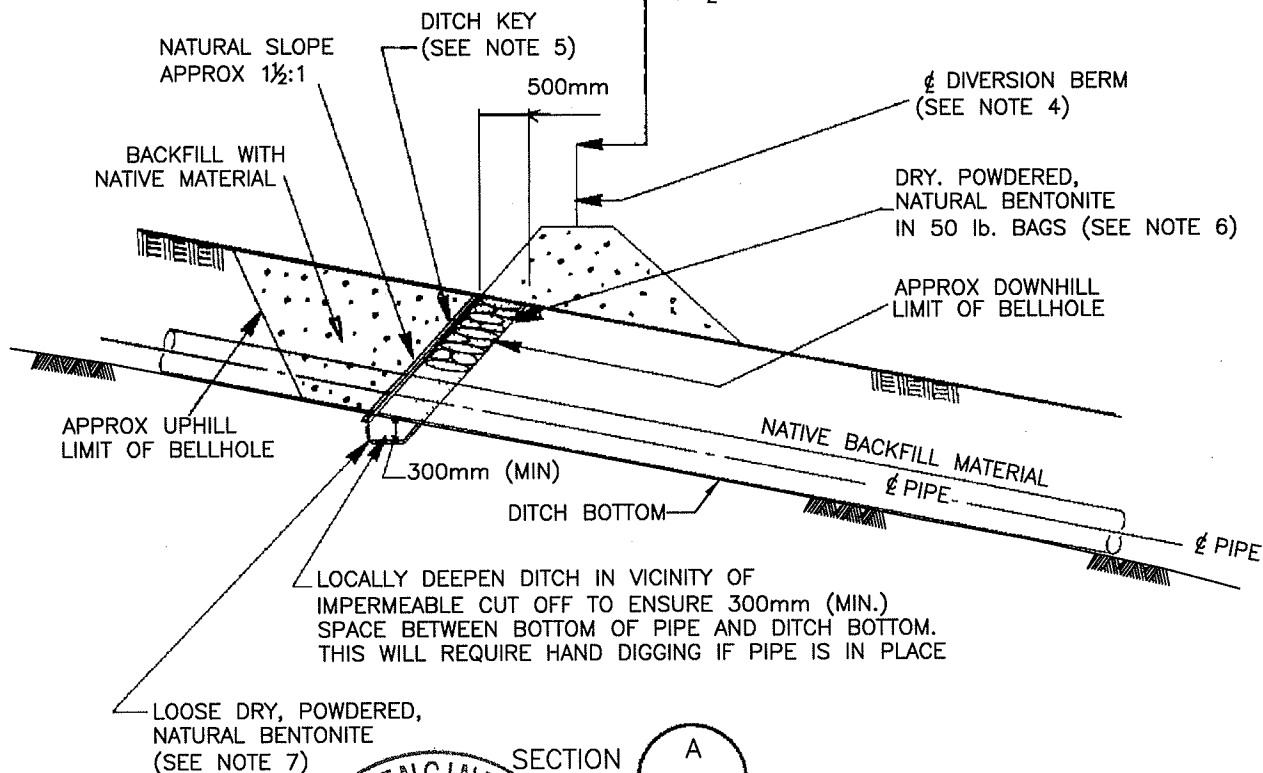
2. FILTER BERM TO BE CONSTRUCTED ON STABLE SLOPE SURFACES ONLY.

3. GEOTEXTILE FOR FILTER BERM TO BE INDEPENDENT OF GEOTEXTILE REQUIRED FOR THE EMBANKMENT.

4. MINIMUM 300mm OVERLAP OF GEOTEXTILE



DIVERSION BERM LOCATED SUCH THAT
UPHILL TOE OF FILL APPROXIMATELY COINCIDES
WITH UPHILL EDGE OF IMPERMEABLE CUT OFF
AT ϕ OF PIPE



SECTION

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WASH DC

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STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

TYPICAL BENTONITE DITCH PLUG

SCALE N.T.S.

DWG No

STDS-03-ML-12-202 SHT 01 OF 02

REV 01

NOTES

1. DITCH PLUGS, WHERE REQUIRED, WILL TYPICALLY BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE FREQUENCY AND FINAL LOCATION OF DITCH PLUGS ARE THE RESPONSIBILITY OF THE COMPANY REPRESENTATIVE AND ARE LOCATED ON THE BASIS OF FIELD OBSERVATIONS, LOCAL TOPOGRAPHY, AND DRAINAGE PATTERNS.
2. DITCH PLUGS ARE TO BE INSTALLED AT LOCATIONS WHERE THERE IS A POSSIBILITY OF GROUNDWATER SEEPAGE FLOWING EITHER WITHIN OR ALONG THE BACKFILLED PIPE DITCH. DITCH PLUGS SHOULD BE LOCATED IMMEDIATELY DOWNSLOPE OF AREAS OF SIGNIFICANT GROUNDWATER SEEPAGE OR AREAS OF CONCENTRATED CROSS SLOPE DRAINAGE. DITCH PLUGS ARE BEST LOCATED AT THE CREST OF STEEPER SLOPES TO ASSIST IN REMOVING WATER FROM THE PIPE DITCH BEFORE IT FLOWS ON A STEEPER GRADIENT. DITCH PLUGS ARE NOT TO BE PLACED IN GRADE CUT, UNLESS INDICATED ON SPECIFIC DESIGN DRAWING.
3. DITCH PLUGS SHOULD BE LOCATED PRIOR TO PIPE LOWER-IN AND BACKFILLING. SUFFICIENT OPEN DITCH MUST BE MAINTAINED TO INSTALL DITCH PLUG (APPROXIMATELY 5 METRES AT DITCH BOTTOM). DITCH PLUGS SHOULD BE CONSTRUCTED AS SOON AS PRACTICABLE AFTER PIPE INSTALLATION AND GENERAL BACKFILLING TO MINIMIZE DITCH WALL SLUMPING, WATER INFILTRATION, OR FROST PENETRATION INTO DITCH WALLS DURING WINTER CONSTRUCTION.
4. SEE DRAWING No. STDS-03-ML-12-221 AND STDS-03-ML-12-222 FOR DESIGN OF DIVERSION BERMS.
5. DITCH PLUG SHALL BE KEYED INTO THE DITCH SIDES AND BOTTOM TO A DEPTH AND WIDTH OF 0.3m.
6. FOLLOWING PLACEMENT, EACH BENTONITE BAG SHALL BE PERFORATED ONCE IN PLACE TO ALLOW FOR THE INFILTRATION OF WATER, THEREBY PERMITTING THE EXPANSION OF BENTONITE.
7. LOOSE BENTONITE SHALL BE PLACED BENEATH AND UP THE SIDES OF THE PIPE TO ENSURE ALL VOIDS ARE FILLED.
8. BAGS ORIENTATION SHOULD ALTERNATE.
9. REFER TO PROJECT SPECIFICATIONS WHERE PIPE PROTECTION MATERIALS (SAND PADDING, PILLOWS, ROCK SHIELD, ETC) ARE REQUIRED.

MATERIAL REQUIRED

DRY POWDERED NATURAL BENTONITE IN 50lb BAGS
FILTER CLOTH : NILEX 24 INCH NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.



DESIGNER:

CHECKED BY:

DESIGN CHECKER:

DESIGN STANDARD

FIA #

STDS

CHAINAGE:

DISCIPLINE #

03

TITLE

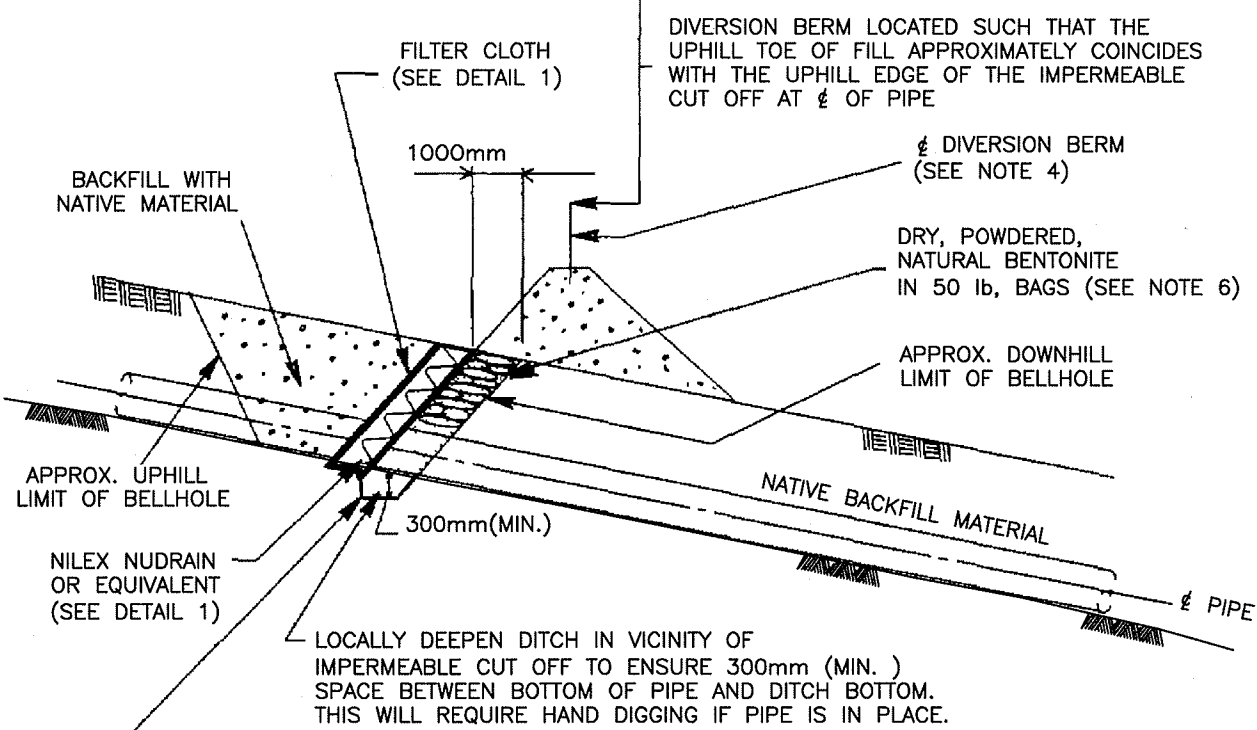
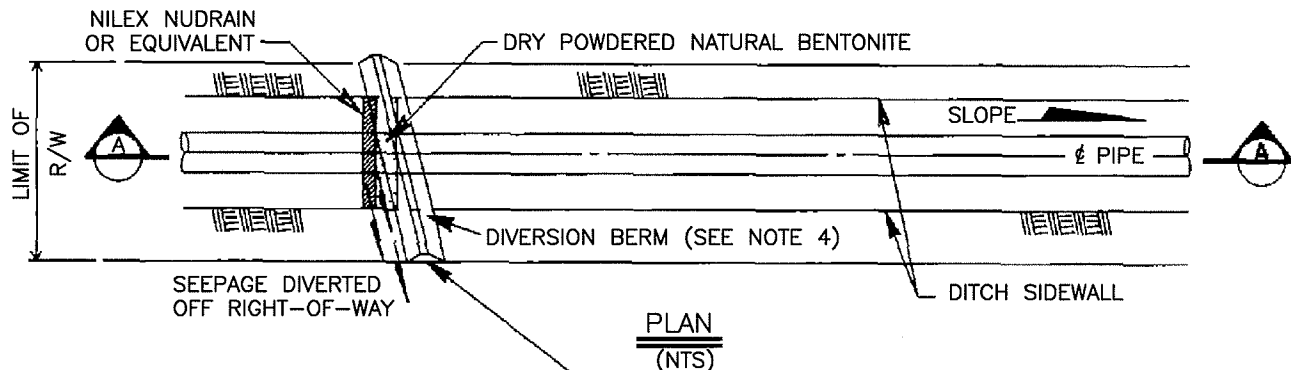
TYPICAL BENTONITE
DITCH PLUG

SCALE N.T.S.

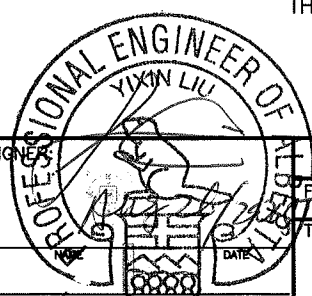
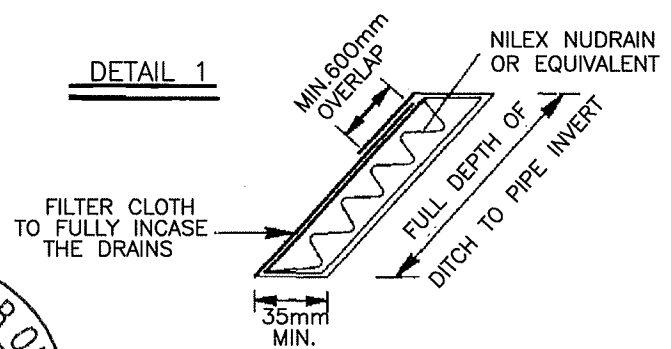
DWG No

STDS-03-ML-12-202 SHT 02 OF 02

REV 01



SECTION A
NTS



DESIGNER:	DESIGN STANDARD		
CHECKED BY:	STDS	CHAINAGE:	DISCIPLINE # 03
DATE:	TITLE		
TYPICAL BENTONITE DITCH PLUG USING NUDRAIN OR EQUIVALENT			
SCALE N.T.S.	DWG No	STDS-03-ML-12-203 SHT 01 OF 02 REV 01	

REVISIONS 00 THIS DRAWING SUPERCEDES SK-1391A (1/2) GENERAL ISSUE - REVIEWED FOR 2015 SPEC

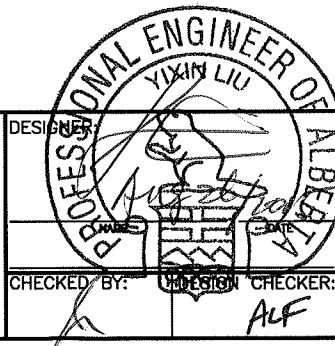
TIME DESIGNFILE

NOTES

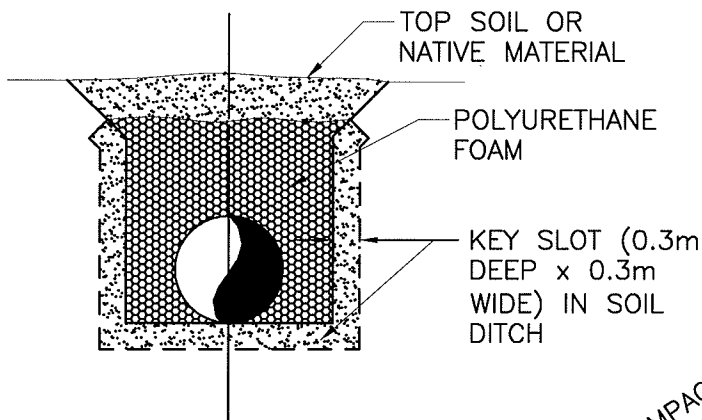
1. DITCH PLUGS, WHERE REQUIRED, WILL TYPICALLY BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE FREQUENCY AND FINAL LOCATION OF DITCH PLUGS ARE THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE AND ARE LOCATED ON THE BASIS OF FIELD OBSERVATIONS, LOCAL TOPOGRAPHY, AND DRAINAGE PATTERNS.
2. DITCH PLUGS ARE TO BE INSTALLED AT LOCATIONS WHERE THERE IS A POSSIBILITY OF GROUNDWATER SEEPAGE FLOWING EITHER WITHIN OR ALONG THE BACKFILLED PIPE DITCH. DITCH PLUGS SHOULD BE LOCATED IMMEDIATELY DOWNSLOPE OF AREAS OF SIGNIFICANT GROUNDWATER SEEPAGE OR AREAS OF CONCENTRATED CROSS SLOPE DRAINAGE. DITCH PLUGS ARE BEST LOCATED AT THE CREST OF STEEPER SLOPES TO ASSIST IN REMOVING WATER FROM THE PIPE DITCH BEFORE IT FLOWS ON A STEEPER GRADIENT.
3. DITCH PLUGS SHOULD BE LOCATED PRIOR TO PIPE LOWER-IN AND DITCH BACKFILLING. SUFFICIENT OPEN DITCH MUST BE MAINTAINED TO INSTALL DITCH PLUG (APPROXIMATELY 3 METRES AT DITCH BOTTOM). DITCH PLUGS SHOULD BE CONSTRUCTED AS SOON AS PRACTICABLE AFTER PIPE INSTALLATION AND GENERAL BACKFILLING TO MINIMIZE DITCH WALL SLUMPING, WATER INFILTRATION OR FROST PENETRATION INTO DITCH WALLS DURING WINTER CONSTRUCTION.
4. SEE DRAWING STDS-03-ML-12-221 AND STDS-03-ML-12-222 FOR DESIGN OF DIVERSION BERMS.
5. FILTER CLOTH TO BE WRAPPED TO TOTALLY ENCLOSE SUBDRAIN IN THE ZONE ILLUSTRATED IN DETAIL 1. A MINIMUM OVERLAP OF 600mm IS REQUIRED.
6. EACH BENTONITE BAG SHALL BE PERFORATED ONCE IN PLACE, TO ALLOW FOR THE INFILTRATION OF WATER THEREBY PERMITTING THE EXPANSION OF BENTONITE.
7. LOOSE BENTONITE SHALL BE PLACED BENEATH AND UP THE SIDES OF THE PIPE TO ENSURE ALL VOIDS ARE FILLED.

MATERIAL REQUIRED

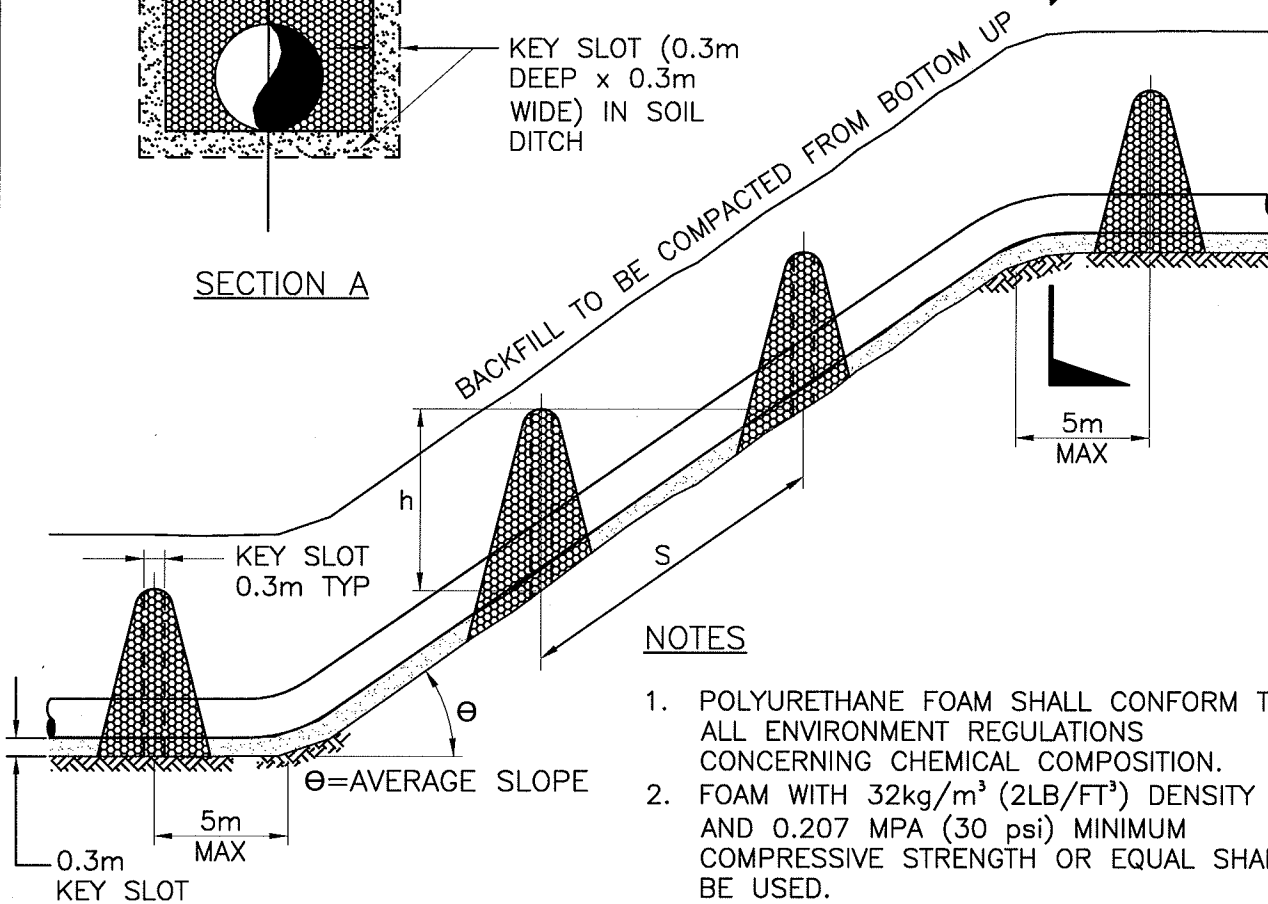
DRY POWDERED NATURAL BENTONITE IN 50 lb. BAGS
FILTER CLOTH : NILEX C-24 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
SUBRAIN : NILEX NUDRAIN OR EQUIVALENT



DESIGN STANDARD	
FIA #	STDS
CHAINAGE:	DISCIPLINE # 03
TITLE	
TYPICAL BENTONITE DITCH PLUG USING NUDRAIN OR EQUIVALENT	
SCALE N.T.S.	DWG No STDS-03-ML-12-203 SHT 02 OF 02
REV 01	



SECTION A

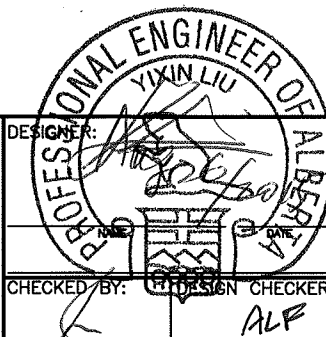


NOTES

1. POLYURETHANE FOAM SHALL CONFORM TO ALL ENVIRONMENT REGULATIONS CONCERNING CHEMICAL COMPOSITION.
2. FOAM WITH 32kg/m³ (2LB/FT³) DENSITY AND 0.207 MPA (30 psi) MINIMUM COMPRESSIVE STRENGTH OR EQUAL SHALL BE USED.
3. IF FORMING REQUIRED, STYROFOAM BOARD CAN BE USED.
4. IN VALLEYS, DRAINAGE AREAS OR AREAS WHERE WATER MAY FLOW ALONG TRENCH AND REMOVE PADDING OR BACKFILL FROM AROUND THE PIPE. ADJUST SPACING OR BREAKERS SO TOP OF BREAKER IS AT APPROXIMATELY THE SAME ELEVATION AS BOTTOM OF UPHILL BREAKER.
5. BREAKER SPACING AND CONFIGURATION MAY BE CHANGED AS DIRECTED BY COMPANY. DEPTH OF DITCH VARIES WITH SITE CONDITIONS.
6. REFER TO PROJECT SPECIFICATIONS WHERE PIPE PROTECTION MATERIALS (SAND PADDING, PILLOWS, ROCK SHIELD, ETC.) ARE REQUIRED.

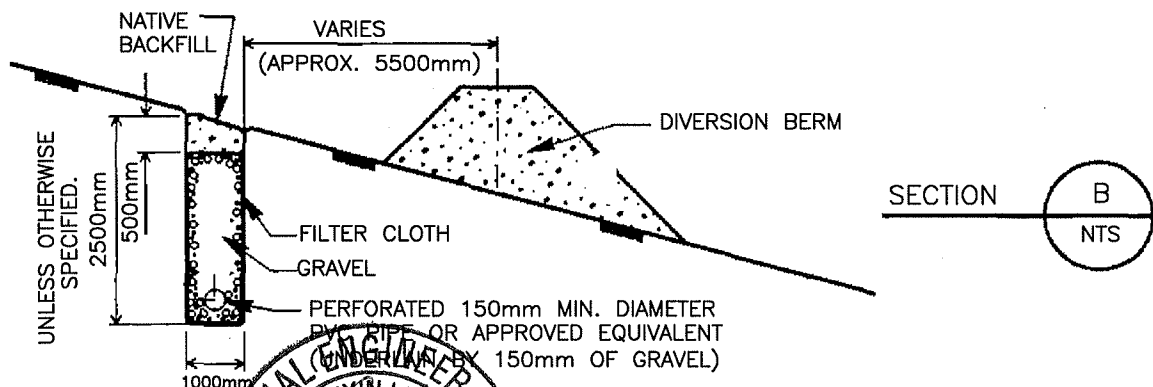
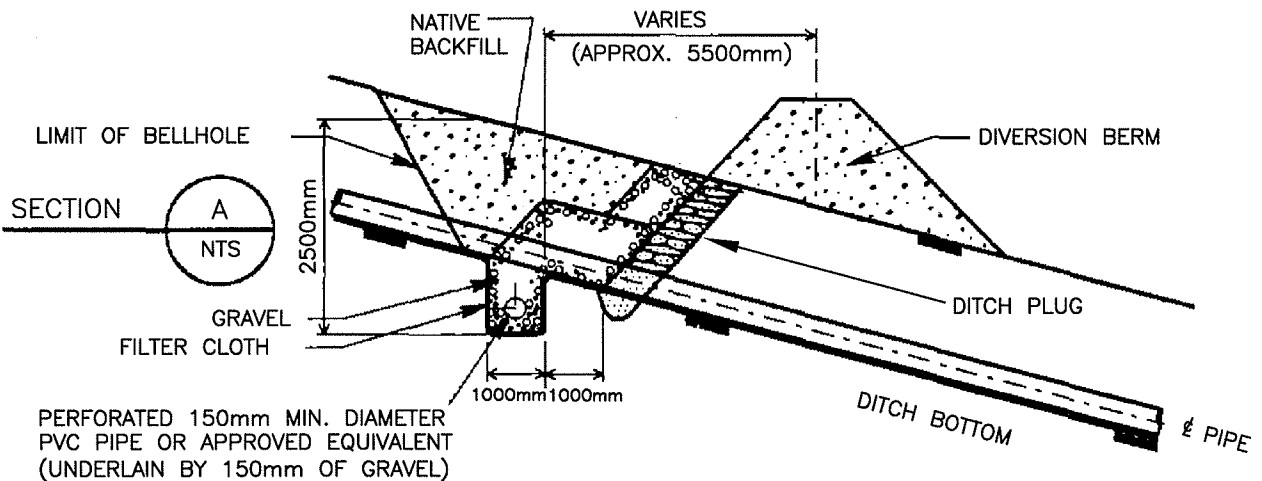
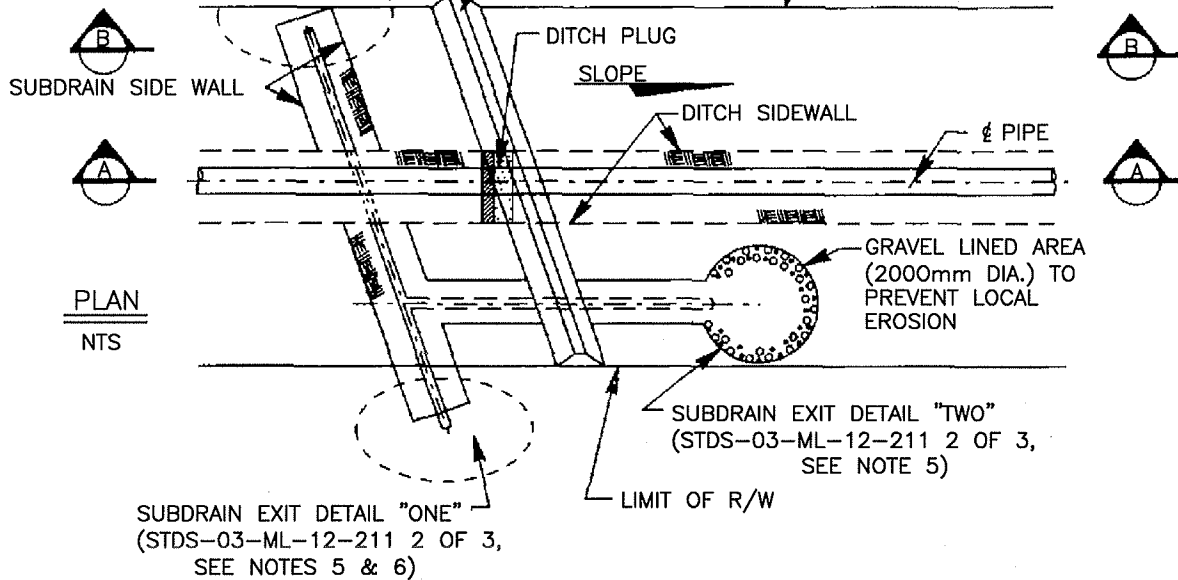
APPROXIMATE BREAKER SPACING

$$S = \frac{h}{\sin \theta}$$



DESIGN STANDARD			
FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE			
TYPICAL POLYURETHANE FOAM BREAKER			
SCALE N.T.S.	DWG No	STDS-03-ML-12-204	
			REV 01

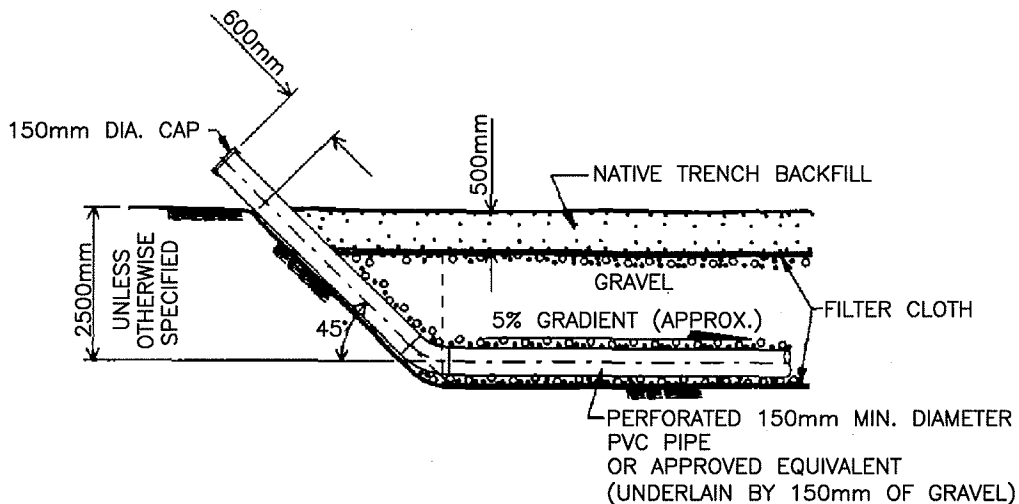
SEE SUBDRAIN FLUSH PIPE
ENTRANCE DETAIL
STDS-03-ML-12-211 2 OF 3



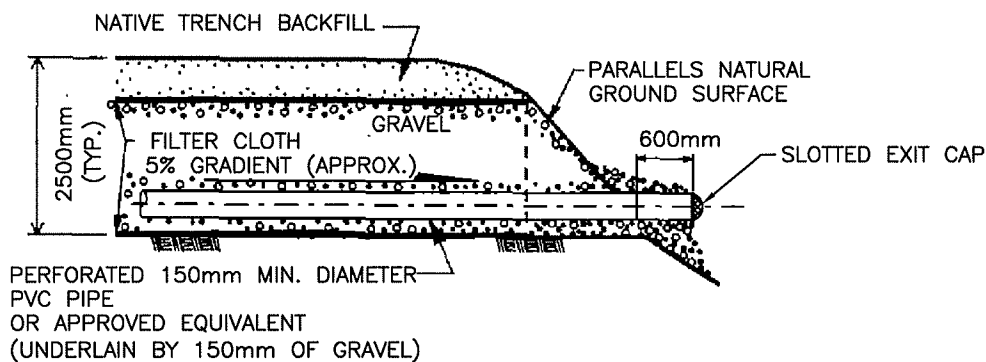
SEE PAGE 3 OF 3 FOR ALL NOTES



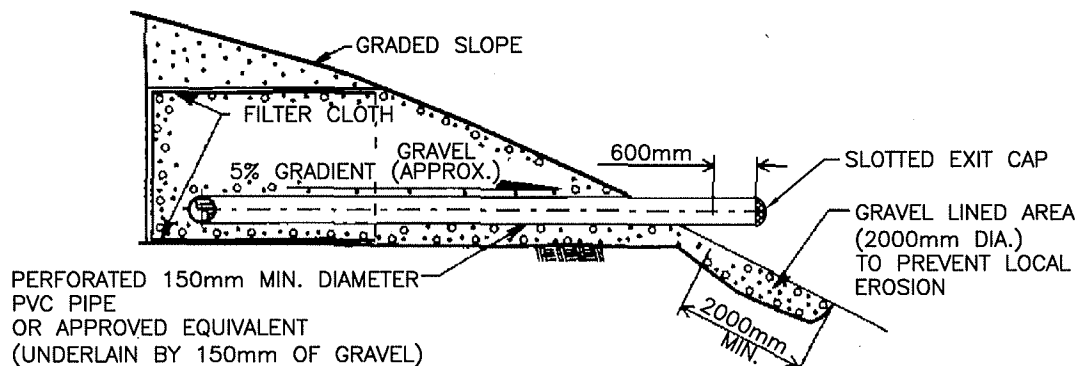
DESIGNER	DESIGN STANDARD		
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CHECKED BY:	TITLE		
ALF	TYPICAL SUBDRAIN USING GRAVEL (SHT. 01 OF 03)		
SCALE N.T.S.	DWG No	REV 01	
	STDS-03-ML-12-211		



SUBDRAIN FLUSH PIPE
ENTRANCE DETAIL



SUBDRAIN EXIT DETAIL "ONE"

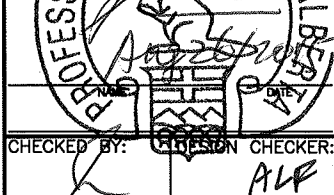


SUBDRAIN EXIT DETAIL "TWO"

SEE PAGE 3 OF 3 FOR ALL NOTES.



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CHECKED BY:

DESIGN CHECKER:

DESIGN STANDARD

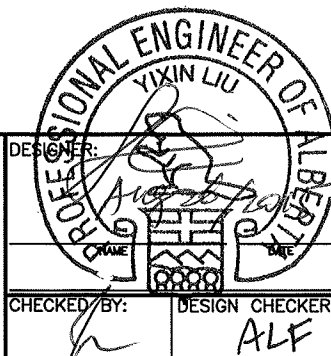
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TITLE	TYPICAL SUBDRAIN USING GRAVEL (SHT. 02 OF 03)			
SCALE N.T.S.	DWG No	STDS-03-ML-12-211	REV 01	

NOTES

1. SUBDRAINS ARE TYPICALLY USED TO LOWER A HIGH GROUNDWATER TABLE WITHIN THE PIPELINE RIGHT-OF-WAY. THEY ARE GENERALLY LOCATED AT THE CREST OF SLOPES OR IMMEDIATELY DOWNSLOPE OF AREAS EXHIBITING SIGNIFICANT GROUNDWATER EXIT.
2. SUBDRAINS WHERE REQUIRED, WILL BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE THE LOCATIONS SHOWN ARE APPROXIMATE AND FINAL POSITIONING OF THE SUBDRAIN IS THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE. LOCAL TOPOGRAPHY, DRAINAGE PATTERNS, AND OBSERVED GROUNDWATER CONDITIONS – PARTICULARLY AFTER DITCH EXCAVATION – WILL GOVERN THE FINAL SUBDRAIN LOCATION.
3. APPROXIMATE SLOPE OF SUBDRAIN TO BE 5%.
4. FILTER CLOTH FOR SUBDRAINS TO BE LAID IN OPEN TRENCH FOLLOWED BY 150mm OF GRAVEL. PERFORATED PIPE SHOULD BE PLACED WITH THE PERFORATIONS AT A MINIMUM BEING ON THE UNDERSIDE AT 4 AND 8 O'CLOCK POSITIONS. REMAINDER OF TRENCH SHOULD BE BACKFILLED WITH CLEAN, WELL GRADED GRAVEL TO WITHIN 500mm OF GRADE AND THE FILTER CLOTH OVERLAPPED TO TOTALLY ENCLOSE GRAVEL. COMPLETE BACKFILLING WITH NATIVE MATERIAL TO PREVENT SURFACE WATER FROM ENTERING SUBDRAIN.
5. SUBDRAIN EXIT DETAIL "ONE" USED WHERE SUBDRAIN EXITS SLOPE WITHIN A REASONABLE DISTANCE AND NATURAL CONTOURS DIRECT WATER OFF RIGHT-OF-WAY. WHERE SUBDRAIN IS REQUIRED IN THROUGHOUT AREA OR WHERE A "DETAIL ONE" EXIT POINT WOULD BE LOCATED GREATER THAN 10 METRES OUTSIDE THE RIGHT-OF-WAY LIMITS THEN THE DIRECTION OF SUBDRAIN IS DIRECTED SO THAT IT EXITS ALONG THE EDGE OF THE RIGHT-OF-WAY. (SEE EXIT DETAIL "TWO")
6. WHERE SUBDRAIN EXIT IS LOCATED BEYOND THE RIGHT-OF-WAY LIMITS, LAND APPROVALS ARE REQUIRED.

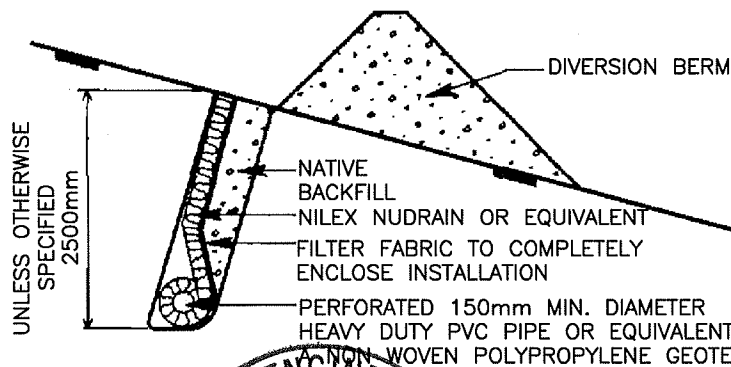
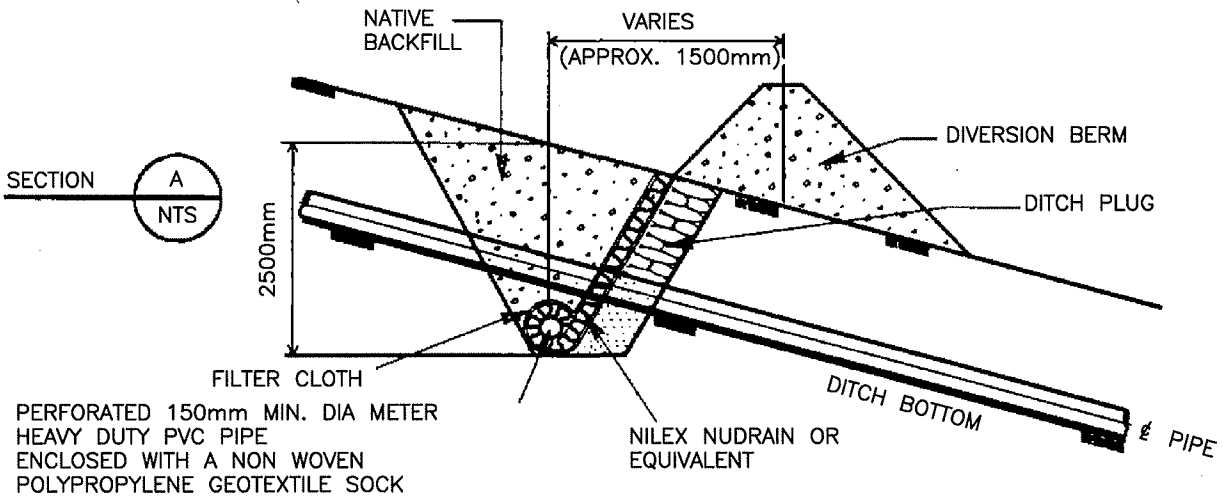
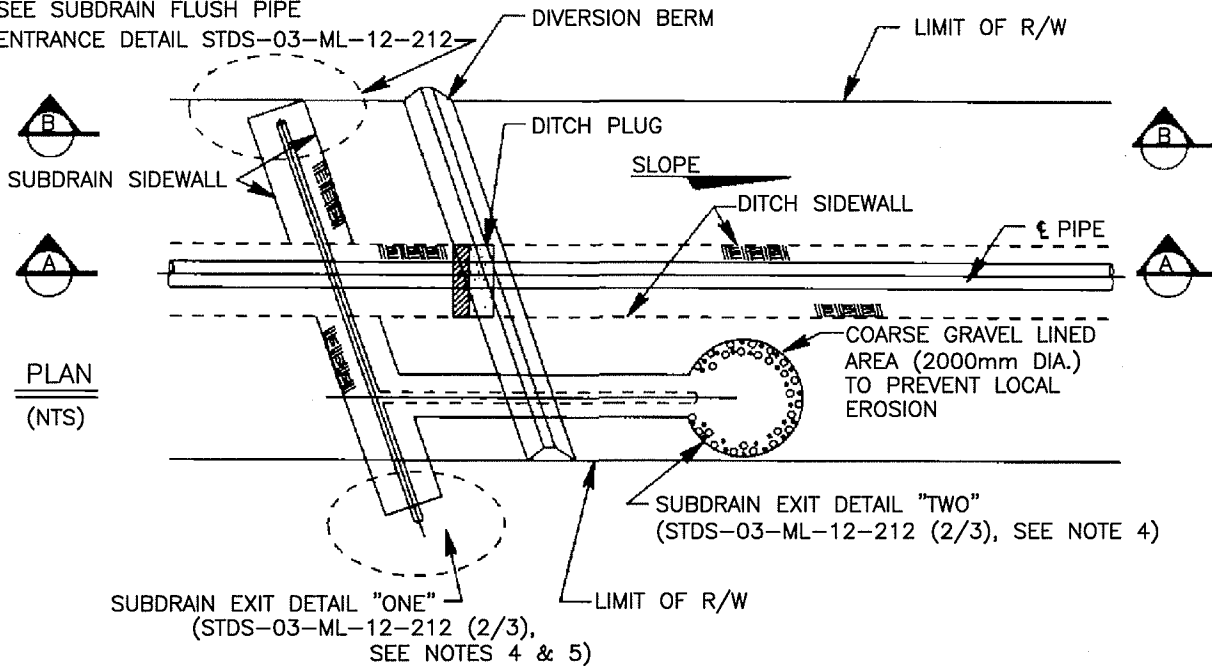
MATERIALS REQUIRED

- GRAVEL: WELL GRADED. LESS THAN 5% PASSING No.200 SIEVE
- FILTER CLOTH: NILEX C-24 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
- PERFORATED PIPE: 150mm MINIMUM DIAMETER, PERFORATED, PVC OR APPROVED EQUIVALENT
- END CAPS FOR DRAIN EXIT AND ENTRY. EXIT CAPS SHALL BE SLOTTED.

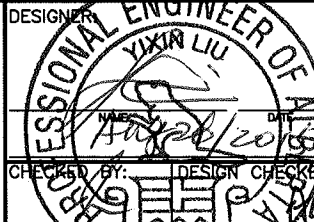


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FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE		TYPICAL SUBDRAIN USING GRAVEL (SHT. 03 OF 03)	
CHECKED BY:	DESIGN CHECKER:	SCALE N.T.S.	DWG No
	ALF		STDS-03-ML-12-211
			REV 01

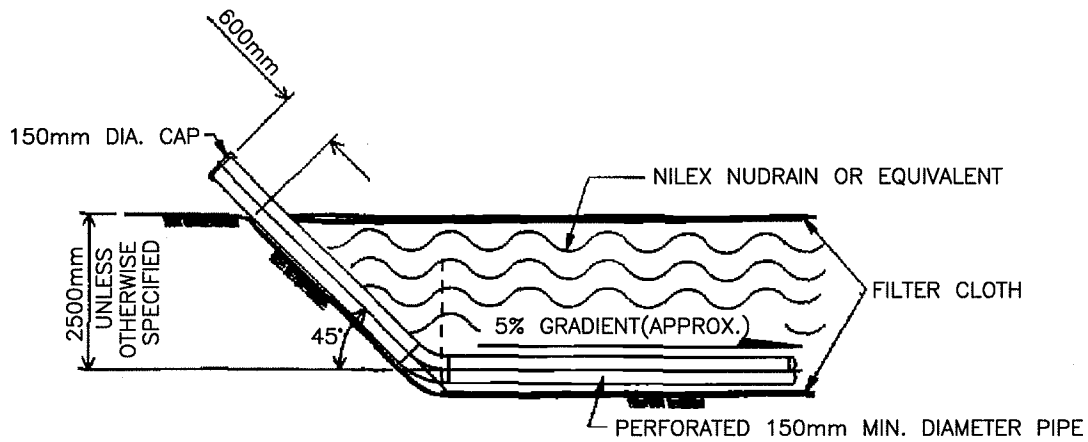
SEE SUBDRAIN FLUSH PIPE
ENTRANCE DETAIL STDS-03-ML-12-212



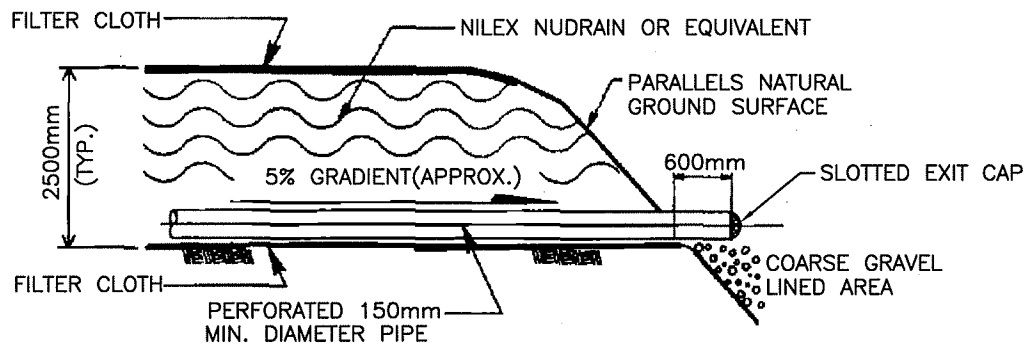
SEE PAGE 3 OF 3 FOR ALL NOTES



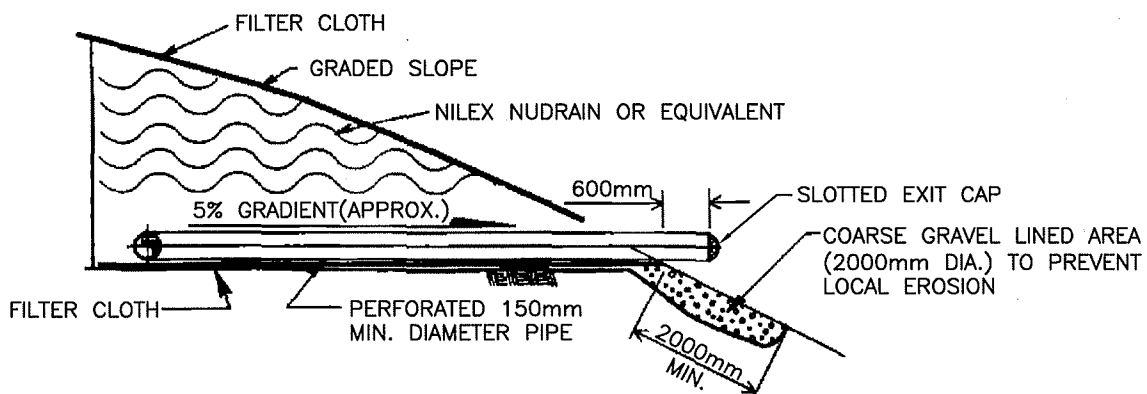
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FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE			
TYPICAL SUBDRAIN (SHT. 01 OF 03)			
SCALE N.T.S.	DWG No	STDS-03-ML-12-212	REV 01



**SUBDRAIN FLUSH PIPE
ENTRANCE DETAIL**

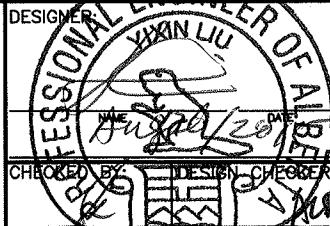


SUBDRAIN EXIT DETAIL "ONE"



SUBDRAIN EXIT DETAIL "TWO"

SEE PAGE 3 OF 3 FOR ALL NOTES.



DESIGN STANDARD			
FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE			
TYPICAL SUBDRAIN (SHT. 02 OF 03)			
SCALE N.T.S.	DWG No	STDS-03-ML-12-212	REV 01

NOTES

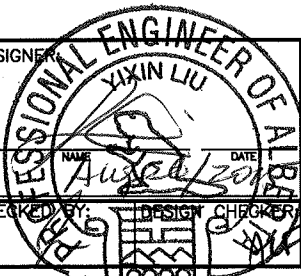
1. SUBDRAINS ARE TYPICALLY USED TO LOWER A HIGH GROUNDWATER TABLE WITHIN THE PIPELINE RIGHT-OF-WAY. THEY ARE GENERALLY LOCATED AT THE CREST OF SLOPES OR IMMEDIATELY DOWNSLOPE OF AREAS EXHIBITING SIGNIFICANT GROUNDWATER EXIT.
2. SUBDRAINS WILL BE SPECIFIED ON THE DRAWINGS WHERE REQUIRED. HOWEVER, THE LOCATIONS SHOWN ARE APPROXIMATE AND FINAL POSITIONING OF THE SUBDRAIN IS THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE. LOCAL TOPOGRAPHY, DRAINAGE PATTERNS AND OBSERVED GROUNDWATER CONDITIONS, PARTICULARLY AFTER DITCH EXCAVATION, WILL GOVERN THE FINAL SUBDRAIN LOCATION.
3. APPROXIMATE SLOPE OF SUBDRAIN TO BE 5%.
4. SUBDRAIN EXIT DETAIL "ONE" USED WHERE SUBDRAIN EXITS SLOPE WITHIN A REASONABLE DISTANCE AND NATURAL CONTOURS DIRECT WATER OFF RIGHT-OF-WAY. WHERE SUBDRAIN IS REQUIRED IN THROUGHOUT AREA, OR WHERE A "DETAIL ONE" EXIT POINT WOULD BE LOCATED GREATER THAN 10 METRES OUTSIDE THE RIGHT-OF-WAY LIMITS THEN THE DIRECTION OF SUBDRAIN IS DIRECTED SO THAT IT EXITS ALONG THE EDGE OF THE RIGHT-OF-WAY. (SEE EXIT DETAIL "TWO")
5. WHERE SUBDRAIN EXIT IS LOCATED BEYOND THE RIGHT-OF-WAY LIMITS, LAND APPROVAL IS REQUIRED.

MATERIALS REQUIRED

- NILEX NUDRAIN OR EQUIVALENT
- FILTER CLOTH: NILEX C-24 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
- PERFORATED PIPE: 150mm MINIMUM DIAMETER, PERFORATED, PVC OR APPROVED EQUIVALENT
- SOCK : NILEX SOCK - NON WOVEN POLYPROPYLENE GEOTEXTILE FOR 150mm DIAMETER PIPE
- COARSE GRAVEL : CLEAN, UNIFORM GRADED ROCK BETWEEN 10mm AND 100mm SIZE.
- END CAPS FOR DRAIN EXIT AND ENTRY. EXIT CAPS SHALL BE SLOTTED.



DESIGNER



DESIGN STANDARD

FIA #	STDS	CHAINAGE:	DISCIPLINE #	03
TITLE				
TYPICAL SUBDRAIN (SHT. 03 OF 03)				
SCALE N.T.S.	DWG No	STDS-03-ML-12-212		REV 01

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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

GENERAL ISSUE -- REVIEWED FOR 2015 SPEC

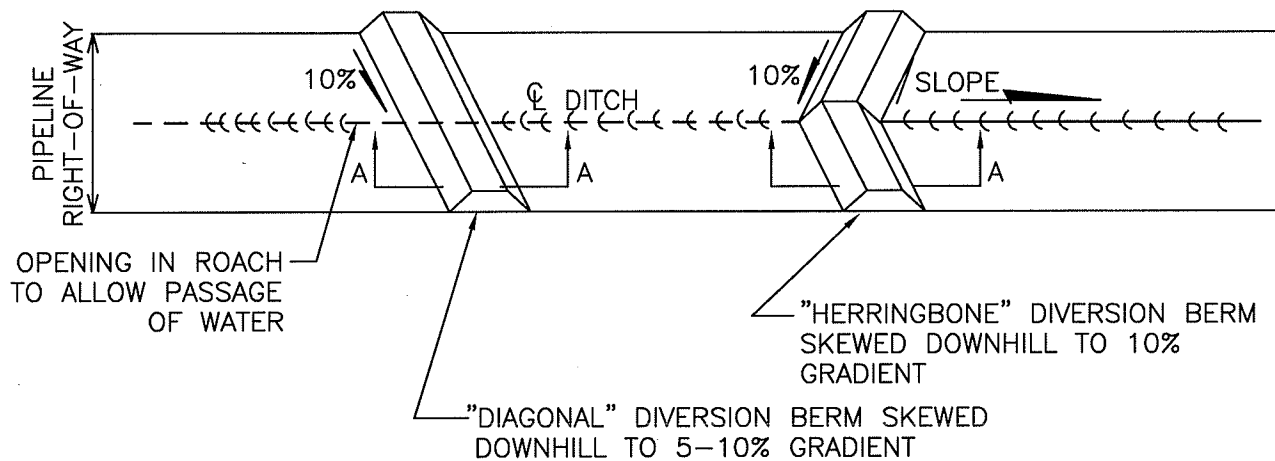
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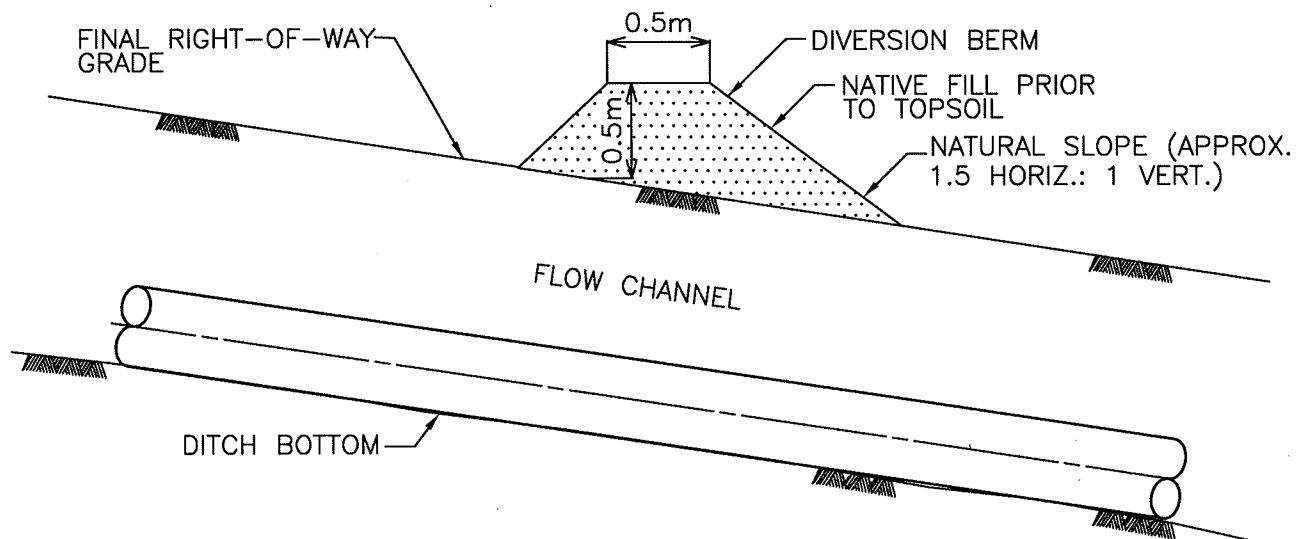
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REVISIONS

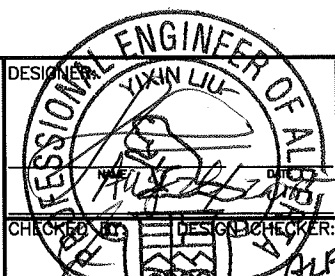
TIME
DESIGNFILE



PLAN



SECTION A-A



DESIGN STANDARD			
FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE		TYPICAL DIVERSION BERMS (SHT. 01 OF 02)	
SCALE N.T.S.		DWG No	STDS-03-ML-12-221
		REV 01	

NOTES

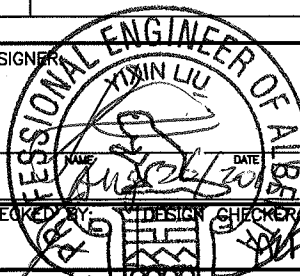
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. "DIAGONAL" DIVERSION BERMS ARE USED:
-WHERE THE EXISTING TOPOGRAPHY AND SLOPE DRAINAGE SUGGEST A PREFERRED DIRECTION OF SURFACE WATER MOVEMENT.
3. "HERRINGBONE" DIVERSION BERMS ARE TO BE USED:
-WHERE THERE IS NO APPARENT PREFERRED DIRECTION OF SURFACE WATER MOVEMENT OR WHERE THE BERM IS LOCATED ACROSS A SLOPE WITH SIDE CUTS ON BOTH SIDES OF THE RIGHT-OF-WAY.
4. ALL BERMS SHALL BE CONSTRUCTED OF SUBSOIL NOMINALLY COMPACTED IN LIFTS. NO ORGANICS, TOPSOIL, SNOW, ICE OR OTHER DELETERIOUS MATERIAL SHALL BE INCORPORATED IN THE BERM FILL.
5. THE LENGTH OF THE BERMS SHALL EXTEND ACROSS THE FULL WIDTH OF THE DISTURBED RIGHT-OF-WAY OR TO THE TOE OF THE CUT SLOPE. BERMS MAY BE EXTENDED BEYOND THE RIGHT-OF-WAY BOUNDARIES IF THE LAND APPROVALS HAVE BEEN OBTAINED.
6. TOPSOIL SHALL BE APPLIED TO THE BERMS AFTER COMPACTION OF SUBSOIL.
7. FOLLOWING TOPSOIL REQUIREMENT, THE BERMS SHALL BE SEEDED WITH THE APPROVED MIX, FOLLOWED BY PLACEMENT OF THE BIO-DEGRADABLE EROSION CONTROL FABRIC (BIO4 OR EQUIVALENT). CHECK DAMS AND SILT FENCE MAY BE REQUIRED AFTER PLACEMENT OF THE EROSION CONTROL LINER, AS DETERMINED BY COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE KEYED-IN. OTHER BIO-DEGRADABLE STAKES/ANCHORS CAN BE USED IN THE PLACE OF WOOD STAKES.
8. THE FINAL LOCATION, SPACING, AND DIRECTION OF THE BERMS ARE TO BE DETERMINED DURING CONSTRUCTION BY THE COMPANY'S AUTHORIZED REPRESENTATIVE BASED ON THE LOCAL TOPOGRAPHY AND DRAINAGE PATTERN.
9. THE FINAL HEIGHT OF THE BERM SHALL BE 0.5m HIGHER ACROSS THE PIPELINE TRENCH IN FROZEN CONDITIONS UNLESS SPECIFIED BY THE COMPANY.
10. SPACING OF DITCH PLUGS SHALL BE EVERY SECOND DIVERSION BERM UNLESS OTHERWISE APPROVED BY THE COMPANIES AUTHORIZED REPRESENTATIVE.

TYPICAL DIVERSION BERM SPACING

SLOPE	SOIL EROSION POTENTIAL		
	HIGH (FINE SANDS AND SILTS)	MODERATE (CLAY AND COURSE SANDS)	LOW (GRAVEL AND EXPOSED BEDROCK)
GENTLE (UNDER 5%)	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE
MODERATE (5%-10%)	30m	60m	90m
STEEP (OVER 10%)	$\frac{305}{\% \text{ GRADE}} = \text{---m}$	$\frac{305 \times 2}{\% \text{ GRADE}} = \text{---m}$	$\frac{305 \times 3}{\% \text{ GRADE}} = \text{---m}$



DESIGNER



DESIGN STANDARD

FIA # STDS CHAINAGE: DISCIPLINE # 03

TITLE TYPICAL DIVERSION BERMS
(SHT. 02 OF 02)

CHECKED BY: DESIGN CHECKER

SCALE N.T.S.

DWG No

STDS-03-ML-12-221

REV 01

NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. "DIVERSION BERMS WITH FLOW CHANNELS ARE APPROPRIATE TO USE ON STEEP SLOPES. THE LINER SHALL CONSIST OF A BIO-DEGRADABLE EROSION CONTROL FABRIC (MIN. BIO4 OR EQUIVALENT).
3. "DIAGONAL" DIVERSION BERMS ARE USED WHERE THE EXISTING TOPOGRAPHY AND SLOPE DRAINAGE SUGGEST A PREFERRED DIRECTION OF SURFACE WATER MOVEMENT.
4. "HERRINGBONE" DIVERSION BERMS ARE USED WHERE THERE IS NO APPARENT PREFERRED DIRECTION OF SURFACE WATER MOVEMENT ACROSS A SLOPE WITH SIDE CUTS ON BOTH SIDES OF THE RIGHT-OF-WAY.
5. ALL BERMS SHALL BE CONSTRUCTED OF SUBSOIL NOMINALLY COMPACTED IN LIFTS. NO ORGANICS, TOPSOIL, SNOW, ICE OR OTHER DELETERIOUS MATERIAL SHALL BE INCORPORATED IN THE BERM.
6. BERMS SHALL EXTEND ACROSS THE FULL WIDTH OF THE DISTURBED RIGHT-OF-WAY OR TO THE TOE OF THE CUT SLOPE. TO PREVENT WATER FROM FLOWING BACK ONTO THE RIGHT-OF-WAY, THE BERMS SHALL BE EXTENDED A SUITABLE DISTANCE BEYOND THE EDGE OF THE RIGHT-OF-WAY, PROVIDED NECESSARY LAND APPROVALS HAVE BEEN OBTAINED.
7. A FLOW CHANNEL SHALL BE EXCAVATED ALONG THE BASE OF THE UPHILL FACE OF THE DIVERSION BERMS ONLY IF MINIMUM COVER EXIST PRIOR TO EXCAVATION. TYPICAL DIVERSION BERM STDS-03-ML-12-221, INCLUDING THE LINER (KEYED AND SECURED) ON THE UPHILL FACE CAN ALSO BE UTILIZED AS DETERMINED BY THE COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE SECURED WITH WOOD STAKES OR OTHER BIO-DEGRADABLE STAKES/ANCHORS AT MAXIMUM 1m INTERVALS BETWEEN.
8. TOPSOIL SHALL BE APPLIED TO THE BERMS AFTER COMPACTION OF SUBSOIL.
9. FOLLOWING TOPSOIL REPLACEMENT, THE BERMS SHALL BE SEEDED WITH THE APPROVED MIX, FOLLOWED BY PLACEMENT OF THE BIO-DEGRADABLE EROSION CONTROL LINER (BIO4 OR EQUIVALENT, SECURED AT MAXIMUM 1m INTERVALS). CHECK DAMS AND SILT FENCE MAY BE REQUIRED AFTER PLACEMENT OF THE EROSION CONTROL LINER, AS DETERMINED BY COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE KEYED-IN.
10. THE FINAL LOCATION, SPACING, AND DIRECTION OF THE BERMS ARE TO BE DETERMINED DURING CONSTRUCTION BY THE COMPANY'S AUTHORIZED REPRESENTATIVE BASED ON THE LOCAL TOPOGRAPHY AND DRAINAGE PATTERN.
11. THE FINAL HEIGHT OF THE BERM SHALL BE 0.5m HIGHER ACROSS THE PIPELINE TRENCH IN FROZEN CONDITIONS UNLESS SPECIFIED BY THE COMPANY.
12. SPACING OF DITCH PLUGS SHALL BE EVERY SECOND DIVERSION BERM UNLESS OTHERWISE APPROVED BY THE COMPANIES AUTHORIZED REPRESENTATIVE.

TYPICAL DIVERSION BERM SPACING

SLOPE	SOIL EROSION POTENTIAL		
	HIGH (FINE SANDS AND SILTS)	MODERATE (CLAY AND COURSE SANDS)	LOW (GRAVEL AND EXPOSED BEDROCK)
GENTLE (UNDER 5%)	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE
MODERATE (5%-10%)	30m	60m	90m
STEEP (OVER 10%)	$\frac{305}{\% \text{ GRADE}} = \text{---m}$	$\frac{305 \times 2}{\% \text{ GRADE}} = \text{---m}$	$\frac{305 \times 3}{\% \text{ GRADE}} = \text{---m}$



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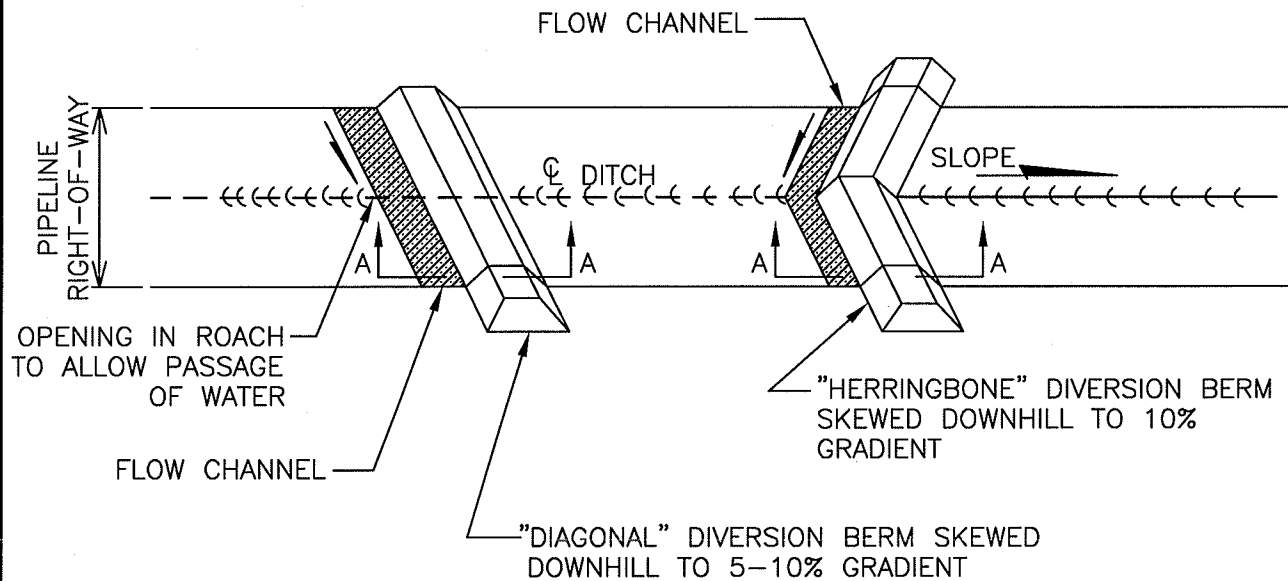
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DESIGN STANDARD

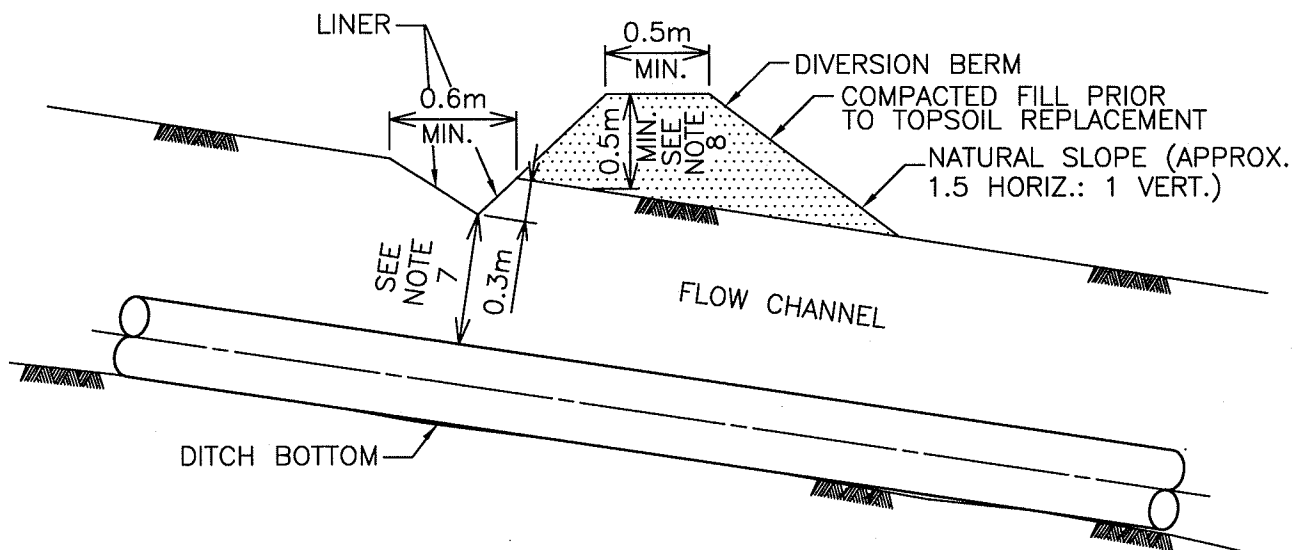
FIA # STDS CHAINAGE: DISCIPLINE # 03

TITLE TYPICAL DIVERSION BERMS
WITH FLOW CHANNEL
(SHT. 02 OF 02)

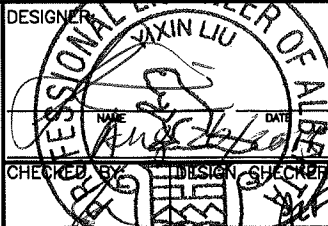
SCALE N.T.S. DWG No STDS-03-ML-12-222 REV 01



PLAN



SECTION A-A



DESIGN STANDARD			
FIA #	STDS	CHAINAGE:	DISCIPLINE # 03
TITLE		TYPICAL DIVERSION BERMS WITH FLOW CHANNEL (SHT. 01 OF 02)	
SCALE N.T.S.	DWG No	STDS-03-ML-12-222	REV 01

APPENDIX 1E

CONTINGENCY PLANS

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1.0 SPILL CONTINGENCY PLAN

Introduction

Depending upon the location, substance and quantity of the release, the incident may be reportable to applicable federal and/or provincial authorities. It will be the responsibility of the Environmental Inspector(s) to determine if an incident is externally reportable and follow the appropriate regulatory reporting requirements. Therefore, it is the policy of the Company that all releases are reported internally to the Environmental Inspector(s), regardless of the location, quantity or substance released.

The Construction Manager and/or Environmental Inspector(s) will immediately notify the appropriate regulatory agency when a reportable event occurs. If this is not possible, notification will be made as soon as practical upon detection of the spill. If a Contractor specific Spill Response Plan is in place, the plan will be reviewed to ensure that the Contractor Spill Response Plan meets the criteria contained in the Company's Spill Contingency Plan. Where inconsistencies exist, the more stringent requirement will apply.

General Measures

The following are standard measures to be adhered to during construction.

1. Appropriate spill equipment will be maintained at all work sites, in accordance with the Waste Management Plan (Appendix 1F). The risk for site-specific spills will be used to determine the appropriate type of response equipment and suitable location for storage.
2. Specific instructions regarding applicable contacts and appropriate response actions to be taken in the event of a spill will be posted at the field construction offices.

Initial Response

The following actions will be taken upon detection of a spill.

1. In the event of a spill of hazardous material, the first person on the scene will follow the actions presented in the Contractor's Spill Response Procedures and/or the Spill Scene Checklist.
2. When notified of a spill, the Contractor will immediately ensure that:
 - action is taken to control danger to human life including the appointment of an Onsite Safety Supervisor;
 - the necessary equipment is mobilized and measures are being implemented to control and contain the spill; and
 - all resources are available to contain and clean-up a spill.
3. When notified of a spill, the Environmental Inspector(s) will immediately ensure that:
 - the appropriate regulatory agencies are notified (e.g., NEB, AEP). Other notifications include the Project Engineer, the Company Environmental Advisor and if required, the RCMP.

General Spill Containment Procedures

The successful containment of a spill on land or water depends on a variety of factors including: ground cover, topography, hydrogeology, solubility of the material, viscosity of the liquid, water currents, soil permeability and climatic conditions.

The following general guidelines will be followed for containment of spilled materials.

1. The first person on the scene will follow the actions listed in the Contractor's Spill Response Procedures and/or the Spill Scene Checklist.
2. Assess the safety hazards of the situation.
3. Remove sources of ignition, if safe to do so.
4. Identify the product, stop source, and physically contain spill as soon as safe to do so.
5. Avoid use of water or fire extinguishing chemicals on nonpetroleum product spills unless it is necessary to control a fire or prevent an explosion, since many chemicals react violently with water and chemical extinguishing agents may release toxic fumes. In addition, chemicals may be soluble in water and dispersal makes containment and clean-up more difficult.
6. Minimize traffic on contaminated soils.
7. Use natural depressions or berms constructed with materials and equipment in proximity to the site to physically contain a spill on land. Deployment of booms may be necessary on water.

Clean-up guidelines for specific accidents are outlined below.

Transportation by Truck

At a minimum, the following general guidelines will be followed for containment and clean-up of most hazardous materials if spilled from a truck.

1. Contain spilled product
2. Pump the source of the leak dry, if applicable.
3. Remove source from site.
4. Recover spilled product.
5. Clean-up contaminated area.
6. Dispose of sorbent pads, heavily contaminated soil and vegetation at an approved facility. On lightly contaminated soil areas where remediation is feasible, add amendments, repeat as required, sample soil and seed as appropriate.

Spills Adjacent to or into a Waterbody

At a minimum, the following general guidelines will be followed for containment and clean-up of most hazardous materials if spilled adjacent to, or into, a waterbody.

1. Construct berms, sumps and/or trenches to contain and/or prevent spilled product from entering a waterbody.
2. Deploy booms, skimmers, sorbents, etc., if feasible, to contain and recover spilled material from waterbody.
3. Recover spilled product.
4. Clean-up contaminated areas.

5. Dispose of heavily contaminated soil and vegetation at an approved facility. On lightly contaminated soil areas where *in situ* restoration is feasible, the site will be reclaimed in a suitable manner, as determined by the Environmental Inspector(s).

Spot Spills

Since effects from small spot spills can generally be minimized if appropriate actions are implemented, all small spills of fuels or noxious materials must be reported immediately to the Environmental Inspector(s).

At a minimum, the following general guidelines will be followed while cleaning up spot spills of fuel or other hazardous materials.

1. Modify construction activity in the immediate vicinity of the spot spill such that the impacted area is not disturbed
2. The Environmental Inspector(s) will determine appropriate methods to remove contaminated soil or vegetation to an approved facility or restore contaminated soils and vegetation in a suitable manner.

SPILL REPORTING AUTHORITIES	
Regulatory Agency	Notes
Alberta Environment and Parks 24 Hour Spill Line 1-800-222-6514	Any spill, release, or emergency that might cause, is causing, or has caused an adverse effect to the environment.
Transportation Safety Board* Phone: 1-819-997-7887 Facsimile: (403) 299-3913 NOTE: The Transportation Safety Board will notify the NEB of any reportable spills. The company should also notify the NEB Operational Project Manager directly.	For all NEB regulated facilities, environmental incidents must be reported to the Transportation Safety Board. An "incident" means an occurrence that results in: <ul style="list-style-type: none"> • the death of or serious injury to a person; • a significant adverse effect on the environment; • an unintended fire or explosion; • an unintended or uncontained release of LVP hydrocarbons in excess of 1.5 m³; • an unintended or uncontrolled release of gas or HVP hydrocarbons; and/or • the operation of a pipeline beyond its design limits as determined under CSA Z662 or CSA Z276 or any operating limits imposed by the Board (incident).

SPILL SCENE CHECKLIST

The following activities should be taken by the first person on the scene of a hazardous material spill or release.

- (a) If possible without further assistance, assess the safety hazards of the situation, control danger to human life and identify the composition (see Spill Report Form - next page) of the spilled material. _____
- (b) If feasible and safe to do so, remove any sources of ignition, cut off the source of the spill and initiate a release response plan (*i.e.*, control, contain and clean-up). _____
- (c) Once the source has been cut off, attempt to contain the spilled area. _____
- (d) Notify the Construction Manager and Environmental Inspector(s). _____
- (e) Take notice of dangers to the environment (*e.g.*, proximity of watercourses) and clean-up actions that might be necessary. _____
- (f) If any of the above tasks are beyond the capabilities at hand, ask for qualified assistance. _____

Note: The Construction Manager and/or Environmental Inspector(s) is responsible for contacting regulatory agencies. The Company Environmental Advisor is responsible for follow-up reporting that may be required by regulations / guidelines.

SPILL REPORT FORM

Type of Material Spilled:

Gasoline _____
Diesel _____
Lube Oil _____
Hydraulic Fluid _____
Vehicle Antifreeze _____
Other (specify) _____

Date and Time of Spill or Discovery: _____

Source of Spill: _____

Area of Spill (m²): _____

Depth of Spill (cm): _____

Volume of Spill (L): _____

Estimated Release Rate: _____

Duration of Release: _____

Location (land, water, land and water): _____

Soil Type (e.g., sandy, clay, etc.): _____

Location: Easting _____; Northing _____ UTM Zone ____; KP ____

Land Use: _____

Environmentally sensitive areas potentially affected: _____

Weather conditions at time of discovery: _____

Procedures taken to minimize, control or stop the release: _____

Remediation plan and schedule of implementation, if required: _____

Current status of the remediation program: _____

(dd/mm/yy) (hr:min): _____

Form Completed by:

Name: _____ (printed) _____ (signed)

Date: _____

2.0 ADVERSE WEATHER CONTINGENCY PLAN

The Environmental Inspector(s) is responsible for monitoring and implementing all procedures and will liaise with the appropriate regulatory agencies, when required. If necessary, a meeting will be held in the field to ensure that all involved parties mutually understand concerns.

Where adverse weather conditions and activities have the potential to cause adverse environmental effects, the Environmental Inspector(s) will suspend that phase of the operation until weather conditions abate or effective mitigation procedures have been implemented. The following represents mitigative measures that may be applied. Specific environmental mitigation is subjective and dependent upon specific right-of-way conditions and the Project schedule.

The following table outlines mitigative measures that allow for the continuation of activities and reduce potential adverse environmental effects.

WIND EROSION	
Mitigation Options to Consider	
1	Uniformly apply mulch or tackifier to topsoil/strippings piles and/or other areas affected by wind erosion.
2	Water identified areas when activities or sufficient winds have created the potential for topsoil/strippings erosion.
3	Apply straw to topsoil/strippings and/or other areas where winds have created the potential for soil erosion. Straw sources are subject to landowner or regulatory approval, and must be approved by the Environmental Inspector(s). When clean straw is unavailable, seeding a clean, unpalatable annual crop at half the normal rate is acceptable.
WATER EROSION	
Temporary Berms / Silt Fence	
1	Temporary berms, silt fence and/or other appropriate mitigative measures (e.g., wattles, erosion control matting) will be implemented along the trench crown, surface material piles, and/or other areas where the potential for water erosion has been identified.
2	To prevent ponding and/or erosion, cross right-of-way drainage will be maintained. Appropriate measures (e.g., sumps, pumping excess water) to prevent deleterious material from entering a watercourse will be implemented, when and where required.
Right-of-Way Maintenance / Stabilization	
1	During adverse weather conditions, the Company will direct the Contractor to reduce unnecessary traffic and the number of vehicles on the right-of-way. Better planning of activities will be required by the Contractor to either tighten up, or spread out the work crews as warranted (e.g., close proximity of ditching, lower in, and backfill operations). To reduce effects, a one trip in, one trip out philosophy will be implemented for all right-of-way access.
2	Traffic will be restricted to the right-of-way. The appropriate regulatory agency will need to approve any off right-of-way activities.
3	The traffic pattern on the right-of-way will be changed to avoid repeated driving in the same areas.
4	Under adverse weather conditions, the Contractor will be required to back-blade the right-of-way during and at the end of the day. Back-blading of the right-of-way fills in tire tracks, thereby assisting in the prevention of water erosion and re-establishing a firm working right-of-way surface.
5	Under adverse weather conditions, topsoil/surface material and/or subsoil may be stripped and placed at the edge of the right-of-way if approved by the Environmental Inspector(s). Topsoil, surface material and/or subsoil will be redistributed evenly across the right-of-way during clean-up.
6	Under spring thaw condition and/or where identified by the Company, and in consultation with the appropriate Regulatory Representatives, vehicle watercourse crossing techniques may be modified and/or replaced with other appropriate crossing techniques.
7	When available and practical, tracked equipment may be required for specific activities.
8	Work in highly sensitive areas may be stopped and shifted to less sensitive areas.
9	If all mitigation fails, Project activities may be suspended until adverse weather conditions abate, thereby incurring a schedule delay. Project shut-down will be based upon discussions between the Construction Manager, Contractor, Environmental Advisor and the appropriate regulatory agencies. Recommencement of work must be authorized by the Construction Manager, in consultation with the Environmental Inspector(s) prior to restart.

3.0 FLOOD AND EXCESSIVE FLOW CONTINGENCY PLAN

The weather conditions will be monitored by the Environmental Inspector(s) on a daily basis. If a major storm is predicted or occurs, qualified personnel will inspect all watercourse crossings where construction is in progress or has been completed, to determine whether any corrective actions need to be implemented.

The appropriate regulatory agencies will be notified when required, as soon as practical, by the Environmental Inspector(s) or Construction Manager, that contingency measures have been implemented (see Appendix B of this EPP).

At watercourses where an isolated crossing method is recommended, the proposed isolation crossing techniques may not be feasible during periods of excessive flow or unusually wet seasons.

The following contingency measures will be implemented progressively or individually, as warranted, if excessive flow or flood conditions are anticipated prior to commencing watercourse crossing construction.

1. Assess the capability to handle the expected flow rate with the proposed crossing method. If use of the proposed crossing method is determined to be feasible by the Company, the crossing will proceed.
2. Defer water crossing construction to a later time when flows have subsided, if it is determined by the Company that the proposed crossing method is not feasible.
3. Alternatively, where the expected flow rates and window limitations combine to preclude the proposed crossing method, request approval from the appropriate regulatory agencies to use an alternate crossing method.

The following contingency measures will be implemented progressively or individually, as warranted, if excessive flow or flood conditions should occur during watercourse crossing construction.

1. Assess the capability to handle the anticipated flow rate with the proposed crossing method. If use of the proposed crossing method is determined to be feasible by the Company, the crossing will proceed.
2. Increase the quantity of materials required to perform the crossing. Reinforce or replace the isolation and/or bypass structure(s) if necessary.
3. Withdraw all equipment or tanks containing fuel, oil or other hazardous materials from potential flood areas.
4. Remove all stationary and mobile equipment deployed at the crossing site to a safe area above the anticipated high water level.
5. Remove any instream flume or dam equipment that may impede streamflow, as safe work conditions allow.
6. Relocate all topsoil/strippings piles at the direction of the Environmental Inspector(s).
7. Relocate spoil piles, to the extent feasible, to a position above the anticipated high water level.
8. Evaluate vehicle crossing structure to determine whether adequate free-board is present on bridges and adequate capacity is available in culverts. Take corrective measures as appropriate to avoid flooding of adjacent lands.
9. Import sandbags and place strategically to help stabilize and add height to banks to prevent flooding of nearby areas, especially where vegetation has been removed.

4.0 WET SOILS CONTINGENCY PLAN

The Company will assign Environmental Inspectors with sufficient training and soils-related experience to be able to identify soils that are too wet for a particular activity and when the soils are sufficiently dry or frozen to allow the activity to resume. The decision to continue or suspend particular pipeline construction activities on lands with excessively wet soils will be made by the Construction Manager in consultation with the Environmental Inspector(s).

Soils are considered to be excessively wet when the planned activity could cause unacceptable damage to soils either due to rutting by traffic through the surface layer into the subsoil; soil structure damage during soil handling; or compaction and associated pulverization of surface material due to heavy traffic.

In order to minimize terrain disturbance and soil structure damage through rutting or compaction due to wet soil conditions, construction alternatives will be employed, as necessary, in the event of excessively wet soils. The contingency measures listed below will be implemented individually or in combination, as necessary, based on site-specific conditions.

Wet Soil Contingency Measures

1. Restrict construction traffic, where feasible, to equipment with low-ground-pressure tires or wide pad tracks.
2. Postpone construction until evening or early morning when the ground is frozen.
3. Install biodegradable geotextile, swamp mats, rig mats, access mats, or corduroy if approved by the applicable regulatory agency, or equivalent, in problem areas.
4. Under frozen conditions, employ frost inducement measures such as snow packing or plowing to increase the load-bearing capacity of thawed ground.
5. Suspend timber skidding operations or implement other measures (e.g., use tarps or plastic sheeting) if the potential exists for salvageable timber to be damaged through contact with wet soils.
6. Suspend construction until soils dry out or freeze.

5.0 FIRE SUPPRESSION CONTINGENCY PLAN

Prior to commencement of construction, the Contractor will designate one of his staff as Fire Boss. The Fire Boss will be familiar with fire-fighting techniques and equipment. A Fire Boss should have some degree of fireline certification and fire experience, or knowledge of fire weather and fire behavior.

Fire Suppression Supplies

Necessary fire fighting equipment will be on site in accordance with the Alberta Forest and Prairie Protection Regulations. In addition, all motorized equipment must carry a fully charged fire extinguisher. The Fire Boss will ensure that fire extinguishers are present and fully charged and all fireline equipment is present and in working order. The fire equipment and water supply on site should be increased as the fire hazard increases.

In the Event of a Fire

The following mitigative measures will be implemented in the event of a fire.

1. Commence fire suppression measures immediately upon detection of fire provided that fire conditions allow personnel to safely proceed under the direction of the Fire Boss.
2. Personnel working on the Project must report the location of fire as well as size of fire and wind direction, to Fire Boss immediately.
3. Fire Boss or the Company designate, will report wild fires and relevant information to the Company's Environmental Advisor, Construction Manager, AEP's Public Lands and Forest Divisions, municipal By-Law officers and applicable local fire departments. Reporting to provincial authorities must be completed immediately. Refer to the Fire Report Form for guidance when reporting fires to regulatory agencies.
4. Fire Boss will deploy fire-fighting equipment and crew to clear fire breaks or extinguish the fire directly if possible. All equipment and personnel shall be made available to control the fire. Effort of fire control will be limited, if warranted, due to safety issues and will take into consideration fire conditions, safety, fitness of personnel and equipment availability.
5. Fire Boss will inspect the fire site as soon as possible and take charge of directing suppression measures until relieved of this duty by the applicable provincial authority or until conditions become unsafe.
6. Fire Boss will deploy additional crew and machinery as needed and the Company will request assistance of AEP's Public Lands and Forest Divisions, local fire department and applicable municipal government if Contractor resources are inadequate (see contact list and phone numbers below). Fire suppression measures shall continue until the fire is extinguished or until otherwise notified by applicable regulatory agency.
7. Moveable material, particularly explosive or flammable materials, vehicles, etc. will be promptly moved to a safe location whenever there is a possibility of being endangered by fire.
8. Fire Boss will ensure that all burning embers are extinguished and will monitor burn area for smouldering material. Employ infrared scanning equipment to detect any hot spots.

24-hour Emergency Line (Alberta)
Regional Wildfire Management Office
Delta Helicopters (Fort McMurray)

310-3473
780-743-7121
780-713-3582

FIRE REPORT FORM

General

Date and Time of Fire or Discovery: _____

Source (if known): _____

Location of Fire

LSD _____ of section _____ Township _____ Range _____ W _____ Mer.

Easting _____; Northing _____ UTM Zone _____; KP _____

Other description of location:

Site Information

Fire is burning in the:

ground _____

bush (timber type) _____

agricultural land _____

Other _____

Rate of spread is:

not moving _____

moderate (less than a normal walk?) _____

fast (more than a normal walk?) _____

Any people at the fire? Yes _____ No _____ Don't know _____

Is property threatened? Yes _____ No _____ Don't know _____

Is road access available? Yes _____ No _____ Don't know _____

Is water readily available? Yes _____ No _____ Don't know _____

Any other observations? _____

(e.g., lightning, recreation, vehicles)

Smoke Information

When unable to see fire, only smoke visible:

Colour:	light grey _____	Column:	intermittent _____
	medium grey _____		scattered _____
	dark grey _____		light _____
	black _____		heavy _____

6.0 SOIL EROSION CONTINGENCY PLAN

If wind or water erosion is evident during the construction phase of the Project, all necessary Contractor equipment and personnel will be made available to control the erosion. During the construction phase, the Environmental Inspector(s) in consultation with the Company's Environmental Advisor will determine appropriate procedures to be implemented to control soil erosion and other soil handling problems encountered.

This table provides a list of control options to be implemented as appropriate. Similar procedures should be followed during the operational phase.

Concern	Mitigative Options
<i>Water Erosion</i>	<ol style="list-style-type: none">1. Implement one or a combination of the following mitigative techniques:<ul style="list-style-type: none">• install silt fences near the base of slopes;• regrade furrows and gullies;• construct cross ditches and berms decreasing the spacing on steeper slopes or on more erodible soils;• construct temporary berms of subsoil, sandbags, wattles, bio-degradable geotextiles or geo-ridge during construction activities;• armour the upslope face of berms with geotextile, rock, logs or sandbags;• import small diameter slash then roll back and walk down;• reseed an annual cover crop as soon as feasible after construction;• transplant native shrubs, plant willow stakes or use other bioengineering techniques;• install slope indicators at locations where the risk of slope failure, or creep exists; consult a geotechnical engineer; and/or• shut down construction until the risk of erosion has been reduced or the conditions improve.

7.0 DIRECTIONAL DRILLING PROCEDURES AND INSTREAM DRILLING MUD RELEASE CONTINGENCY PLAN

During an HDD, an accidental release of drilling mud adjacent to or into a watercourse could adversely affect the environment. The following contingency plan has been developed to ensure that appropriate measures are in place to minimize the risk of adverse effects during directional drilling.

Both the Contractor and the Company must be diligent during all aspects of directional drilling to ensure that the potential for an instream drilling mud release is minimized; or if it does occur, that environmental effects are minimized.

Should the Contractor have an instream drilling mud release contingency plan in place, both plans will be reviewed by the Company with the Contractor to ensure that the most stringent conditions of both plans apply.

7.1 General Measures

1. Ensure that supervisory personnel are aware of this contingency plan prior to commencement of drilling activity.
2. Arrange for access beyond the boundaries of the pipeline Project's surface rights agreement along the drill path to monitor, contain and clean-up potential frac-out releases.
3. Install surface casing at the entry point to a depth that extends beyond the coarsest material, if warranted.
4. Ensure that drilling mud composition is limited to bentonite-based systems (e.g., bentonite, water and industry standard additives). All bentonite-based systems shall meet the applicable regulatory requirements and shall be limited to those that in its composition and concentration, should an interaction with the environment occur, do not result in a significant adverse effect to the environment. At the Company's request the Contractor shall provide all product Material Safety Data Sheets for approval.
5. Construct a sump at the entry point and a subsoil berm downslope of the proposed exit point with a capacity adequate to capture anticipated volumes of drilling mud that could be released during pullback and other drilling operations. Construct a sump with the above-noted capacity, at the exit point after the pilot hole has been completed (see Dwg. STDS-03-ML-05-131 in Appendix D of this EPP).
6. Install surface casing at the exit point if coarse-textured near surface deposits could interfere with drilling mud circulation.
7. Develop a clean-up plan, prior to drilling. The plan will be prepared by the drilling contractor in consultation with the Company inspection staff. Acquire the appropriate approvals to access the release area if off right-of-way and for mud pump-off.
8. Reclaim entry and exit sumps that contained drilling mud immediately after completion of drilling and remediate to meet the applicable requirements of ERCB Directive 050 *Drilling Waste Management*.

7.2 Emergency Response Equipment

1. Maintain the following equipment onsite in sufficient quantities during drilling operation to contain any inadvertent drilling mud releases:
 - sandbags;
 - filter cloth (e.g., silt fence);
 - T-bar posts;

- post pounders;
 - light towers, flashlights or headlamps;
 - shovels;
 - 6 mil polyethylene; and
 - 2-trash pumps c/w sufficient lengths of leak-free hose and suction heads.
2. Maintain vacuum truck(s) onsite during pullback operations.
 3. Maintain the appropriate water quality sampling equipment onsite during drilling operation to ensure that accurate water quality samples can be taken. Onsite equipment to be provided by the Company or their Contractor may include:
 - turbidity meter;
 - sampling pole;
 - chest waders;
 - water sample bottles (approximately 30 - 500 ml bottles);
 - boat; and
 - coolers.
 4. Ensure that the water quality sampling program, if implemented, is in place prior to drilling and includes the following information:
 - sample locations (both an upstream control site as well as appropriate downstream sites);
 - frequency of sampling; and
 - sampling procedures.

The program will be amended if warranted by conditions.

5. Ensure that a minimum of three sets of walkie-talkies with spare batteries are onsite and available for use during monitoring operations.

7.3 Monitoring

1. Implement water quality monitoring plans to monitor for sediment events during drilling activities. Water quality monitoring will be used to avoid exceedance of the Canadian Council of Ministers of the Environment (CCME) (2001) guidelines and provincial limits for total suspended solids (TSS) and as early warning signs to potential problems during construction.
2. Supervisory personnel will be onsite at all times during drilling, reaming and pullback operations to ensure that emergency response measures will be implemented immediately and effectively. the Company will also assign inspection personnel to the site during all phases of drilling of the watercourse.
3. Monitor and record annular pressures throughout drilling.
4. Monitor and record the amount of fluid return to the mud tank/pit and the amount of make up drilling fluid required in the mixing tanks during drilling of the pilot hole and hole opening (reaming). Maintain a detailed log of all drilling activities in order to correlate drilling status with potential frac-out events.
5. Monitor both onshore and instream portions of the drill path and surrounding area (*i.e.*, within 400 m minimum) for signs of drilling mud release. The size of the area to be monitored will be determined by evaluating geotechnical conditions (*i.e.*, amount of fracturing, type and depth of substrate) and drilling conditions (*i.e.*, depth of drill path, distance between watercourse and entry and exit points). Monitoring will be on a continuous basis during drilling operations and will continue for at least eight hours after shut-down. Personnel equipped with walkie-talkies shall be positioned at the most

advantageous locations to observe any sign of a release of drilling mud to the surface or in the watercourse.

6. Ensure that contact is maintained at all times between monitoring and drilling personnel.
7. Establish monitoring stations at the following locations and obtain water samples for visual inspection or turbidity measurement at the noted intervals if pressurized drilling fluids or water are used.

Downstream Monitoring Sample Sites	Sampling Interval (approx.)
25 m (approx.)	2 hours
100 m (approx.)	2 hours
200 m (approx.)	4 hours
400 m (approx.)	4 hours

Increase the sampling frequency if monitoring of drilling mud returns indicates that a release may have occurred.

8. On watercourses with ice cover, onsite conditions may allow visual monitoring of water quality by observing open reaches or, if safe, by augering and maintaining an open hole in the ice for sampling. Supply monitors with practical safety gear (e.g., ropes, ladders, inflatable boat, flotation coveralls) for traversing ice. Continue to evaluate ice conditions throughout the monitoring program.
9. If monitoring reveals sediment values are approaching threshold values, the Environmental Monitors will alert the Environmental Inspector(s) and work with them to develop corrective actions. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified.
10. If the watercourse is frozen to the bottom, onsite conditions will not allow visual monitoring of water quality by observing open reaches or by augering and maintaining an open hole in the ice for sampling. Continue to visually monitor areas where early detection of a frac-out would most likely occur.

7.4 Emergency Response

The loss of drilling mud into seams of coarse material, fissures, etc. routinely occurs during drilling operations. Since drilling fluid does not always flow to the surface, a loss does not necessarily indicate that the drilling mud has been released onto near shore areas or into the watercourse. Nevertheless, a release of drilling mud into a watercourse can adversely affect fish and fish habitat.

1. Suspend drilling operations immediately if excessive loss of drilling mud or change in annulus pressure is noted and conduct a detailed examination of the drill path and surrounding area for evidence of a release to the surface.
2. Immediately notify the Construction Manager and the Environmental Inspector(s) if a drilling mud release is observed.
3. If the amount of mud released is not great enough to allow practical collection, the mud release will be allowed to dry and dissipate naturally.
4. If the drilling mud release enters a watercourse, the Construction Manager will immediately notify the Company's engineering staff as well as the Environmental Inspector(s). The Environmental Inspector(s) or Environmental Advisor will immediately notify the applicable provincial and DFO fisheries biologists, and the appropriate land authority (i.e., AEP). Any drilling mud release that enters waters or that may cause or is causing an adverse effect is reportable to AEP.

DFO Fisheries Biologist
AEP 24 hour Emergency Line
Provincial Fisheries Biologist
Transportation Safety Board

1-855-852-8320
1-800-222-6514
Rebecca Baldwin (780)-743-7470
1-819-997-7887

5. Contain and further prevent drilling mud from entering the watercourse from near shore areas by installing a berm of subsoil, sandbags or other material approved by the Environmental Inspector(s).
6. Conduct water quality sampling as directed by the Environmental Inspector(s). Instream and near shore containment/clean-up objectives include the following:

Instream

1. Divert streamflow around the mud release to the extent practical.
2. Install silt fencing around the exit point(s), if feasible.
3. Remove mud from the watercourse by pumping, shovels or with a hoe.
4. Dispose of mud in accordance with provincial requirements.
5. Consider the following options for diverting streamflow from the mud release area.
 - Construct a dam and pump set-up on smaller watercourses.
 - Install a flume to divert water past the release area.
 - Install coffer dams made of sandbags or sheet metal.
 - Attempt to contain the release point within an area isolated with aquadams or sheet metal, etc.
 - If access is possible, consider covering the mud at the source point on stream bottom with a layer of poly and sand bags to prevent scouring of mud.
6. Consider the following options for removal of mud from instream.
 - Use trash pumps or hydrovac truck. If trash pumps are used, ensure that the pump-off area does not drain directly into watercourse or construct a holding area. If a hydrovac truck is used, ensure that all activities comply with the guidelines in Alberta's Oil and Gas Waste Regulations.
 - In consultation with provincial and DFO fisheries biologists, leave mud in place if current streamflow levels inhibit removal operations or removal will result in unacceptable terrain or instream damage.

Onshore

1. Contain the mud release immediately to limit the area affected and prevent the mud from entering the watercourse.
2. Dispose of mud.

For onshore mud release, consider the following options for immediate containment.

- If accessible by heavy equipment, immediately construct berms or excavate a sump for containment.
 - If not accessible by heavy equipment, construct weirs using logs, silt fence, rolls of matting, shovel trenches, and/or filter cloth and a containment area where appropriate.
3. Before allowing filtered water to enter the watercourse, ensure that the TSS level is within 10 mg/L of the background TSS levels.
 4. The Company's inspection staff will prepare a report summarizing the events leading up to the release as well as measures taken following the release to minimize effects on the environment. The report will be submitted to the Director of Regional Water Management within seven days of the mud release. Report the details of the spill to the AEP's 24 hour emergency line at 1-800-222-6514. The regional office with jurisdiction will review the report and request additional information accordingly.

Plans for Potential Continuance of Drilling

Drilling will only be allowed to resume if the potential for significant adverse effects on the environment is low, as determined by project management, inspection staff, aquatic specialists, drilling or geotechnical consultant (if warranted) and the drilling contractor, and as approved by the DFO fisheries biologist.

1. Implement measures to prevent the further release of drilling mud into the watercourse. Appropriate measures will vary depending on the lessons learned during the previous drill attempt.
2. Progressively implement the following measures to prevent the further release of drilling mud into the watercourse.
 - Ensure that appropriate structures, materials, equipment and personnel are in place and available in the event of a subsequent release of drilling mud.
 - Reduce drilling mud pressures if practical.
 - Plug fissures/fracture with nontoxic sealers or plugging agents pumped into the drill hole and left undisturbed for an appropriate period of time whereupon drilling will be resumed. If the sealing agents are not successful, drilling will be suspended and the plan reviewed and revised.
 - Employ downhole cementing to either seal off the problem zone for redrilling or seal off a large portion of the existing drill hole to a point where a new drill path (generally at a lower elevation) can be attempted. If these measures are unsuccessful, then drilling will be suspended and the plan reviewed and revised.
 - Move the drill and attempt to redrill from a new location employing the same protection measures implemented on the initial drill if conditions indicate that a second drill will be successful. Prior to commencing the redrill, the proposed drill path will be reviewed and revised accordingly.

Alternate Crossing Method

Prior to construction, a detailed watercourse crossing and contingency plan for each proposed HDD installation site will be prepared to address the possibility that the HDD installations are unsuccessful. The plan will identify methods, measures and activity schedules to:

- minimize effects on fish and fish habitat;
- limit the risk of soil erosion and promote revegetation with suitable plant species;
- minimize the disturbance of native vegetation (in particular rare plants and ecological communities) and wildlife and their habitats;
- minimize disturbance of archaeological resources; and
- avoid navigational risks and minimize disruption to boaters.

The plans will be prepared by the project team with input from several environmental specialists (wildlife, vegetation, fish and fish habitat, historical resource and reclamation specialists), engineering and construction personnel, contractors, and the results of consultation with the applicable regulatory agencies.

The following information will be considered within the plans:

- a summary of issues requiring mitigation;
- schedules for the river crossing and onshore construction, and reclamation;
- access routes and traffic control measures;
- equipment and temporary work space requirements;

- site-specific plans to avoid, salvage or minimize effects on local features;
- a grade plan that identifies workspace requirements;
- temporary and permanent erosion control measures including the identification of specific materials such as silt fencing, erosion control matting, etc.;
- revegetation procedures and seed mixes;
- other information requested by regulatory agencies;
- detailed drawings to support the above-noted information; and
- inspection and monitoring plans.

8.0 PLANT SPECIES AND ECOLOGICAL COMMUNITIES OF CONCERN DISCOVERY CONTINGENCY PLAN

In the event that rare plants or ecological communities are discovered during future vegetation studies, the plant or ecological community will be assessed and appropriate mitigative measures will be determined prior to construction of the pipeline. The appropriate site-specific mitigative measures will be determined following an assessment by a vegetation specialist, which will consider the following:

- the location of the plant or ecological community on the right-of-way;
- the relative rarity of the plant or ecological community (regionally, nationally, etc.);
- the local abundance of the plant or ecological community;
- the growth habit and propagation strategy of the plant or ecological community; and
- the habitat preferences of the plant or ecological community.

The suite of mitigative options that may be implemented includes the following:

- narrow down the proposed area of disturbance and protect the site using snow fencing and signage;
- inform all users of access restrictions in the vicinity of fenced sites;
- temporarily cover the site with snow (given the season), geotextile pads, flex net, swamp mats, or equivalent;
- extend road or watercourse bores to avoid or minimize effects on the site;
- realign the route to avoid the site; or
- propagate rare plants or specific portions of sensitive ecological communities, via vegetative or reproductive means (e.g., harvesting of seed from the right-of-way or adjacent area, salvaging and transplanting portions of sod and surrounding vegetation or collecting of cuttings).

The Rare Plant Survey will outline appropriate mitigation to be implemented at each site where a rare plant or ecological community is discovered within the Project Footprint. The Preliminary Environmental Alignment Sheets will be amended, if warranted, to incorporate these mitigative measures.

9.0 WILDLIFE SPECIES OF CONCERN DISCOVERY CONTINGENCY PLAN

The following procedures provide contingency measures for the discovery of wildlife species of concern (*i.e.*, with conservation status) prior to and during construction. Wildlife species of conservation status refer to those species listed federally (*i.e.*, by SARA Schedule 1 and COSEWIC), provincially in Alberta (*i.e.*, At Risk or May Be at Risk, or classified as Threatened or Endangered under Alberta's *Wildlife Act*).

Wildlife Species of Concern Discovery Prior to Construction

In the event that wildlife species of concern or a site-specific habitat feature is discovered during wildlife field work or other studies along the construction right-of-way or at other associated Project components (*e.g.*, borrow sites), the discovery will be reviewed and the appropriate mitigation measures will be determined by a qualified Wildlife Resource Specialist and as identified in Section 7 of the EPP. The review of the wildlife species observation or the habitat feature will consider the following:

- the wildlife species, its conservation status and specific habitat needs relative to the area of development;
- the location of the wildlife habitat feature relative to the area of development and in consideration of the recommended setback distances as provided by regulatory guidelines, where applicable;
- the presence of topographic features or vegetation to effectively screen the habitat feature from construction activities;
- the timing of construction versus the timing windows/sensitive periods for wildlife species as provided by regulatory guidelines, where applicable; and
- the potential to shift the location of the activity and/or modify the schedule of construction activities to reduce or avoid direct and/or sensory disturbance.

The mitigation measures to be implemented will be determined by a qualified Wildlife Resource Specialist and may include the following.

- Abide by timing windows and the recommended setback distances (as provided by regulatory guidelines, where applicable).
- Abide by daily timing restrictions on construction activities, where these apply.
- Narrow down the area of disturbance and protect the site using fencing or clearly mark the site using flagging.
- Extend trenchless crossings, where practical to avoid or reduce clearing requirements (*e.g.*, at road, pipeline, watercourse/wetland crossings, etc.)
- Inform all users of access restrictions in the vicinity of flagged or fenced sites.
- Realign the route or shift the development (*i.e.*, access road, ancillary site, etc.) within the staked boundaries to avoid the site.
- Install a replacement structure (*i.e.*, nest platform) if a raptor nest that is protected year-round is removed (*e.g.*, eagle).
- Enhance habitat during reclamation.
- Determine if a permit and/or regulatory consent is necessary for the proposed action (*e.g.*, to relocate amphibians), if practical, and monitor the post-construction response.

The locations of wildlife habitat features with a timing window and/or recommended setback distance that are encountered along the construction right-of-way or associated components as well as the associated mitigation to be implemented have been identified in Section 7 of the EPP and on the Environmental Alignment Sheets. The EPP and the Environmental Alignment Sheets will be updated to provide information on any new discoveries prior to construction.

Wildlife Species of Concern Discovery During Construction

Wildlife species of concern that have potential to occur in the vicinity of the Project and their habitat preferences, as well as the locations of provincially identified wildlife areas (e.g., Key Wildlife and Biodiversity Zones), and wildlife features will be identified during the Environmental Education Program and provided to the Lead Environmental Inspector(s) and the Environmental Inspector(s).

In the case of an observation of a wildlife species of concern, the mitigation will vary depending on the species. For example, observations of song birds and/or large mammals, where no associated habitat feature (e.g., active nest, mammal den) is present, may not warrant mitigation given their ability to move away from the construction area. For other species such as amphibians that may be restricted to a pond, mitigation measures (e.g., salvage of individuals, temporary suspension of work in area) will be reviewed and implemented as required. The Lead Environmental Inspector(s) or Environmental Inspector(s) will be contacted to determine if further action is required.

In the case of a discovery of a wildlife feature (e.g., raptor nest, mammal den, amphibian breeding pond, etc.), mitigation measures may include the following.

- Suspend work immediately if a wildlife feature is discovered. Do not resume work at that location until the measures below are implemented.
- Notify the Lead Environmental Inspector(s) and the Environmental Inspector(s) who will notify the Construction Manager.

The Lead Environmental Inspector(s) will review the wildlife feature and either allow construction to resume or, in the event of a confirmed or potential discovery, proceed by notifying a qualified Wildlife Resource Specialist. The qualified Wildlife Resource Specialist will review the feature and determine the mitigation measures to be implemented, in consultation with the Environmental Manager. The appropriate regulatory authority may be contacted, as needed. The Wildlife Resource Specialist will visit the site, if necessary.

10.0 HERITAGE RESOURCE DISCOVERY CONTINGENCY PLAN

Heritage Resource Discovery During Construction

In the event that archaeological, historical or palaeontological resources are discovered during construction of the Project, the sites will be assessed and appropriate mitigative measures will be determined. The site will be assessed based on the following criteria:

- the significance of the site;
- the location of the site with respect to the Project Footprint;
- the feasibility of alternate routing or siting to avoid the resource; and
- the decision of the appropriate regulatory agency (*e.g.*, ACCS).

In the event that heritage resources are discovered during construction, follow the measures outlined below.

1. Suspend work immediately in the vicinity of any newly discovered archaeological, palaeontological, historical or traditional land use site. Work at that location may not resume until the measures below are undertaken.
2. Notify the Environmental Inspector(s) who will notify the Construction Manager.
3. The Environmental Inspector(s) will provide an initial assessment of possible archaeological, palaeontological and historical remains and either allow construction to resume or, in the event of a confirmed or potential discovery, proceed by notifying:
 - The Company's Heritage Resource Specialist; and
 - Applicable regulatory agencies (*e.g.*, ACCS) (see Appendix B of the EPP) as required.
4. The Company's Heritage Resource Specialist may deem it necessary to visit the site and will, regardless of whether a site visit is required, develop an appropriate mitigation plan in consultation with the Company's Environmental Advisor and, if necessary, the appropriate regulatory agency.

11.0 TLU SITES DISCOVERY CONTINGENCY PLAN

11.1 TLU Sites Identified Prior to Construction

In the event that Traditional Land Use (TLU) sites are identified during future studies for the Project, the sites will be assessed and appropriate mitigative measures will be determined. The TLU site will be assessed based on the following criteria:

- the location of the TLU site with respect to the proposed area of development;
- the relative importance of the TLU site to the community; and
- the potential to alter construction activities to minimize or avoid sensory disturbance

The mitigative measures that may be implemented will be dependent on the type of site identified. On past projects, the forms of accepted mitigation noted in the following subsections have been successful in mitigating effects on Aboriginal TLU sites. As part of the studies, each Aboriginal community will be asked to identify potential TLU sites, including trails, culturally modified trees, habitation sites, plant harvesting locations, hunting, fishing, trapping and gathering places and sacred areas. Alternative site-specific mitigation strategies may also be recommended by communities.

Trails and Travelways

Travel corridors are essential for conducting traditional activities, and effects on actively-used trails should be reduced and mitigated. Trails include well-defined all-terrain vehicle (ATV) and snowmobile corridors, navigable waterways, river portages, and historic foot, dog sled and pack horse pathways.

Successful and proven mitigative measures available to trails transecting the pipeline right-of-way include:

- detailed recording and mapping in the vicinity of the proposed pipeline right-of-way. In partnership with community representatives, a decision is then made about the relative importance of the trail and, if warranted, how to best to maintain and control access; and
- other mitigation options include signage or scheduling construction during periods of least impact.

Culturally Modified Trees

Culturally modified trees (CMTs) are trees showing evidence of intentional modification by Aboriginal people in their utilization of the forest. CMTs include such features as trees where the bark and/or cambium has been stripped for use as a raw material or for food, trees blazed to mark trails and trees carved for spiritual practices. CMTs provide physical evidence of Aboriginal resource use in an area and are often valued by members of the First Nations communities.

Standard and effective mitigative measures available, when and where necessary, vary depending on the function of the CMT. Blazed CMTs marking trails are mitigated as trails, while CMTs which are spiritual in nature are mitigated as sacred areas. Successful and accepted mitigative measures for other CMTs may include:

- detailed recording and mapping;
- flagging, fencing or avoidance, and/or
- sampling of trees for dating, where appropriate, using increment cores or stem cross-sections.

Habitation Sites

Habitation sites are located in prime, resource-rich areas and include traditional campsites, cabins and settlements. Campsites typically have defined hearths (fire rings), de-limbed trees, tent frames and/or miscellaneous cached or discarded camping supplies and equipment. Cabin structures represent a more permanent occupation of the land, and include central log or timber-framed structure, traditional activity areas such as drying racks and smoking tents, and ancillary equipment storage areas. A group of cabins or campsites may signify a long-term or intermittent occupation. A settlement may have been used seasonally or throughout the year, depending on location or necessity. The relative size and nature of habitation sites continuously evolve based on how families and communities grow, and often expand from campsites to cabins and possibly to settlements.

Successful and proven mitigative measures for habitation sites include:

- detailed mapping, photographic recording and avoidance of the location by the proposed development; or
- should avoidance of a site not be feasible, mitigative measures consisting of detailed recording and controlled excavations may be implemented.

Plant Harvesting

Many Aboriginal individuals harvest medicinal, ceremonial and food source plants. Plants are gathered in a variety of environments which include mature forests, along watercourses and in rugged or mountainous areas. Detailed information regarding medicinal plants is passed down from the Elders and is considered proprietary by the communities.

Effective mitigative measures are dependent on the context and relative location of a harvesting area to the proposed development, but may include:

- providing Aboriginal communities with opportunity to harvest prior to construction;
- limiting the use of chemical applications;
- minimizing construction effects or avoidance.

Hunting

Hunting and wildlife sites are areas where large fauna such as elk, moose, deer, caribou and bear are commonly harvested. They are identified both in community discussion, and by observed game ambushes, blinds and hunting stands, dry meat racks and butchered animal remains. Furthermore, locales where game can be expected, such as mineral licks, calving areas and well-used game trails, are typically prized hunting areas.

Successful and accepted mitigation for hunting sites may include:

- minimizing construction impacts;
- adhering to species-specific timing constraints;
- leaving breaks in the windrows and strung pipe to allow animals to cross; and
- limiting the use of chemical applications.

Fishing

Changes to local fishing spots, as well as the broader water system, can impact Aboriginal harvesting. Fishing sites relate to the use of specific reaches of lakes and streams and, generally, this information is gathered by having community representatives identify fishing locales and specify the nature of their use and success rates.

Standard and effective mitigative measures for fishing areas may include:

- recording and mapping of fishing locales; and
- adherence to the regulations, standards and guidelines set by provincial and federal regulatory agencies for watercourse crossings.

Trapping

Trapping and snaring of animals for food and pelts are activities that continue to be engaged in by Aboriginal individuals. These traps and snares may or may not be located within registered trap lines. Concerns expressed by both Aboriginal and non-Aboriginal trappers are generally identified and mitigated individually.

In order to avoid accidental damage where the proposed pipeline route transects a trap line, mitigative measures may include:

- maintaining access to the trap line; and
- moving of trap line equipment by the trapper prior to construction.

Gathering Places

Aboriginal people often met in gathering places to share in ceremonial activities, exchange items of trade, arrange and celebrate marriages, and for other activities. Additionally, indigenous grave sites are sometimes recorded in the general area of large gathering places. Such gathering places have historical, ceremonial, cultural and economic significance to Aboriginal communities.

Potential effects on gathering places may be mitigated through detailed recording, mapping and avoidance; however, the visual impact will be assessed in the field and mitigative measures will be refined and optimized, if warranted.

Sacred Areas

One of the primary concerns of Aboriginal communities with regard to any proposed development project is to ensure that sites sacred to the local communities are protected from adverse effects. These areas include burials, vision quest locations, rock art panels, birth locations and ceremonial places, among others. A particular element is often only a small component of a larger spiritual complex, which can encompass topographic features and may, by its very nature in the context of Aboriginal spirituality, be inestimable and irreplaceable.

Mitigative measures for sacred areas may include detailed recording, mapping and avoidance; however, additional mitigative measures, if warranted, will be refined and optimized in the field and through community discussions.

11.2 TLU Sites Discovered During Construction

In the event that a TLU site is discovered during construction of the pipeline, the following measures will be undertaken.

1. Suspend work immediately in the vicinity of any newly discovered sacred sites. Work at that location may not resume until the measures below are undertaken.
2. Notify the Environmental Inspector(s), who will notify the Construction Manager and the Company's Heritage Resource Specialist.
3. The Company's Heritage Resource Specialist will assess the site and develop an appropriate mitigation plan using the information listed above.

APPENDIX 1F

MANAGEMENT PLANS

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1.0 CHEMICAL AND WASTE MANAGEMENT PLAN

1.1 Purpose

The Chemical and Waste Management Plan has been prepared to provide guidelines for dealing with the generation of project waste, and to provide guidelines for dealing with the procurement, storing and handling of hazardous materials required for the Project.

This plan outlines specific measures to be followed by all Company employees and contractors involved with the construction of the Project. The plan is designed to ensure that chemicals and wastes are procured, handled, stored and disposed of in an environmentally responsible manner, thereby maintaining ecological and cultural integrity. This plan will reduce the likelihood of an accidental release of potentially hazardous waste products into the environment during pipeline construction.

This plan applies to all employees, contractors and consultants who conduct work on behalf of the Company during construction of the Project. All employees, contractors and consultants will abide by all federal, provincial and local requirements for the storage, handling, transport, disposal and spill reporting requirements of all products and waste materials that are potentially hazardous to human health and the environment.

The Environmental Inspector is responsible for ensuring compliance with TransCanada's Environmental Guidelines and all applicable codes, regulations and industry standards for waste management and handling chemicals. Where a discrepancy occurs, the most stringent requirements apply. In the event of a spill, the Spill Contingency Plan (see Appendix E of this EPP) will be implemented. The Spill Contingency Plan sets forth the lines of communication and procedures to follow in order to facilitate containment and clean-up should a spill occur.

1.2 Applicable Regulations, Guidelines and Codes of Practice

1.2.1 Federal

- Onshore Pipeline Regulations, Section 11.
- *Hazardous Products Act*, Controlled Products Regulation and Ingredients Disclosure List Regulation (Workplace Hazardous Materials Information System [WHMIS] legislation).
- Canada Labour Code, Oil and Gas Occupational Safety and Health Regulation, Part XI Hazardous Substances.
- *Transportation of Dangerous Goods Act* and Regulation.

1.2.2 Provincial

- *Environmental Protection and Enhancement Act*.
- *Energy Resources Conservation Act*.
- *Oil and Gas Conservation Act* and Regulations.
- *Pipeline Act* and Regulation.
- *Occupational Health and Safety Act* and Regulations.
- Occupational Health and Safety Code, Part 29 WHMIS, Sections 395 to 414.
- *Public Health Act*.
- Fire Code.

- ERCB Directive 055 - Storage Requirements for the Upstream Petroleum Industry.
- ERCB Directive 058 - Oilfield Waste Management Requirements for the Upstream Petroleum Industry.
- ERCB Directive 050 – Drilling Waste Management.

1.3 Guiding Principles

The Company is committed to performing its activities in an environmentally responsible manner. The following general guiding principles have been incorporated into this plan:

- reasonable preventative measures will be taken to avoid the release of wastes and hazardous materials into the environment;
- all waste and hazardous material spills will be reported to the Environmental Inspector and to the appropriate authorities, if warranted;
- all waste and hazardous material spills will be cleaned up promptly and thoroughly; and
- waste and hazardous materials will, to the extent feasible, be recycled, disposed of or moved to an approved area as required.

1.3.1 Application

This Chemical and Waste Management Plan applies to the pipeline right-of-way, other construction areas, all staging areas, construction yards and public roadways being used in association with the Project. Awareness of these requirements will be integrated as appropriate into preconstruction training and orientations.

1.3.2 Description of Wastes and Chemicals

Potential Project related wastes have been divided into two categories for discussion of storage, handling and disposal procedures.

Solid Nonhazardous Wastes – include garbage and debris generated through the activities of personnel during pipeline construction and right-of-way reclamation. These wastes are nontoxic in nature and include, but are not necessarily limited to:

- food wastes;
- pipe tape and coating;
- spent welding rods;
- grinder pads;
- styrofoam and plastics;
- wood;
- wire;
- survey stakes/flagging tape;
- used geotextile; and
- metal strapping.

Industrial Wastes - include wastes and products generated or utilized during pipeline construction. These materials may contain quantities of potentially toxic substances in the form of residues and include, but are not necessarily limited to:

- used oils (engine oil, transmission/drive train oil, hydraulic/lube oil, gear oils, lubricating greases);
- used lube filters;
- spent grease cartridges;
- used antifreeze (containers and cans of ethylene glycol, propylene glycol);
- contaminated soil, vegetation and/or absorbents that may contain hydraulic fluid, gasoline, diesel or lube oil;
- used solvents;
- used batteries (automotive/equipment);
- film processing waste liquids; and
- spent cleaning products and associated materials rags.

Potential Project related chemicals that are likely to be found on the construction sites include, but are not necessarily limited to:

- batteries;
- cleaning products;
- fuels (gasoline, diesel, propane);
- lubricants (engine oil, transmission/drive train oil, hydraulic oil, gear oil, lubricating grease);
- coolants (ethylene glycol, propylene glycol);
- paints and solvents;
- film processing chemicals; and
- glues (including epoxy and urethane coating products) and cements.

1.3.3 Mitigative Measures

All employees, contractors and consultants of the Company will be required to comply with applicable regulations for the containment, handling, storage, use and disposal of wastes and chemicals. The following are minimum requirements.

General Measures

1. Construction yards and staging areas that are designated as an industrial waste or chemical storage area will be selected and designed to:
 - avoid wetlands, watercourses, sensitive vegetation, highly permeable soils, steep slopes and water supply wells when feasible;
 - prevent vehicle incidents by providing unobstructed access (for delivery, disposal and emergency vehicles);

- provide safe storage areas, including secondary containment, for all chemical liquids and hazardous wastes in accordance with applicable regulatory requirements; and
 - provide unobstructed access/egress to/from emergency response materials and equipment.
2. All Project staff with waste management and hazardous materials responsibilities will be educated in accordance with regulatory requirements specific to the Project. All personnel shall understand their responsibilities for proper handling, identification, documentation and storage of wastes and hazardous materials.
 3. An appropriate number of portable toilets shall be made available to ensure each crew has ready access to washroom facilities. The facilities will be serviced and cleaned regularly and will be adequately secured. All site personnel are to use portable toilets as provided.
 4. The Contractor shall register with the appropriate provincial government department with respect to hazardous materials (to obtain a hazardous waste generator number or equivalent) and shall, at that time, provide detailed manifest information regarding the location of the staging areas, the types of waste that will be produced, and the transport vehicle that will be collecting the waste for disposal.

Prevention of Release into the Environment

1. The Contractors' equipment will be clean and in good operating condition.
2. Contractors will be supplied with a list of required stand-by equipment and required spill response container supplies to respond to large volume spills. The stand-by equipment will be stationed in the field construction yards. Appropriate measures will be taken immediately to limit the spread of the contamination, in accordance with the Spill Contingency Plan (see Appendix E of this EPP).
3. Prior to construction kick-off, the Contractor will ensure that all spill response equipment and materials are onsite or readily available.
4. Fuel/service vehicles will carry:
 - fire extinguishers;
 - shovels;
 - an impermeable barrier for placing under vehicles to be serviced; and
 - hydrocarbon spill kits complete with a minimum of 10 kg of sorbent material for clean-up of small spills.
5. Sorbents, barrier materials (e.g., impermeable liners, etc.), shovels, a water boom, and 210 L storage drums will be stockpiled at the contractor yards/staging areas to respond to small spills.

Waste and Chemical Handling

1. Personnel who will be handling waste materials will possess valid WHMIS training.
2. All fuel truck drivers, and drivers transporting waste or chemicals will have current Transportation of Dangerous Goods (TDG) certification.
3. During waste and chemical handling activities, employees and/or contractors will use appropriate personal protective equipment to prevent any contact with material.
4. Procedures for safe loading and unloading of products will be followed
 - service vehicles will be equipped with automatic shut-off valves;
 - brakes will be set;
 - the vehicle will be grounded if the product is flammable;
 - the operator will observe loading and unloading activities at all times; and

- when complete, the operator will examine all outlets for leakage and take corrective action if warranted.

Waste and Chemical Storage

1. An appropriate number of waste and recycling receptacles will be made available during the Project.
2. Designated industrial waste storage areas at a facility shall be designed to meet all applicable federal and provincial regulations.
3. Hazardous materials will be stored in designated storage area(s). Short term hazardous material storage on the right-of-way may be designated at the discretion of the Environmental Inspector, if required for specific tasks.
4. Hazardous materials and industrial wastes will be stored greater than 100 m from a wetland, watercourse or waterbody, where feasible.
5. Designated storage areas will be clearly identified and secured. Waste stored in any containers must be clearly labelled to comply with TDG Act and WHMIS regulations.
6. Hazardous wastes will be separated by type.
7. Secondary containment may be required depending on the location, type, volume and duration of the waste or chemical being stored. Secondary containment will be in accordance with applicable federal, provincial and municipal requirements
8. Containment devices will be constructed from suitable metallic or non-metallic materials capable of containing the stored product.
9. Secondary containment areas not protected from the elements will be monitored regularly to ensure that ice, snow, or rainwater have not decreased the volumetric capacity for storage of a spill to be less than 110% of the aggregate storage volume of the containment area. Water accumulated within a secondary containment structure may be removed if authorized by the Environmental Inspector. If there is visible hydrocarbon sheen, the water will be collected for proper storage and disposal.
10. Containers and tanks will be closed when not in use. Drain valves will be locked to prevent accidental or unauthorized releases.
11. Secured non-hazardous materials (*i.e.*, skids, geotextiles, survey stakes etc.) that pose no threat to the surrounding ecosystem will be neatly stockpiled in locations along the right-of-way for disposal. The disposal frequency is dependent upon the type of material stockpiled and will be determined by the Environmental Inspector.
12. The Contractor will visually inspect designated hazardous material storage areas and aboveground tanks on a regular basis as well as when the tank is refilled. The Contractor shall maintain inspection records in accordance with applicable federal, provincial and local requirements. Identified problems or deficiencies shall be corrected in a timely manner.
13. The Contractor will remove all secondary containment structures at the end of the construction phase, and return the impoundment area to its original contours and appearance, including establishing appropriate drainage patterns and vegetation cover.

Waste Disposal

1. All waste materials will be disposed of in accordance with federal and provincial legislation and municipal/regional regulations as required.
2. Each construction site will be equipped with adequate garbage receptacles for solid non-hazardous wastes and debris. These materials will be collected as required and disposed of at approved locations. Food wastes will be stored in animal proof (bear-proof) containers and transported to an appropriate landfill site.

3. Receptacles for industrial wastes generated during construction will be provided in order to keep them segregated from non-hazardous waste. Used oil and oil filters will be placed in sealed containers and delivered for disposal by a qualified service contractor.
4. Receptacles for recycling various products (e.g., paper and tin) will be available at Project construction yards and camps and will be hauled to appropriate recycling depots.
5. Naturally Occurring Radioactive Materials (NORMs) will be transferred to approved locations by a qualified contractor for final disposal.
6. Polychlorinated Biphenyl (PCB) treatment or disposal facilities must be pre-approved by the Company. This includes third party waste brokers, consultants and contractors. PCB concentration must be thoroughly characterized prior to special treatment or disposal.

Documentation and Record Keeping

1. Material Safety Data Sheets (MSDSs) will be available for each product stored at a particular construction yard or staging area.
2. The contractor will maintain a record of the routine inspections performed on the industrial waste storage area(s). The Contractor will furnish the Company construction office with any and all inspection reports monthly.
3. Provincial manifest records will be reviewed by an authorized Company representative with current TDG certification when waste is transferred from a temporary storage facility for transport to a final disposal location.
4. The Environmental Inspector(s) will be provided with copies of waste manifests. Provincial manifest records must be reconciled within six weeks of initial shipment date. Until notification that the waste has been received at its final disposal location, the waste is the responsibility of the Company.
5. Copies of manifest records must be kept in a central location for a minimum of two years after the waste has arrived at its final disposal location.

2.0 TRAFFIC CONTROL MANAGEMENT PLAN

This plan deals with the management and control of pipeline construction traffic along the pipeline route and temporary access routes. It covers activities during preconstruction, construction and post-construction phases of the Project.

2.1 Purpose

The Traffic Control Management Plan provides guidelines for vehicular use on the right-of-way and associated access roads. The intent is to minimize disturbance resulting from pipeline construction on these lands, particularly in riparian areas and in areas of high erosion hazard. All vehicle and equipment operators will adhere to the contingency measures for wet/thawed conditions outlined in the Wet Soils Contingency Plan (see Appendix E of this EPP).

The plan objectives will be accomplished by minimizing the development of access routes, selecting appropriate access routes that cause the least disturbance, managing traffic on these routes and determining appropriate as-left treatment at the completion of the Project.

2.2 Pre-construction

The applicable provincial authorities will be notified of all access road upgrading requirements and NGTL will accommodate continued public access during pipeline construction whenever feasible.

Prior to construction activities, the Company will place notices in local and/or regional newspapers to announce the Project initiation and the construction schedule. Information regarding labour, equipment, and activity schedules will be provided to applicable municipal and provincial authorities prior to the commencement of work.

The Project will adhere to the following principles.

- All motorized vehicle traffic, including ATV, Argo and snowmobile traffic, will be confined to the approved route, access roads or trails except where specifically authorized by the appropriate authority.
- ATVs and Argos may be used during preconstruction activities if minimal terrain impact is anticipated. Vehicle travel across wetlands and riparian areas should be reduced to the extent feasible.
- Prior to commencement of construction activities, features of concern flagged during biophysical surveys or indicated on the Environmental Alignment Sheets, Table 1 or Table 2 will be clearly marked. Following clearing, snow fencing will be installed to delineate the sensitive resources.

The development and maintenance of access roads required prior to, or during construction, will adhere to the relevant requirements set out in this EPP.

2.3 Construction

During construction, traffic will adhere to the following guidelines.

- All Project personnel and other visitors to the right-of-way will participate in the Contractor orientation program.
- All access points to the right-of-way will be flagged and signed to discourage public use.
- All vehicular traffic will be restricted to the approved and staked pipeline route, work space and access roads.

- Construction and inspection personnel and visitors to the right-of-way and other work sites will receive instruction on locations suitable for parking vehicles and equipment.
- Snow fencing, and signage will be erected to protect features of concern as specified in this EPP. The boundaries of shoo-flies and trails will be clearly staked.
- The Company, Contractor and all subcontractor personnel will avoid areas that are fenced or staked and abide by any restrictions on in/out privileges that are implemented in areas requiring special protection.
- The Company, Contractor and all subcontractor personnel will limit travel up and down the right-of-way during the course of the work. General touring trips on the right-of-way will be minimized.
- Special measures such as limiting of construction traffic, swamp mats or matting may be warranted in areas with poorly-drained and organic soils (see the Wet Soils Contingency Plan in Appendix E of this EPP).
- Construction personnel will be transported between construction yards and the construction site by multi-passenger vehicles to the extent practical, in order to minimize vehicle traffic.
- Control measures may be put in place to ensure traffic adheres to special restrictions that are in effect (e.g., narrowing of work space to limit impact on a species of concern).
- The speed limit on the right-of-way will be designated by the Contractor. Speed limits may be lowered under specific conditions such as areas with poor visibility, steep terrain or areas where specific wildlife concerns have been identified.
- All Project-related vehicles will follow applicable traffic, road-use and safety laws.
- All vehicle traffic will avoid unnecessary wheel spin.
- During nonfrozen conditions, equipment travel, particularly that of heavy and/or tracked equipment, will make use of the stripped and graded areas for travel and passing.
- Vehicles will be limited to travel on the access roads and right-of-way for which they are designed. Most vehicles are able to turn around within the width of the construction right-of-way. Stringing trucks require extra turning radius. Consequently, approaches to the pipeline right-of-way or existing public roads will wider when used for stringing trucks. Where turnarounds are required on the right-of-way, extra space will be required on the travel side of the right-of-way. Previously disturbed areas will be used for this purpose, when feasible. Stringing trucks will be limited to access roads developed for their use. Turn around areas require approval by applicable government agencies.

2.4 Post-Construction

After construction is complete, restoration efforts will be initiated and traffic will adhere to the following principles to ensure there is as little disturbance as practical.

- All temporary construction access roads and shoo-flies will be reclaimed to preconstruction conditions or restored as per this EPP. Newly created access points will be blocked unless otherwise directed by the Company or the appropriate regulatory agency.
- Vehicle traffic will be minimized on newly seeded areas until ground cover is re-established.
- Routine access to the right-of-way for operation, maintenance and monitoring activities will be by way of pre-existing roads and trails wherever feasible. Where travel along the right-of-way in the vicinity of important vegetation is required (e.g., during reclamation monitoring) foot travel will be used whenever feasible. ATV/Argos will be used if necessary.

- Efforts to control off road vehicle use will be coordinated with the appropriate authorities and will be conducted until the right-of-way has been satisfactorily reclaimed. Methods to control access may include one or a combination of the following:
 - posting of appropriate signage at all points of access;
 - create a visual barrier to reduce line of sight;
 - installation of locking gates and fencing; and/or
 - installation of slash or rock barriers.

3.0 HYDROVAC SLURRY HANDLING MANAGEMENT PLAN

3.1 Purpose

To provide guidance regarding the management of hydrovac slurry during construction activities in a manner that is protective of the environment and compliant with applicable regulations. This management plan applies to all hydrovac slurry generated as a result of construction activities in Canada.

3.2 Pre-Excavation Contamination Risk Screening

The management of hydrovac slurry must be proportional to the environmental risk inherent to the project or undertaking. Requirements for sampling hydrovac slurry is managed through a risk based approach. The determination of the potential for contamination is conducted during the pre-excavation contamination risk screening.

Selection of hydrovac slurry management methods is determined based on the presence or absence of encountering contamination within the planned hydrovac excavation area. Contaminant risk screening must include, at a minimum, the following tasks:

1. Review historical information/records within the area(s) proposed for hydrovac excavation where available.
2. Evaluate risk due to proximity of the planned excavation area to surface equipment.
 - a. If the excavation area is located within a facility footprint (e.g. aboveground piping, valve assemblies, meter stations, compressor stations, pump stations etc.) the slurry should be considered potentially contaminated until analysis results prove otherwise. Refer to Section 3.4 Contaminated/Suspected Contaminated.
 - b. If the excavation area is located outside of a facility footprint there is less risk in uncovering contaminated soil.
3. Onsite inspection of the proposed excavation area will include olfactory and visual observation for signs of contamination (e.g. odour, soil staining, impacted vegetation, sheen).

Upon completion of the risk screening, the Environmental Inspector (EI), or designate, should have sufficient information to determine what will be encountered within the work area and designate the site as 'contamination not suspected' or 'contaminated/suspected contaminated.'

3.3 Contamination Not Suspected/Non-Contaminated Slurry

Non-contaminated (contamination not suspected) refers to slurry, which is anticipated to be free of impact from known contaminants based on the pre-excavation contamination risk screening.

- Hydrovac slurry from new disturbances is generally of mineral soil content and has a low risk of contamination, therefore onsite disposal is the preferred method if subsidence is not a concern. The disposal area must be in a location that has had the surface materials removed. If a soil berm is required to contain slurry, soil material shall be of subsoil or an alternative material capable of containing the slurry. This decision must be approved by the TransCanada Environmental Advisor or designated environmental field representative.
- Non-contaminated slurry can either be temporarily stored onsite in bermed containment (or in other containers approved by the project) to ensure no uncontrolled surface run-off or release into the ground or transported to an approved storage or disposal facility.
- Non-contaminated slurry may be released into the hydrovac excavation if future subsidence of the site is not a concern and the area is fenced until the tailings are dry.

- Non-contaminated slurry may be used as clean fill onsite only. Water from non-contaminated slurry can be pumped on site or removed as non-contaminated, following approved dewatering and water management practices.

3.4 Contaminated/Suspected Contaminated

- Slurry shall be considered potentially contaminated where results from the pre-excavation risk screening indicated a potential for contamination or sampling has indicated the presence of contamination in the hydrovac area. Any excavation within a facility footprint is considered suspected contaminated until analysis results prove otherwise.
- If contaminants are suspected, do not remove the hydrovac slurry from the site. Arrangements should be made to temporarily contain the slurry onsite in adequate structures pending analysis and final disposal arrangements.
- Contaminated slurry shall be kept separate from non-contaminated slurry. Ensure approved transportation, temporary storage and disposal locations are in place prior to starting hydrovacating activities.
- Contaminated hydrovac slurry may be temporarily stored in bermed and/or lined impermeable containment until a disposal location for the slurry has been determined. Contaminated hydrovac slurry MUST NOT be allowed to drain onto or into the ground.

3.5 Additional Requirements

- The contractor is responsible to ensure that all hydrovac equipment and more specifically the equipment holding tanks are clean and free of contaminants prior to arriving on site to prevent any potential for introduction of new contaminants. Hydrovac equipment will be inspected and approved for cleanliness, by the Environmental Inspector(s) or designate. Upon request by the Company, the contractor must provide written proof of cleanliness.
- If temporary onsite storage is to be constructed (e.g., sump or bermed area) the surface materials must be removed from the area. The area constructed must be able to contain slurry and prevent any off site migration.
- Hydrovac contractor may temporarily store slurry in their trucks or at a site that is designed to safely store slurry. Use clean oilfield storage tank or metal slop bin for temporary storage if other more practical storage options (i.e., temporary pits) are not desirable for the site.
- The contractor will ensure that the EI has reviewed and approved a disposal site prior to starting Hydrovac operation.
- Ensure road weight restrictions are adhered to.
- Salvage topsoil prior to hydrovac use in all areas with agricultural potential.
- Wet hydrovac slurry cannot be sent to a landfill even if it is not contaminated with hazardous substances. Wet hydrovac slurry can be disposed of by the hydrovac contractor to a licensed treatment or disposal facility where accepted. Appropriate documentation must be provided to the Company to verify that hydrovac slurry disposal is in accordance with regulatory requirements and to the satisfaction of the Company
- Do not mix contaminated slurry with uncontaminated slurry.
- DO NOT pump hydrovac slurry water into a watercourse, waterbody or onto a landowner's property, even if the landowner has provided permission.

- Contaminated and potentially contaminated slurry needs special handling storage and disposal requirements.
- All hydrovac holes shall be adequately back filled with mineral soil or other materials as directed by the owner of the facilities, to ensure settling of material does not pose a hazard for wildlife, livestock or the general public.
- Monitoring of the slurry for indications of contamination should be ongoing during the hydrovacating activities.

4.0 BEAR–HUMAN CONFLICT MANAGEMENT PLAN

Background

Bear-human conflicts with Project personnel may occur during construction and operation of the Project. Potential conflict situations may arise due to vehicle collisions, attraction to garbage and debris and human encroachment. Although efforts will be made to avoid, limit or mitigate potential effects on bears and their habitat, potential conflicts may occur.

Where conflict is unavoidable, Project personnel will consult with the appropriate regulatory agencies and, as appropriate, interested and affected Aboriginal communities to identify possible mitigation measures to be implemented to reduce potential conflicts.

All Project personnel and other visitors to the right-of-way will participate in NGTL's environmental awareness training program which will include a discussion of the contents of this Bear-Human Conflict Management Plan.

Objectives

The primary objective of the Bear-Human Conflict Management Plan is to provide direction to and assist Project personnel in reducing or avoiding bear-human conflicts during the construction and operation of the Project. The goals of the Bear-Human Conflict Management Plan are to provide guidelines for:

- preventing direct and indirect mortality of bears; and
- reducing bear-related safety concerns for Project personnel.

Measures developed to avoid or reduce effects on wildlife and wildlife habitat during construction of the Project are provided in Section 7.0 in this EPP.

Vehicle Collisions and Access Management

The measures outlined below, will be implemented to reduce the risk and severity of potential vehicle collisions with wildlife.

- All motorized vehicle traffic, including ATV, Argo and snowmobile traffic, will be confined to the approved route, access roads or trails except where specifically authorized by the appropriate authority.
- All access points to the right-of-way will be flagged and signed to discourage public use.
- All vehicular traffic will be restricted to the approved and staked pipeline route, work space and access roads.
- Construction personnel will be transported between construction yards and the construction site by multi-passenger vehicles to the extent practical, in order to minimize vehicle traffic.
- The speed limit on the right-of-way will be designated by the Contractor. Speed limits may be lowered under specific conditions such as areas with poor visibility, steep terrain or areas where specific wildlife concerns have been identified.
- All Project-related vehicles will follow applicable traffic, road-use and safety laws.
- Where segments on the right-of-way require rollback for access management or erosion control, ensure sufficient timber of appropriate size is available.
- In consultation with the landowners(s) or appropriate regulatory agency, determine potential rollback locations, and materials to be used.

- All temporary construction access roads and shoo-flies will be reclaimed to preconstruction conditions or restored as per this EPP. Newly created access points will be blocked unless otherwise directed by the Company or the appropriate regulatory agency.
- Efforts to control off road vehicle use will be coordinated with the appropriate authorities and will be conducted until the right-of-way has been satisfactorily reclaimed. Methods to control access may include one or a combination of the following:
 - posting of appropriate signage at all points of access;
 - create a visual barrier to reduce line of sight;
 - installation of locking gates and fencing; and/or
 - installation of slash or rock barriers.

Camps and Ancillary Developments

The following measures will be implemented to avoid or reduce the risk and severity of bear-human conflicts at camps and ancillary developments. Follow the measures provided in Appendix F: Bear-Human Conflict Management Plan for Camps of the Integrated Standards and Guidelines – Enhanced Approval Process (Government of Alberta 2013).

- Construction camps will be fenced and Texas gates installed at access points to discourage or prevent bears or other wildlife from gaining access to the site. The potential for bear-human conflict at each construction camp will be reviewed and, where warranted, bear-deterrent measures will be installed. These measures may include chain-link fencing (e.g., at sites with limited potential for bear conflicts), electric fencing (e.g., at sites with high probability of bear conflicts or at remote camps accessed by helicopter), cattle guards or electrified gates at access points, and a bear alarm system to deter and detect wildlife.
- Appropriate fencing may be installed at Project temporary facilities such as stockpile sites and borrow pits, if warranted, to limit the potential for wildlife conflicts.
- Implement a wildlife reporting system so Project personnel are informed of any bear activity around camps and work sites.
- Design and maintain camps to prevent surprise encounters with bears. Any feature on pathways and around buildings that may conceal a bear and increase the chance of a surprise encounter will be eliminated or reduced by implementing the measures below.
 - Skirting will be attached to buildings to prevent bears, particularly young bears, from taking refuge under them.
 - Building exits, pathways and outside work areas will be well lit to allow people to move about the camp safely when it is dark.
 - All camp buildings will have secure doors and windows. A window in a door, or next to it, allows people to check for bears before exiting.

Storage and Management of Attractants

- All potential attractants in construction camps will be stored, as noted below, so that they are inaccessible to bears.
- All garbage and food waste will be disposed of in bear-resistant containers. Container lids shall be kept secured and closed when not being loaded. At camps and work sites not enclosed by a perimeter fence, garbage and food waste will be disposed of in garbage containers in secure

buildings or in bear-resistant containers and transferred to bear-resistant garbage containment receptacles at least daily prior to nightfall.

- No food or garbage will be left outside unattended. All food will be stored indoors in appropriate containers.
- All used cooking oil and grease will be disposed of in bear-resistant secure cooking grease storage containment. Lids will be kept closed when not being loaded and the exterior shall be kept clean.
- Signage explaining proper food storage or garbage disposal will be posted at strategic locations in camp, such as dining areas, kitchens, garbage receptacles and waste disposal sites. Signage will be posted advising workers not to litter and to remove all waste from vehicles and dispose of it in the appropriate waste containers within the camp.
- All garbage and food waste will be regularly transported to the nearest bear-proof transfer station or landfill for proper disposal.
- Grey water (e.g., wastewater from sinks, showers and basins) can be a strong wildlife attractant. Grey water will be treated so that it does not attract wildlife. Grey water will be treated in the same manner as sewage in an approved waste management system.
- Accumulations of human waste (e.g., sewage) can attract wildlife, including bears. Collect sewage in entirely enclosed bear-resistant sewage containment systems and dispose of regularly at an approved facility. Portable toilets will be regularly cleaned to reduce odours.
- The Lead Environmental Inspector and Environmental Inspector(s) will make regular inspections of facilities and camps.
- Project personnel are not permitted to hunt or fish on the work site.

At remote camps with helicopter access, use the following guidelines.

- Minimize all odour and food attractants.
- Contain the entire camp, including cooking, garbage, sleeping areas and wastewater sites within the electrified fenced area.
- Remove garbage daily, prior to nightfall.
- Disinfect garbage receptacles daily.
- Use an open human waste (e.g., sewage) system with odour control (e.g., liming).
- Use a central cooking and eating area.
- Store all food and non-food attractants in bear-resistant receptacles.

Reducing and Managing Conflicts with Bears

Two main situations that may lead to human injury by bears include:

- when humans suddenly surprise a bear at close range, particularly a bear with cubs; and
- when food-conditioned bears that are also human-habituated aggressively approach people for food.

The measures provided below for avoiding a bear encounter and reducing the risk of injury to Project personnel and wildlife will be implemented.

• All Project personnel will receive education regarding bear awareness and staying safe in bear country. Without a good understanding of the principles and practices of staying safe around bears, personnel may not properly respond to interactions and may perpetuate misinformation. The following information will be made available during the Project orientation:

- general ecology of black bears relevant to human safety;
- black bear ecology in the Project area;
- a discussion of human-habituation and food conditioning;
- the detrimental effects of directly or indirectly feeding wildlife, including bears;
- how to work safely in bear country and avoid bear encounters;
- how to avoid attracting a bear by properly managing non-natural attractants;
- how to avoid inadvertently displacing bears from important habitats;
- awareness that a bear encounter may occur despite all necessary precautions and guidelines on how to behave during a bear encounter; and
- locations or contacts for reporting bear observations or bear-human conflicts.

Deterring a Bear Encounter

The approach for deterring a bear encounter includes the measures listed below.

- Project personnel will be educated in methods to deter or chase away an approaching bear. Construction sites and camps will have a variety of bear deterrents on hand including noise makers.
- Any bear approaching construction camps or other Project facilities or construction sites will be deterred and deterred every time it returns. Bear deterrents may include bear spray, noisemakers (e.g., bear bangers, blow horns), electric fencing and/or other deterrents approved by the Regional Wildlife Officer. The Regional Wildlife Officer will be asked to assist in situations where bears become aggressive.
- A bear that has obtained human food or garbage may be difficult to deter. Eliminating rewards that attract a bear is critical for deterrent efforts to succeed.
- Any encounter and, if necessary, deterring methods will be managed on a case-by-case basis, utilizing appropriate measures that maximize human and bear safety.
- Project personnel will report immediately to the Environmental Inspector or Camp Manager any bear that has entered a construction camp, other facility site, or construction site or has obtained human food or garbage. If a bear has obtained human food or garbage, the source will be immediately addressed and secured.

5.0 BREEDING BIRD AND NEST MANAGEMENT PLAN

This Breeding Bird and Nest Management Plan (BBNMP) describes the implementation of standard measures employed by TransCanada for reducing the risk of 'incidental take' of birds. Incidental take is the inadvertent disturbance to, or destruction of, a bird or its nest or egg, which for most bird species is a contravention of federal, provincial, and territorial legislation (Environment Canada 2015a). The BBNMP is applicable to all TransCanada projects in Canada, although for new infrastructure projects (e.g., new pipelines, new facilities involving wildlife surveys), additional Project-specific BBNMP mitigation measures may be developed following the guidance provided in this Plan.

5.1 Regulations, Guidelines, and Codes of Practice

5.1.1 *Federal*

There are legal obligations in Canada regarding the protection of migratory birds, as well as non-migratory birds. The following regulations apply to the protection of birds in Canada:

- *Migratory Birds Convention Act, 1994*
- *Migratory Birds Regulation*
- *Species at Risk Act, 2002, Section 32*

The *Migratory Birds Convention Act* (MBCA) and the *Migratory Birds Regulation* (MBR) prohibit the disturbance or destruction of migratory birds and their nests and eggs in Canada. "Migratory bird" is defined by Section 2 of the MBCA, and generally includes most migratory species that are native or naturally occurring in Canada (Environment Canada 2013a). The MBCA and MBR apply to all lands and waters in Canada, regardless of ownership. Environment Canada is responsible for administering the MBCA on behalf of the federal government.

Birds not covered by the MBCA include grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, kingfishers, and some species of blackbird. Although not covered by the MBCA, Provincial setbacks or other protection may apply to these birds.

Some bird species, including migratory and non-migratory bird species are protected under the *Species at Risk Act* (SARA). The Species at Risk Public Registry provides the current list of species protected under SARA. It is prohibited to remove the nest of any threatened or endangered species at any time if the species is likely to re-use that nest. Environment Canada is responsible for administering SARA.

5.1.2 *Provincial and Territorial*

Provincial and territorial governments share responsibility with Environment Canada for the management of birds in Canada. Bird species not listed under the MBCA and SARA may, or may not, also be protected under provincial or territorial legislation. The following legislation applies to the protection of birds within each jurisdiction:

- *Wildlife Acts* (Alberta, British Columbia, Manitoba, Northwest Territories, Nova Scotia, Nunavut, Saskatchewan, Yukon);
- *Fish and Wildlife Act* (New Brunswick);
- *Wild Life Act* (Newfoundland);
- *Wildlife Conservation Act* (Prince Edward Island);
- *Fish and Wildlife Conservation Act* (Ontario); and

- *An Act Respecting the Conservation and Development of Wildlife* (Quebec).

Provincial or territorial legislation may include year-round protection of inactive nests of some species, and in some provinces or territories a permit may be authorized for the removal of an inactive nest of some species. In some jurisdictions, legislation may include species-specific protection, or exemption from protection (e.g., pest species that damage crops).

5.1.3 Guidelines and Codes of Practices

Environment Canada provides avoidance guidelines to help make proactive decisions for reducing the risk of incidental take of migratory birds and their nests and eggs. Environment Canada cannot provide authorizations or permits for incidental take, and activities that affect migratory birds or their nests and eggs can result in violations of the Migratory Birds Regulation. Due diligence and best management practices must be followed to prevent contravention of the MBCA.

The following information sources were reviewed in the development of the BBNMP, and should be referred to for additional detail in the development of project-specific BBNMPs:

- Environment Canada's *Avoidance Guidelines* (2015b), and *Guide for Developing Beneficial Management Practices for Migratory Bird Conservation* (2013b)
- Draft Migratory Birds Convention Act: A Best Management Practice Developed for the Canadian Energy Pipeline Association (CEPA 2013)
- Other (e.g., provincial) applicable guidance documents and best management practices

5.2 Breeding Bird and Nest Management

The Breeding Bird and Nest Management Plan applies to all employees, contractors and consultants who conduct work on behalf of TransCanada during construction. The plan has been prepared using guidance from Environment Canada regarding protection of migratory birds, but the mitigation measures described will apply to all breeding birds.

5.2.1 Breeding Bird General Mitigation and Management

TransCanada is committed to avoiding incidental take of breeding birds. The following guiding principles, as stated by Environment Canada (2015a), have been incorporated into the BBNMP. Additionally, TransCanada employs the general measures and Best Management Practices developed by the Canadian Energy Pipeline Association document (CEPA 2013):

- know your legal obligations;
- avoid engaging in potentially destructive or disruptive activities in sensitive periods and locations in order to reduce the risk of affecting breeding birds; and,
- develop and implement appropriate preventative and mitigation measures to avoid the risk of incidental take and to help maintain sustainable populations of birds.

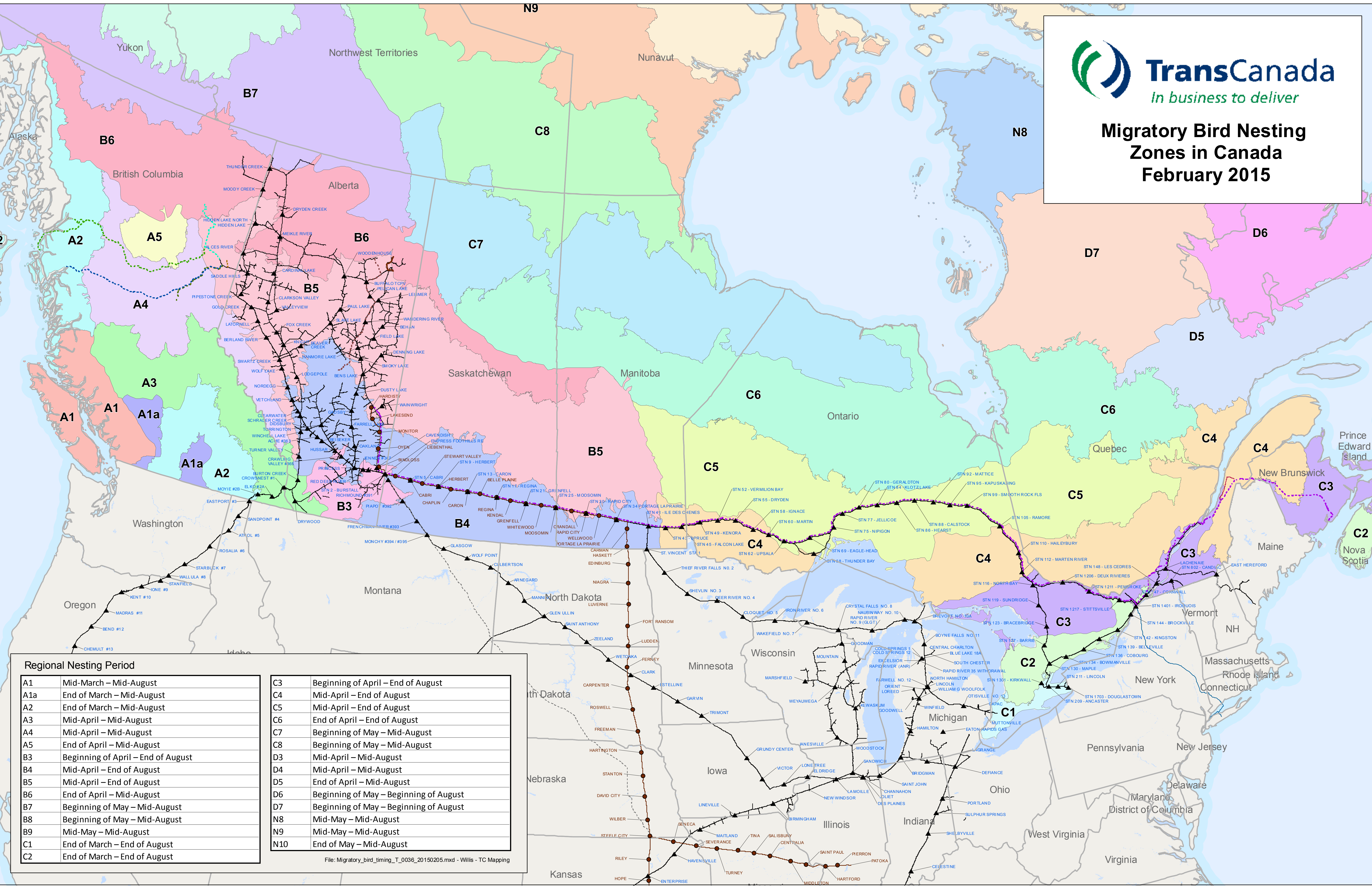
Regional Nesting Zones and Timelines

TransCanada will use the regional nesting zones and nesting periods identified by Environment Canada to identify the risk of incidental take of migratory birds in Canada (Figure 1). The primary nesting period is the period when 10% or more of the species within a given nesting zone are expected to be breeding, as interpreted from Environment Canada's nesting calendars (Environment Canada 2014). The primary nesting period is the period of time when risk of incidental take is substantially higher than at other times of the year.

The nesting timetable in Figure 2 provides nesting activity for migratory birds for three broad habitat types: wetland, open field, and forest. Primary nesting periods for each nesting zone in Canada, by broad habitat type and consolidated, are provided in Figure 2.



Migratory Bird Nesting
Zones in Canada
February 2015



Regional Nesting Period

A1	Mid-March – Mid-August
A1a	End of March – Mid-August
A2	End of March – Mid-August
A3	Mid-April – Mid-August
A4	Mid-April – Mid-August
A5	End of April – Mid-August
B3	Beginning of April – End of August
B4	Mid-April – End of August
B5	Mid-April – End of August
B6	End of April – Mid-August
B7	Beginning of May – Mid-August
B8	Beginning of May – Mid-August
B9	Mid-May – Mid-August
C1	End of March – End of August
C2	End of March – End of August

C3	Beginning of April – End of August
C4	Mid-April – End of August
C5	Mid-April – End of August
C6	End of April – End of August
C7	Beginning of May – Mid-August
C8	Beginning of May – Mid-August
D3	Mid-April – Mid-August
D4	Mid-April – Mid-August
D5	End of April – Mid-August
D6	Beginning of May – Beginning of August
D7	Beginning of May – Beginning of August
N8	Mid-May – Mid-August
N9	Mid-May – Mid-August
N10	End of May – Mid-August

Figure 2 Primary Nesting Periods by Nesting Zones and Broad Habitat Types

Nesting Zone	Wetland		Open Field		Forest		Consolidated Primary Nesting Period	
	Start	End	Start	End	Start	End	Start	End
A1	March 28	July 27	April 9	August 8	April 1	August 7	March 28	August 8
A1a	March 29	July 25	April 10	August 10	April 5	August 7	March 29	August 10
A2	April 9	July 27	April 23	August 7	April 12	August 7	April 9	August 7
A3	April 16	July 29	May 2	August 8	May 1	August 7	April 16	August 8
A4	April 25	August 2	May 7	August 8	May 3	August 7	April 25	August 8
A5	April 29	August 2	May 7	August 8	May 3	August 7	April 29	August 8
B3	April 16	July 29	May 2	August 12	April 21	August 12	April 16	August 12
B4	April 26	July 30	May 5	August 15	April 25	August 12	April 26	August 15
B5	May 1	August 2	May 8	August 10	May 3	August 9	May 1	August 10
B6	May 5	August 2	May 10	August 5	May 7	August 7	May 5	August 7
B7	May 12	August 4	May 14	August 7	May 12	August 8	May 12	August 8
B8	May 15	August 7	May 16	August 10	May 15	August 8	May 15	August 10
B9	May 17	August 8	May 22	August 8	May 17	August 9	May 17	August 9
C1	April 3	August 12	April 16	August 11	April 9	August 11	April 3	August 11
C2	April 10	August 12	April 20	August 11	April 15	August 9	April 10	August 9
C3	April 15	August 2	April 25	August 13	April 21	August 11	April 15	August 13
C4	April 21	July 29	April 29	August 14	April 25	August 8	April 21	August 14
C5	April 27	July 29	May 7	August 14	May 1	August 8	April 27	August 14
C6	May 2	August 2	May 8	August 4	May 5	August 7	May 2	August 7
C7	May 7	August 4	May 13	August 2	May 9	August 7	May 7	August 7
C8	May 15	August 6	May 18	August 3	May 15	August 7	May 15	August 7
D3-4	April 20	July 28	May 27	July 29	May 23	August 7	April 20	August 7
D5	April 27	July 30	May 6	August 1	May 1	August 7	April 27	August 7
D6	May 7	August 3	May 15	August 4	May 10	August 7	May 7	August 7
D7	May 12	August 7	May 16	August 5	May 15	August 7	May 12	August 7
N8			May 22	August 7			May 22	August 7
N9			May 22	August 9			May 22	August 9
N10			May 30	August 7			May 30	August 7

Source: Environment Canada 2014

General Mitigation Measures

The following general steps that will be used to avoid breeding bird nests and minimize interaction with breeding birds in keeping with Environment Canada's avoidance guidance include the following (also described in Figure 3).

- Avoid the breeding bird primary nesting period.
- In the event that construction activities are scheduled within the primary nesting period for migratory birds and in keeping with Environment Canada's avoidance guidance, a wildlife resource specialist will conduct a non-intrusive field survey for evidence of nesting (e.g., presence of singing birds, territorial males, alarm calls, distraction displays, carrying of food or nesting material). The field survey will be conducted within seven days of the start of construction.
- In the event that an active nest is found, it will be subject to site-specific mitigation measures (e.g., clearly marked species-specific protective buffer around the nest).
- Commence activity once the birds have fledged.

Outside of Primary Nesting Season

Outside of the primary nesting period (*i.e.*, when fewer than 10% of species in a nesting zone are breeding), a search for migratory bird nests is generally not warranted, unless recommended on a project-specific basis. Any discoveries of active or protected nests will be documented and mitigated through the TransCanada Wildlife Species of Concern Discovery Contingency Plan. A Wildlife Resource Specialist will be consulted for additional guidance as needed. Similar nest avoidance or other applicable mitigation steps will be used in these situations.

Within Primary Nesting Season

In the event that clearing or construction activities cannot be avoided during the migratory bird nesting period, non-intrusive methods can be used to conduct an area search for evidence of nesting within seven days of activities that are scheduled to occur. The process to be followed in the event that a migratory bird nest search is warranted is outlined in Figure 3.

In some circumstances, depending on the intensity of the activity to be conducted and the presence of other mitigating factors (e.g., existing disturbance in the project area), a non-intrusive nest search completed by a Wildlife Resource Specialist may not be warranted. A decision to modify the nest search requirements will be made by the Environmental Advisor as well as the Project Manager and the determination will be made following an evaluation of activity risk considering the intensity of proposed activity, land use, and potential for incidental take.

Search methods will be appropriate to the species and habitat types likely to be present in the project area and will take into consideration current guidance where available. Final search methods will be determined by a Wildlife Resource Specialist, but will include the following.

- Nest searches will be conducted in all habitat types, with the exception of cultivated land or mowed hay land.
- Nest searches will be conducted in the Project Footprint, as well as a suitable buffer surrounding the Footprint. The area covered by the nest search off right-of-way is dependent on surrounding land use, the intensity of the planned activity, and land access permission. Nest searches will also include wetlands attractive to migratory birds that are in the vicinity of the Footprint, excluding wetlands that are located off the Project Footprint in cultivated lands and mowed hay lands.
- In areas where species with special conservation status are observed, nest searches will be extended to include the species-specific federally or provincially recommended setback distances (e.g., Government of Alberta 2011, 2013), where land access is available.

If Active Nests are Found

In the event that an active nest is found (Figure 3) TransCanada will do the following.

- Determine if the nest will be affected by the activity and the bird species.
- Consult with specialists (e.g. wildlife resource specialist, Environment Canada, provincial wildlife biologist) where needed to develop appropriate mitigation.
- Avoid the area or employ appropriate site-specific mitigation measures where recommended (e.g., clearly marked species-specific protective buffer around the nest).
- Hold activity until the birds have fledged or the risk to the birds has otherwise been eliminated. Confirmation that the birds have left the area will be made prior to any local activity.
- Commence the activity.

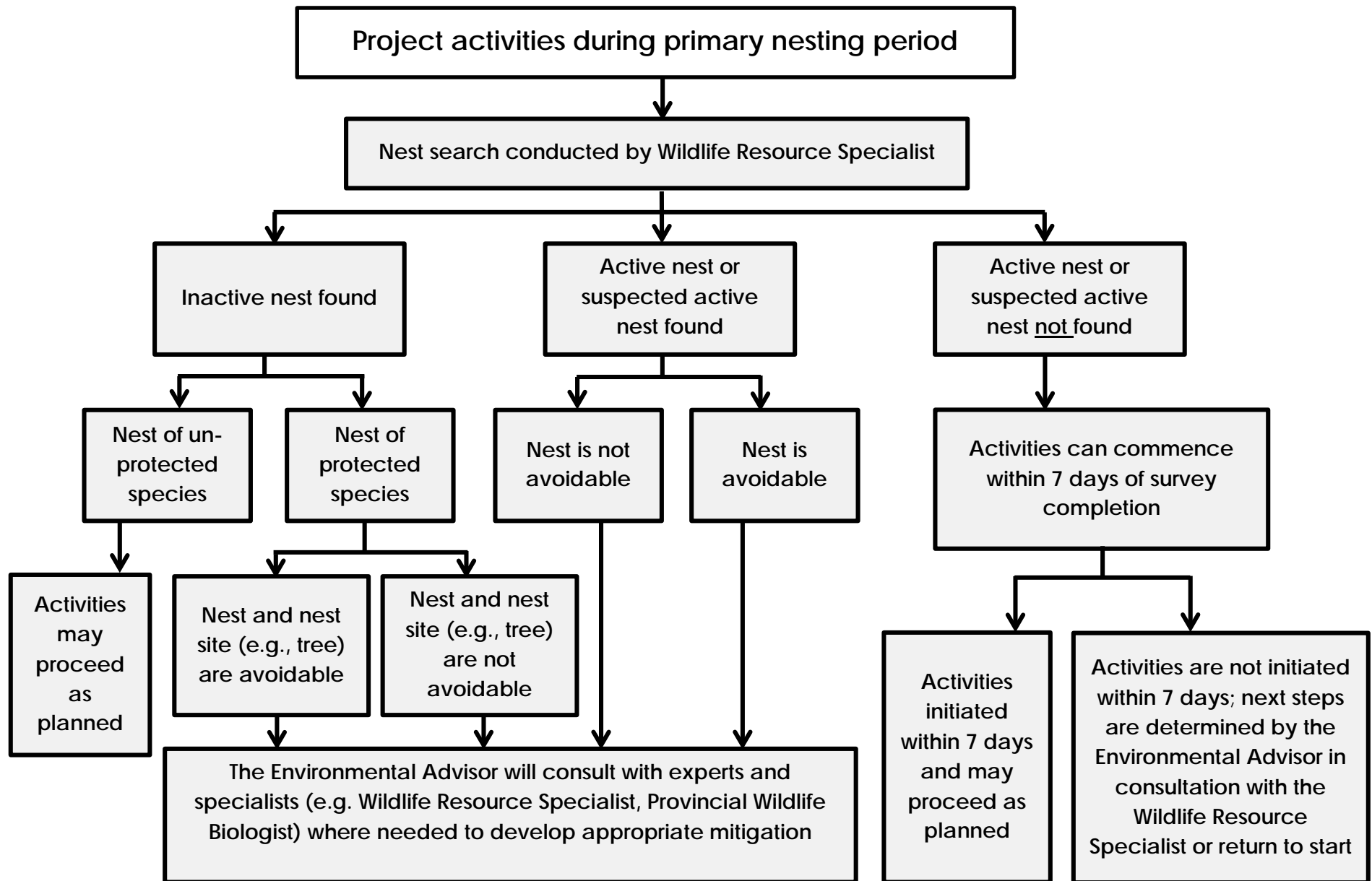


Figure 3: Breeding Bird Nest Search

5.3 References

- Canadian Energy Pipeline Association. 2013. Migratory Birds Convention Act: A Best Management Practice for Pipelines. Draft for Discussion. Prepared by Stantec Consulting Ltd. Website: <http://www.cepa.com/wp-content/uploads/2014/01/Migratory-Birds-Sept-26-2013-for-Publication.pdf>. Accessed: July 2015
- Environment Canada. 2013a. Birds Protected in Canada Under the Migratory Birds Convention Act, 1994 and Regulations. Website: <http://www.ec.gc.ca/nature/default.asp?lang=En&n=496E2702-1>. Accessed: July 2015.
- Environment Canada. 2013b. Guide for Developing Beneficial Management Practices for Migratory Bird Conservation. Website: <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=E9B8C86C-1>. Accessed: July 2015
- Environment Canada. 2014. General Nesting Periods of Migratory Birds in Canada. Website: <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1>. Accessed: February 2015.
- Environment Canada. 2015a. Incidental Take of Migratory Birds in Canada. Website: <http://www.ec.gc.ca/paom-itmb/>. Accessed: February 2015.
- Environment Canada. 2015b. Avoidance Guidelines. Website: <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=AB36A082-1>. Accessed: July 2015.

6.0 ACCESS MANAGEMENT PLAN

The Access Management Plan (AMP) is intended to work in coordination with the Environmental Protection Plan (EPP) and other management plans in the EPP. Access management planning will occur prior to the project construction phase with minor adjustments potentially required during construction to address unforeseen site conditions. The specific measures in the plan will typically be completed during the final cleanup stage of the project construction phase. Should trenchless techniques be prescribed, they will be executed at the appropriate time of the construction phase. This will ensure the intent of the plan is achieved and potential elements such as limited clearing or no clearing and access management are addressed.

Access management is not applicable where it cannot be effective, such as where cleared linear features are constructed adjacent to one another. Placing access management measures on a project right-of-way (RoW) adjacent to pre-existing or maintained industrial clearings or other linear developments that have no measures in place would be ineffective as an access deterrent.

Access management is an established method for minimizing new access to an area. Access management is a requirement and key element of federal and provincial guidelines such as the following:

- NEB Filing Manual; and
- The Alberta Enhanced Approval Process.

The Environmental Inspector is responsible for ensuring implementation of the plan and compliance with TransCanada's environmental guidelines and all applicable codes, regulations and industry standards.

6.1 Purpose

The purpose of the Access Management Plan is to provide guidance and measures for managing motorized human access for the Project in areas where new or expanded human access has been identified as potentially disruptive to the habitat, behaviour, and populations of wildlife species and pre-existing traditional land use practices. Project construction and associated traffic are relatively short term activities, however long term access to an area can result in enduring effects to the local area as a result of human access.

Access management will be designed to deter human motorized access along the Project rights-of-way, with the objectives of maintaining access levels at or near preconstruction conditions and ensuring effectiveness of individual access management measures.

6.2 Goals and Objectives of the Access Management Plan

The goals of the AMP are to:

1. Implement access management measures where applicable to deter an increase in motorized public access:
 - along new pipeline rights-of-way,
 - on new temporary construction access,
 - into existing linear disturbances that intersect the Project right-of-way;
2. Maintain accessibility necessary for safe pipeline and facility operations and be compliant with applicable regulations and guidelines; and
3. Maintain existing access at locations identified during the project consultation and planning stage. This includes disturbances and/or dispositions that are or could be utilized by others.

The goals and objectives of the AMP will be achieved by identifying areas that require access management along the Project right-of-way and temporary construction access, and implementing the appropriate site-specific measures. Emphasis for access management will be placed on areas of intersecting open disturbance (e.g., existing rights-of-way, seismic lines and roads), non-contiguous segments of the pipeline rights-of-way, new temporary construction access and areas sensitive to increased access.

The access management measures will be monitored as a component of Post-Construction Reclamation Monitoring (PCRM), and adaptive management will occur where appropriate if objectives are not being achieved. The objectives of monitoring access management are to:

1. Determine pre-construction levels of access along the proposed right-of-way;
2. Determine the effectiveness of access management measures for the Project by evaluating post-construction access levels with pre-construction conditions and previous monitoring;
3. Identify access management measures or locations that are ineffective, and determine contingency measures to supplement or replace measures found to be ineffective.

6.3 Selection of Access Management Measures and Locations

A combination of one or more measures selected from Table 1 will be implemented to achieve the goals and objectives of access management. Selection of access management locations will focus on areas where the measures have the possibility to be effective. Locations and type of measures for access management will be refined based on factors such as availability of access management measures construction material and storage space.

Potential locations where access management strategies could be implemented will be determined during project planning and will consider the following:

- segments of the right-of-way that deviate from paralleling existing linear features (i.e., non-contiguous), temporary access (i.e., shoo-flies) and false rights-of-way used to string pipe at trenchless crossings are priority areas for access management measures;
- intersections of the Project footprint with other linear features (i.e. roads) where trenchless crossing methods may be extended to retain intact vegetation, and where construction access may be limited or where alternate access may be used;
- areas that are accessible to restoration crews and equipment;
- locations where suitable material is available for rollback or berms;
- locations where construction requirements allow and where trees are present along the edge of the right-of-way, which may be felled over the right-of-way following construction;
- soil characteristics that are conducive to mounding; and
- upland, well-drained sites that are conducive to seedling planting and establishment.

6.3.1 Timber Utilization, Fire and Forest Health

The selection of access management measures considers commercial forestry (timber utilization) and fire and forest health values, as woody debris rollback in targeted areas is one of the most practical and widely used techniques for managing access on pipeline rights-of-way.

6.4 Access Management Measures

Table 1 provides a summary of potential access management measures that may be applied to linear developments, and includes available information on type and implementation specifications. The mitigation type selected will be based on site specific conditions, *e.g.* the availability of timber or brush for roll-back or slash berms (*i.e.* may be limited or unavailable in some project areas). Existing site conditions will be taken into consideration during access management planning. A combination of short and long-term measures that can effectively achieve access management goals and objectives can be implemented.

The following table provides a list of access management options which are not project specific, but may be applicable depending on local site conditions. Site specific opportunities for access management not found in Table 1 may be identified during planning and/or construction and will be evaluated on their merits with respect to access management goals and objectives. The access management measures that are selected to meet the objectives will be applied in consultation with the applicable regulatory authority.

TABLE 1
POTENTIAL ACCESS MANAGEMENT MEASURES

Type of Measure	Specifications	Comments
Minimal surface disturbance	<ul style="list-style-type: none"> Width of grubbing is limited to the trench area and where grading is required, and reduces the need for soil salvage over wider areas of the footprint In non-frozen ground conditions, and where indicated in project specific documentation, minimize disturbance (<i>e.g.</i> limit traffic) beyond the stripped areas prior to pipe handling activities Reduces disturbance to vegetation and root systems by cutting, mowing or walking down; mulching stumps, shrubs and trees that are non-merchantable at ground level (mulch depths maximum 5 cm), and limiting traffic to stripped areas. Intact root systems and seed bed can facilitate rapid regeneration of vegetation Within riparian areas surrounding watercourse crossings (<i>i.e.</i> designated buffer zone), mulching is not permitted unless approved by the Company Beyond the ditch line area, work on top of mulch layer where possible. This is achieved by freezing in mulch and allowing a layer of packed snow or ice to form grade level of RoW, using frost induction techniques (<i>i.e.</i> watering, utilizing snow, dragging tires, snow making) to form a protective layer where travel can be accommodated 	<ul style="list-style-type: none"> The objective is to minimize impacts on the soils and vegetation substructure, with the goal of allowing the Project footprint to re-vegetate to a similar pre-construction condition, subject to land-use guidelines specific to the disposition May be limited to construction during winter conditions, constrained by existing ground topography and to areas where grading isn't required In site specific circumstances and conditions, matting may be appropriate for short distances to meet the intent of this measure Minimal surface disturbance construction methods reduce impacts to soil structure and leads to the rapid regeneration of native vegetation. This method aids in achieving the goal of access control

TABLE 1 Cont'd

Type of Measure	Specifications	Comments
Snow ramping	<ul style="list-style-type: none"> Trees and shrubs are walked down using construction equipment and piled with layers of snow to create a ramp for vehicle traffic, if there is enough snow cover during winter construction. Small coniferous trees can also be walked down, but only in years when there is a higher than normal snow fall. When the snow melts in the spring following construction, the trees and shrubs recover their original configuration and create access control 	<ul style="list-style-type: none"> Snow ramping can be combined with some elements of Minimal Surface Disturbance, with the intent to minimize disturbance to small shrubs and understory, thereby encouraging the trees and shrubs to recover to a level similar to their original shape and create access control and provide habitat. Snow making may be required in site specific circumstances to address the intent of this measure
Trenchless construction techniques	<ul style="list-style-type: none"> Trenchless construction techniques (e.g., bore or HDD) are used to install pipe under transecting disturbances (e.g., watercourses, roads, third party utility rights-of-way) 	<ul style="list-style-type: none"> Extending these types of crossings in some cases may provide opportunities to retain natural vegetation screens that block access between the right-of-way and the intersecting disturbance
Woody debris rollback	<ul style="list-style-type: none"> Rollback density should be approximately 200–300 m³/ha. Lengths of 50 – 100 m have been found to be sufficient to deter access and will also allow space between the debris to facilitate seedling planting. Location and extent of rollback is subject to availability of appropriate material Woody debris should be spread evenly and must extend across the entire footprint width (i.e. no gaps between edge of standing timber and tops/ butt of the placed rollback) at a coverage/ density that will not restrict the ability to plant seedlings or limit planted or natural seedling growth Utilization of merchantable quality timber requires approval from the applicable regulatory authority. The placement of woody debris needs to consider risks from a forest fire perspective Rollback can be implemented in isolation or in combination with other treatments (e.g., rollback combined with signs or with revegetation measures such as seeding or planting) 	<ul style="list-style-type: none"> Rollback can be effective immediately following implementation, provided adequate material is available and properly applied (Vinge and Pyper 2012). Long rollback segments are more effective at managing access because ATV riders will be less inclined to try to ride through the debris or traverse around it in adjacent forest stands Placement of woody debris rollback can conserve soil moisture, moderate soil temperatures and provide nutrients as debris decomposes, prevent soil erosion, provide microsites for seed germination and protection for planted tree seedlings (Pyper and Vinge 2012; Vinge and Pyper 2012) Fire risk can be minimized through proper storage and placement of materials (Pyper and Vinge 2012). A 25 m rollback-free fuel break placed at 250 m intervals along rollback segments is recommended by the Integrated Standards and Guidelines for the Enhanced Approval Process (AER 2013)
Mounding	<ul style="list-style-type: none"> Mounding involves the excavation and inversion of soil beside the hole, and capping with a layer of mineral soil. This treatment creates a mosaic of high and low-lying areas For access management purposes, mounds should be created using an excavator. Excavations are typically 0.75 m deep 	<ul style="list-style-type: none"> In addition to access management, mounding can create suitable microsites for revegetation

TABLE 1 Cont'd

Type of Measure	Specifications	Comments
Berms	<ul style="list-style-type: none"> Berms may be constructed of slash and timbers. Supported berms resemble log fences or walls, constructed using timber cleared from the right-of-way To be effective, berms should be constructed to an approximate height of 2 m 	<ul style="list-style-type: none"> Promote rapid shrub/tree regeneration at ends of berms (e.g., bio-engineering, seedling planting) to increase effectiveness as access management
Tree felling	<ul style="list-style-type: none"> Tree felling is the process of deliberately cutting trees at the margin of a clearing to fall over the linear disturbance. Trees are felled from both sides of the linear disturbance to create access control. It may be applicable in specific locations where adjacent trees are tall enough to cover the entire width of the RoW 	<ul style="list-style-type: none"> Tree felling requires simpler site requirements than rollback and less specialized equipment than mounding Tree felling can promote natural revegetation by increasing cone deposition onto the ROW, creating microsites through shading and dropped dead woody debris, and protecting planted seedlings from extreme weather, wildlife trampling and damage from access
Bio-engineering and shrub staking	<ul style="list-style-type: none"> Bio-engineering is the use of live vegetation to stabilize and revegetate a site (e.g., transplants; installing cuttings), and is a technique often used on slopes or riparian banks Vegetation used for bio-engineering is either found at the site to be treated, or collected nearby in the form of cuttings Species are determined based on the biophysical characteristics of the site, adjacent forest stand composition, and restoration objectives (e.g., low palatability for ungulates) Planting densities depend on several factors, including habitat type (upland, riparian, wetland), ecosystem, tree/shrub species and minimum density target Planting is conducted in non-frozen ground conditions, and in the season following winter final cleanup 	<ul style="list-style-type: none"> Species and planting densities used for bio-engineering are site dependent Nursery-grown shrub seedlings may be planted where staking is not practical due to lack of available material, limitations associated with collecting material off-site, or where restoration prescription calls for shrub planting of species that do not readily regenerate through cuttings/staking (e.g., alder) Conifer seedling planting is considered an effective access control measure (effectiveness is expected to take longer than 10 years)

TABLE 1 Cont'd

Type of Measure	Specifications	Comments
Transplanting	<ul style="list-style-type: none"> Transplanting involves moving transplantable vegetation (e.g. small trees and shrubs) from off RoW to the RoW as a vegetation access management measure 	<ul style="list-style-type: none"> Transplanting has the advantage of immediately establishing relatively large trees/shrubs (e.g., saplings) and providing immediate-term access management Transplanting programs often result in the storage of plant materials under less-than-ideal conditions due to seasonal factors (i.e., extreme weather). Other access management options such as seedling planting have been shown to be more successful Limitations to implementation of transplanting include inconsistent availability of vegetation suitable for transplant, and the potential for degradation of neighbouring vegetation communities if transplants are sourced from adjacent tree stands
Gates and fencing	<ul style="list-style-type: none"> Gates or fencing can be placed at the start of new permanent roads to restrict unauthorized, motorized access Gates and fencing should be extended across the right-of-way to prevent motorized vehicles from circumnavigating the barrier 	<ul style="list-style-type: none"> Gates allow access by authorized individuals for operations and maintenance Signage may be implemented in conjunction with gates to explain the purpose of access restrictions
Signs	<ul style="list-style-type: none"> Signs may be installed at potential access points to explain why motorized access is being managed in the area, as well as why the restrictions are in place 	
Road deactivation	<ul style="list-style-type: none"> Road deactivation involves ripping the roadbed, removal of stream crossing structures, recontouring cut and fill slopes and re-establishing native vegetation to entirely eliminate the roadbed Reclamation of the treated road surface should occur as part of the road deactivation process 	

6.5 Access Management Measures Monitoring

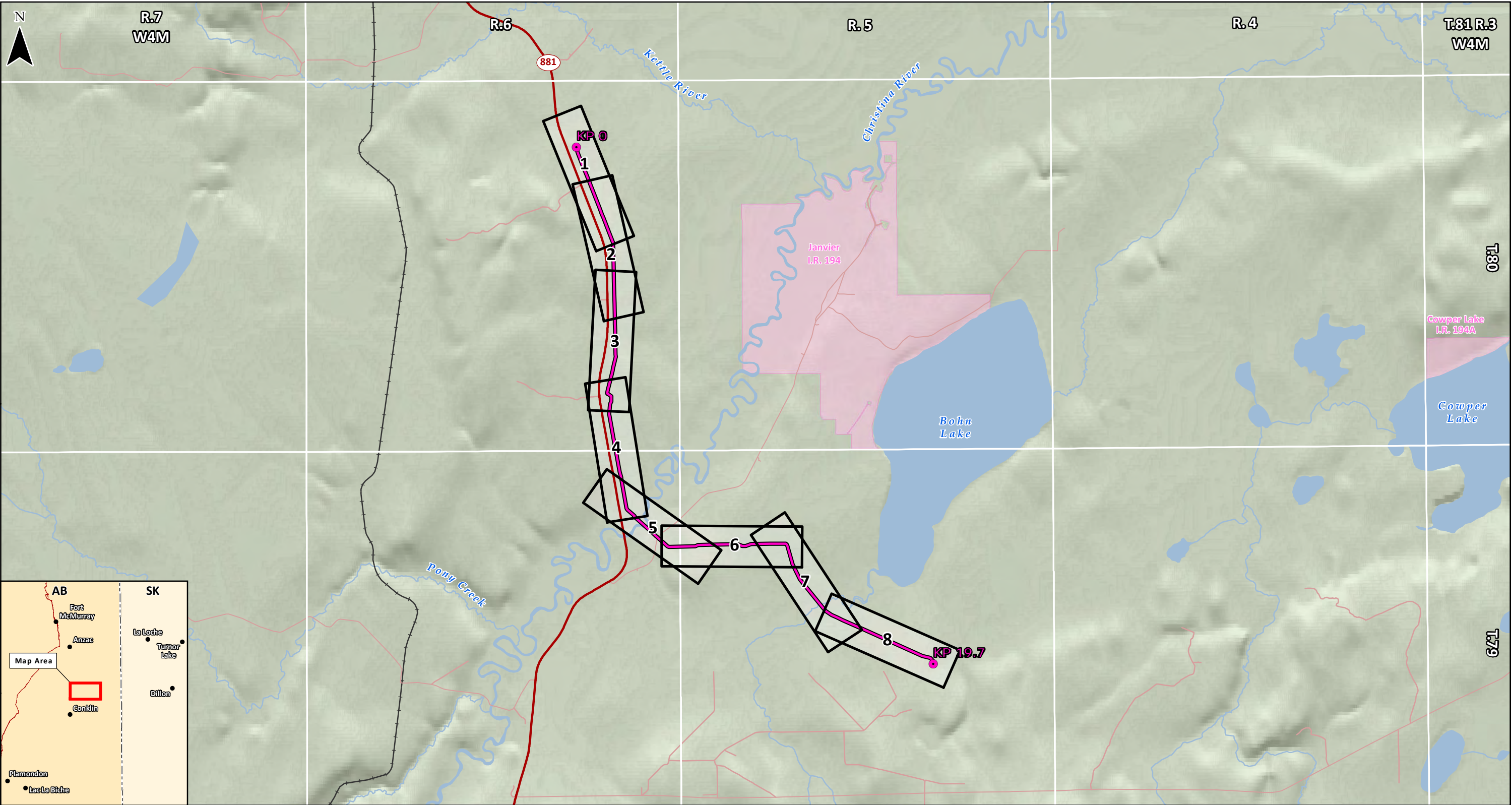
Access management monitoring will be conducted concurrently with PCRM and may be combined with operational or maintenance activities, such as corrosion or leak detection surveys and pipeline surveillance flights, where opportunities exist.



6.5.1 Monitoring Implemented Access Management Measures

Aerial overflights and ground surveys are methods that could be used to check the integrity of access management measures, identify evidence of motorized access, and identify changes in land use and new development that may affect access management on the Project right-of-way. Surveys are intended to provide evidence that a specific access management measure was (or was not) effective. The principle of continual improvement will be used to refine access management in order to see improving access management results.

6.5.2 *Reporting Implemented Access Management Measures*

The access management measures described in this management plan will be monitored and communicated via reporting to applicable regulatory authorities during the post construction reclamation monitoring phase.



SOURCES		<div><p>TransCanada <i>In business to deliver</i></p></div> <div><p>ch2m</p></div>	PROPOSED 2017 NGTL SYSTEM EXPANSION	LEGEND	SCALE		REVISIONS				
UTM Zone 12N KP, Proposed Pipeline Routing: NGTL 2016; Highway, Road: NRCan 2015; Railway: NRCan 2012; Hydrology: IHS Inc. 2004; Indian Reserve: Government of Canada 2016; Map Window: CH2M HILL Energy Canada Ltd. 2016; Hillshade: TERA Environmental Consultants 2008. <small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small>			<p>KETTLE RIVER LATERAL LOOP</p> <p>CHRISTINA RIVER SECTION</p> <p>ENVIRONMENTAL ALIGNMENT SHEETS</p> <p>GREEN AREA</p> <p>INDEX</p>	<div><div><div><div><div></div><div>Kilometre Post (KP)</div></div><div><div><div></div><div>Proposed Kettle River Lateral Loop Christina River Section</div></div><div><div><div></div><div>Road</div></div><div><div><div></div><div>Highway</div></div></div><div><div><div></div><div>Railway</div></div><div><div><div></div><div>Watercourse</div></div><div><div><div></div><div>Waterbody</div></div><div><div><div></div><div>Indian Reserve</div></div><div><div><div>1</div><div>Environmental Alignment Sheet Extent and Number</div></div></div></div></div></div></div></div></div></div></div></div>	<div>SCALE: 1: 100,000</div> <div><div><div></div><div>0</div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div><div>km</div><div>(All Locations Approximate)</div></div> <div><div>CH2M REF: 650028</div><div>September 2016</div></div>	NO.	DATE	DESCRIPTION	BY	QA	
			0	March 2015	Green Area EAS	SL	PS				
			1	September 2015	Green Area EAS	SL	PS				
			2	September 2016	Green Area EAS	AJ	PS				

650028_EAS_Kettle_River_Index_Map_Rev2.mxd

RESOURCE-SPECIFIC MITIGATION TABLES FOR THE PROPOSED NGTL 2017 CHRISTINA RIVER SECTION

Land use and environmental features with corresponding unique identifiers are positioned vertically above their respective locations on the following photomosaic. Mitigation measures described here do not include all of the protection measures to be implemented. The Environmental Protection Plan (EPP) accompanying the Environmental Alignment Sheets (EAS) provides additional protection measures. Section references in the following notes refer to locations in the EPP where the additional information can be found.

General Notes Regarding the EAS

- Minimal disturbance in the Green Area. No stripping required, except where grading occurs.
- Preliminary locations for access control measures are indicated on the Environmental Alignment Sheets in the Reclamation Construction Mitigation Band. Locations for access control will be verified in the field and adjusted as needed by the Environmental Inspector(s), in discussion with Alberta Environment and Parks (AEP).
- For additional reclamation measures, refer to Section 8.3, 8.4 and 8.8 in the Environmental Protection Plan.

TABLE 1

WILDLIFE FEATURES AND AREAS ENCOUNTERED ALONG THE CHRISTINA RIVER SECTION OF THE 2017 NGTL SYSTEM EXPANSION

Wildlife Unique ID	KP ¹	Legal Location	Feature/area	Construction Timing Restriction	Recommended Mitigation ²
WILD-001	8.5 to 11.2	16-35-79-6 W4M to 9-25-79-6 W4M	Key Wildlife and Biodiversity Zone (associated with the Christina River)	January 15 to April 30	<ul style="list-style-type: none">NOVA Gas Transmission Ltd. (NGTL) has prepared a Key Wildlife and Biodiversity Zone (KWBZ) Protection Plan, in consultation with AEP.Implement mitigation measures listed in the specific rows in the "Mitigation" column of Table 1 of Section 7.1 of the EPP for Habitat Loss/Alteration, Access Management/Line-of-Sight and Barriers/Filters to Wildlife Movement.To the extent feasible, schedule clearing, construction and clean-up activities within Key Wildlife and Biodiversity Zones to occur outside of the timing restriction of January 15 to April 30 (Government of Alberta 2013a). If activity is to occur within this period, consult with AEP.NGTL's Environmental Advisor and Environmental Inspector(s) will maintain an open line of communication with the appropriate regulator prior to and for the duration of the Project. NGTL will provide AEP with refined construction schedules as they become available, if requested by AEP. See Appendix 1B of the EPP for a list of contacts.All efforts will be made to conduct site preparation (<i>i.e.</i>, clearing and grading) prior to January 15.No new permanent access is planned for the Project within the KWBZ.Access into KWBZ will be restricted to essential Project staff and signs will be placed at the start and end of access roads to deter non-Project traffic.Limit access to the right-of-way within the KWBZ during reclamation and operations, whenever possible, through the use of existing roads or aerial inspections on the right-of-way and facility sites as needed.

- Notes:
- 1

KP locations are approximate.
- 2

All recommended mitigation measures are found in Table 1, Section 7.1 of the EPP.

TABLE 2												
WETLANDS ENCOUNTERED ALONG THE CHRISTINA RIVER SECTION OF THE 2017 NGTL SYSTEM EXPANSION												
Wetland Unique ID ¹	Wetland Type ²	Environmental Alignment Sheet Label	KP Start to KP End ³	UTM Start (12U)	UTM End (12U)	Length of Wetland by Centre Line (km)	Area of Wetland by Footprint (ha)	Project Components Crossed ⁴	Beaver Modified	COP Required ⁵	Site-Specific Mitigation ⁶	Comments
WET1-1	Seasonal Marsh	SM	KP 3.19 to KP 3.21	511491E 6199599N	511486E 6199578N	--	0.01	Construction right-of-way and temporary workspace	No	Yes	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET2-1	Seasonal Marsh	SM	KP 5.07 to KP 5.18	511505E 6197720N	511508E 6197608N	0.07	0.28	Construction right-of-way and temporary workspace	Yes	Yes	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET2-2	Seasonal Marsh	SM	KP 5.19 to KP 5.19	511488E 6197599N	511488E, 6197598N	--	0.00	Construction right-of-way and temporary workspace	Yes	Yes	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET3-1	Shrubby Fen	SF	KP 5.20 to KP 5.37	511488E 6197599N	511488E 6197598N	0.16	0.49	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	Associated with a potentially fish-bearing drainage (unnamed tributary to Christina River, CR-WC3) ⁷
WET4-1	Mixedwood Treed Swamp	MTS	KP 5.36 to KP 5.74	511530E 6197595N	511539E 6197422N	0.38	1.08	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET5-1	Treed Fen	TF	KP 5.73 to KP 6.29	511512E 6197432N	511510E 6197055N	0.54	1.51	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET6-1	Treed Swamp	TS	KP 6.37 to KP 6.50	511539E 6197058N	511406E 6196518N	0.11	0.31	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET5-2	Treed Fen	TF	KP 6.56 to KP 7.09	511360E 6196442N	511357E 6196315N	0.53	2.42	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET5-3	Treed Fen	TF	KP 8.18 to KP 8.44	511316E 6196263N	511409E 6195793N	0.26	0.80	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET7-1	Needle-Leaf Treed Swamp	NLTS	KP 8.44 to KP 8.62	511544E 6194731N	511581E 6194466N	0.18	0.48	Construction right-of-way	Yes	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	Associated with a potentially fish-bearing drainage (unnamed tributary to Christina River, CR-WC4) ⁷
WET8-1	Shrubby Swamp	SS	KP 9.62 to KP 9.84	511554E 6194466N	511613E 6194292N	0.22	0.60	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	---
WET9-1	Shrubby Swamp	SS	KP 10.66 to KP 10.70	5117761E 6193304N	511822E 6193085N	0.07	0.27	Construction right-of-way and temporary workspace	Yes	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET10-1	Treed Fen	TF	KP 11.61 to KP 11.70	513222.E 6191812N	513313E 6191730N	0.74	2.15	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET10-2	Treed Fen	TF	KP 11.73 to KP 11.88	513345E 6191701N	513495E 6191586N	1.62	5.47	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET10-3	Treed Fen	TF	KP 12.24 to KP 13.04	513841E 6192151N	514645E 6192165N	--	0.17	Temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET10-4	Treed Fen	TF	KP 14.59 to KP 16.22	516046E 6192026N	516890E 6190652N	--	0.27	Temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET11-1	Non-woody Fen	NWF	KP 16.20 to KP 16.45	516827E 6190633N	517021E 6190465N	0.23	1.10	Construction right-of-way and temporary workspace	Yes	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	Associated with a fish-bearing drainage (tributary to Bohn Lake; CR-WC7) ⁷
WET12-1	Treed Fen	TF	KP 16.43 to KP 17.18	516975E 6190453N	517640E 6190101N	0.73	2.26	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--

TABLE 2 Cont'd

Wetland Unique ID ¹	Wetland Type ²	Environmental Alignment Sheet Label	KP Start to KP End ³	UTM Start (12U)	UTM End (12U)	Length of Wetland by Centre Line (km)	Area of Wetland by Footprint (ha)	Project Components Crossed ⁴	Beaver Modified	COP Required ⁵	Site-Specific Mitigation ⁶	Comments
WET13-1	Shrubby Swamp	SS	KP 17.17 to KP 17.22	517645E 6190128N	517673E 6190086N	0.04	0.10	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--
WET12-2	Treed Fen	TF	KP 17.21 to KP 18.38	517678E 6190113N	518741E 6189633N	1.16	3.23	Construction right-of-way and temporary workspace	No	No	Minimal Surface Disturbance Procedure Frozen Forested Lands – ROW Preparation – No Stripping Required STDS-03-ML-05-445 (1 Sheet)	--

- Notes:
- 1

Gaps in the Project Footprint occur at areas of existing disturbance (*e.g.*, access roads), a single wetland complex that encompasses such gaps is noted as multiple crossings in some cases. The Wetland Unique ID (WETX-#) has been developed to show the type of wetland (X) and the number of times it crosses the proposed Footprint (#).
- 2

Wetland types align with the Canadian Wetland Classification System (CWCS) (NWWG 1997) but have been modified where appropriate (*e.g.*, non-woody fen encompasses both moss and graminoid CWCS fen type) and to show the hydroperiod or permanency of marsh wetlands (*i.e.*, temporary, seasonal or semi-permanent).
- 3

The delineated start and end locations provided are intended to identify the transition zone as accurately as possible, are as precise as feasible and were derived during the 2014 desktop review and wetland field surveys. KP locations are approximate.
- 4

COP notification to be submitted to AEP for mineral and shallow open water wetlands in the Green Area (Alberta Government 2013b,c).
- 5

Footprint is comprised of construction right-of-way and temporary workspace.
- 6

Typical drawings are found in Appendix 1D of the EPP.
- 7

Watercourse associations and site specific mitigation details are provided in Table 4 of these EAS Sheets.

TABLE 3

NOXIOUS WEEDS OBSERVED ALONG THE CHRISTINA RIVER SECTION OF THE NGTL 2017 SYSTEM EXPANSION

Vegetation Unique ID ¹	KP ²	Species (<i>Scientific Name</i>) [Rank]	UTM Coordinates (12U)	Legal Location	Abundance and Distribution	Mitigation
NX-001	KP 0.2	Perennial sow-thistle (<i>Sonchus arvensis</i>)	510582E 6206469N	12-26-80-6 W4M	Perennial sow-thistle was observed at low density in a disturbed area on the existing right-of-way approximately 28 m east of centreline as programmed on a hand held GPS.	<ul style="list-style-type: none">Refer to Sections 7.1.17 to 7.1.20, and 8.8.24 to 8.8.25 of the EPP for measures to be implemented.
NX-002	KP 2.9 to 3.2	Perennial sow-thistle (<i>Sonchus arvensis</i>)	510859E 6201653N	SE 23-80-6 W4M	Perennial sow-thistle was observed at low density in a cutblock.	<ul style="list-style-type: none">Refer to the mitigation for the perennial sow-thistle at KP 0.2 (NX-001).

- Notes:
- 1

The abbreviation NX refers to Noxious Weed occurrences.
- 2

KPs locations are approximate.

TABLE 4

SUMMARY OF WATERCOURSE CROSSINGS ALONG THE CHRISTINA RIVER SECTION OF THE 2017 NGTL SYSTEM EXPANSION

Watercourse ID	KP ¹	UTM Coordinates (12U)		Name	Fisheries Timing Restriction	Stream Classification	Survey Date, Open Water Mean Channel Morphology Results	Vehicle Crossing Method ³		Pipeline Crossing Method ³		QAES Recommendations
		Easting	Northing					Type	Drawing ²	Type	Drawing ²	
CR-WC1	1.03	510858	6201644	Unnamed tributary to Kettle River	April 16 to July 15	C	September 10, 2014 Bankfull Width: 0.9 m Wetted Width: 0.1 m Bankfull Depth: 0.22 m Flow: Negligible	Culvert or clear span bridge if water present	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Isolate if water present	Dam and Pump Watercourse Crossing Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.Fish salvage required for isolated crossing methods.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	
CR-WC2	2.35	511349	6200374	Unnamed tributary to Kettle River	April 16 to July 15	C	September 10, 2014 Bankfull Width: 1.0 m Wetted Width: 0.8 m Bankfull Depth: 0.27 m Flow: Negligible	Culvert or clear span bridge if water present	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Isolate if water present	Dam and Pump Watercourse Crossing STDS-03_ML-05-112 (3 sheets) Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.Fish salvage required for isolated crossing methods.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	
CR-WC3	5.26	511515	6197535	Unnamed tributary to Kettle River	April 16 to July 15	C	September 11, 2014 Bankfull Width: 2.1 Wetted Width: 1.2 m Bankfull Depth: 0.36 m Flow: Negligible	Clear span bridge if water present	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Isolate if water present	Dam and Pump Watercourse Crossing STDS-03_ML-05-112 (3 sheets) Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	
CR-WC4	8.60	511602	6194314	Unnamed tributary to Kettle River	April 16 to July 15	C	September 12, 2014 Bankfull Width: 1.3 m Wetted Width: 0.3 m Bankfull Depth: 0.21 m Flow: Negligible	Logfill or clear span bridge if water present	Temporary Log Bridge Crossings STDS-03-ML-05-102 (1 sheet)	Isolate if water present	Dam and Pump Watercourse Crossing STDS-03_ML-05-112 (3 sheets) Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	
CR-WC5	10.54	512387	6192672	Christina River	April 16 to July 15	C	September 14, 2014 Bankfull Width: 48.0 m Wetted Width: 30.8 m Bankfull Depth: 1.65 m Flow: 7.00 m3/s	Clear span bridge/existing bridge/access from both sides	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Proposed Horizontal Directional Drill (Trenchless)	Site specific crossing drawing	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.Water quality monitoring during construction.Fish salvage if isolation contingency method required.
CR-WC6	11.07	512801	6192390	Unnamed tributary to Christina River	April 16 to July 15	C	September 13, 2014 Bankfull Width: 1.1 m Wetted Width: 0.7 m Bankfull Depth: 0.26 m Flow: Negligible	Culvert or existing bridge if water present	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Isolate if water present	Dam and Pump Watercourse Crossing STDS-03_ML-05-112 (3 sheets) Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	

TABLE 4 Cont'd

Watercourse ID	KP ¹	UTM Coordinates (12U)		Name	Fisheries Timing Restriction	Stream Classification	Survey Date, Open Water Mean Channel Morphology Results	Vehicle Crossing Method ³		Pipeline Crossing Method ³		OAES Recommendations
		Easting	Northing					Type	Drawing ²	Type	Drawing ²	
CR-WC7	16.30	516907	6190581	Unnamed tributary to Bohn Lake	April 16 to July 15	C	September 13, 2014 Bankfull Width: 15.0 m Wetted Width: 15.0 m Bankfull Depth: 2.32 m Flow: Negligible	Clear span bridge if water present	Temporary Steel Bridge Crossings STDS-03-ML-05-101 (3 sheets)	Isolate if water present	Dam and Pump Watercourse Crossing STDS-03_ML-05-112 (3 sheets) Flume Water Course Crossings STDS-03-ML-05-111 (3 sheets)	<ul style="list-style-type: none">Implement mitigation measures as per Section 8.4 of the EPP.Fish salvage required for isolated crossing methods.Water quality monitoring during construction.
								Snowfill/icebridge/clear span bridge if dry or frozen to bottom	Temporary Ice Bridge Crossings STDS-03-ML-05-104 (1 sheet)	Open cut if dry or frozen to bottom	Typical Open Cut Watercourse Crossing STDS-03-ML-05-105 (2 sheets)	

- Notes:
- 1 All KP locations are approximate.
 - 2 Typical drawings are found in Appendix 1D of the EPP.
 - 3 Refer to Section 8.4 of the EPP.

TABLE 5

TRADITIONAL LAND USE SITES ENCOUNTERED ALONG THE CHRISTINA RIVER SECTION OF THE NGTL 2017 SYSTEM EXPANSION

To maintain confidentiality, site-specific Traditional Land Use information is redacted from the public version of the document.

References

Alberta Government. 2013a. Integrated Standards and Guidelines – Enhanced Approval Process. December 1, 2013. 94 pp.

Alberta Government. 2013b. *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*. Edmonton, AB. 36 pp.

Alberta Government. 2013c. *Code of Practice for Watercourse Crossings*. Edmonton, AB. 44 pp.

National Wetlands Working Group. 1997. The Canadian Wetland Classification System. Edited by B.G. Warner and C.D.A. Rubec. Wetlands Research Centre, University of Waterloo, Waterloo, ON.

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<div><div><div>SOURCES</div><div>UTM Zone 12N Imagery: 2013 SPOT5 ©2016 CNES. Licensed by BlackBridge Geomatics Corp. www.blackbridge.com. Water Well: AESRD 2015; KP: Proposed Pipeline Routing: NGTL 2016; Wetland, Watercourse Crossing Preliminary Access Control Location: CH2M HILL Energy Canada, Ltd. 2016; Existing Pipeline, Highway, Road: IFS Inc. 2016; Wildlife Sensitivity AEP, GOA 2015.</div><div>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</div></div></div>																																																																				
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<table><tr><th colspan="6">REVISIONS</th><th>MAP NUMBER</th><th>18180-09-LA-03-002 OF 008</th><th colspan="3" rowspan="5">PROPOSED 2017 NGTL SYSTEM EXPANSION KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION ENVIRONMENTAL ALIGNMENT SHEETS</th></tr><tr><th>NO.</th><th>DESCRIPTION</th><th>DATE</th><th>BY</th><th>CHKD</th><th>DATE</th><th>09/2016</th><th></th></tr><tr><td>0</td><td>Green Area EAS</td><td>March 2015</td><td>SL</td><td>PS</td><td>REVISION</td><td>2</td><td></td></tr><tr><td>1</td><td>Green Area EAS</td><td>September 2015</td><td>AJ</td><td>PS</td><td>ROUTE REVISION</td><td>3</td><td></td></tr><tr><td>2</td><td>Green Area EAS</td><td>September 2016</td><td>AJ</td><td>PS</td><td>SCALE</td><td></td><td></td></tr><tr><td colspan="6"></td><td></td><td></td><td>PROJECTION</td><td>DATUM</td><td>CH2M REF:</td></tr><tr><td colspan="6"></td><td></td><td></td><td>UTM 12N</td><td>NAD83</td><td>650028</td></tr></table>				REVISIONS						MAP NUMBER	18180-09-LA-03-002 OF 008	PROPOSED 2017 NGTL SYSTEM EXPANSION KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION ENVIRONMENTAL ALIGNMENT SHEETS			NO.	DESCRIPTION	DATE	BY	CHKD	DATE	09/2016		0	Green Area EAS	March 2015	SL	PS	REVISION	2		1	Green Area EAS	September 2015	AJ	PS	ROUTE REVISION	3		2	Green Area EAS	September 2016	AJ	PS	SCALE											PROJECTION	DATUM	CH2M REF:									UTM 12N	NAD83	650028
REVISIONS						MAP NUMBER	18180-09-LA-03-002 OF 008	PROPOSED 2017 NGTL SYSTEM EXPANSION KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION ENVIRONMENTAL ALIGNMENT SHEETS																																																												
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RESOURCE BAND	OWNERSHIP		CROWN	
	LAND USE		GREEN AREA - FORESTED	
	FISHERIES RESOURCES (NAME/CLASSIFICATION)		CHRISTINA RIVER / CLASS C	UNNAMED TRIBUTARY TO CHRISTINA RIVER / CLASS C
	VEGETATION			
	SOILS		GRAY LUVISOL, ORGANIC	
	HISTORICAL OR HERITAGE RESOURCES			
	TRADITIONAL LAND USE			
	WETLAND		SS	SS



CONSTRUCTION MITIGATION ¹	EQUIPMENT CLEANING STATION		
	FISHERIES TIMING RESTRICTIONS ⁵		APRIL 16 TO JULY 15
	WATER CROSSING PROCEDURES ⁵		CR-WC5
	WILDLIFE RESTRICTIONS ²		WILD-001; JANUARY 15 TO APRIL 30
			MIGRATORY BIRD NESTING PERIOD; MAY 1 TO AUGUST 10
	VEGETATION	WETLAND RESTRICTIONS ³	WET8-1
			WET9-1
	SOILS	UPLAND RESTRICTIONS ⁴	
		HANDLING	
		SALVAGE DEPTH	
		SALVAGE CRITERIA	NO STRIPPING REQUIRED, EXCEPT WHERE GRADING
	RECLAMATION		NO SEEDING IN WETLANDS. ALLOW FOR NATURAL RECOVERY
	HISTORICAL		
	TRADITIONAL LAND USE		
	OTHER	KEY WILDLIFE ²	KEY WILDLIFE AND BIODIVERSITY ZONE (CHRISTINA RIVER)

Land use and environmental features with corresponding unique identifiers are positioned vertically above their respective locations on the photomosaic. Mitigation measures described in the accompanying Resource Specific Mitigation Tables (RSMT) do not include all of the protection measures to be implemented. The Environmental Protection Plan (EPP) accompanying this Volume provides additional protection measures.

Superscript Notes:
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3. See Table 2 of the accompanying RSMT for additional details.
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SOURCES
Imagery: 2013 SPOT6 ©2016 CNES. Licensed by BlackBridge Geomatics Corp. www.blackbridge.com
Water Well: AESRD 2015; KP: Proposed Pipeline Routing: NGTL 2016; Wetland, Watercourse Crossing Preliminary Access Control Location: CH2M HILL Energy Canada, Ltd. 2016; Existing Pipeline, Highway Road: IFS Inc. 2016; Wildlife Sensitivity AEP, GOA 2015.
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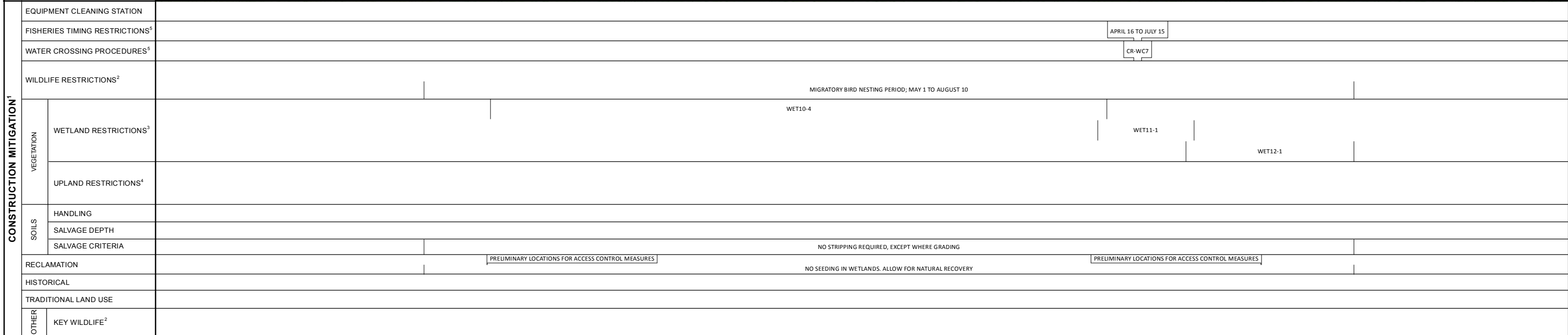
PREPARED FOR:

PREPARED BY:

REVISIONS					MAP NUMBER	18180-09-LA-03-005 OF 008
NO.	DESCRIPTION	DATE	BY	CHKD	DATE	09/2016
0	Green Area EAS	March 2015	SL	PS	REVISION	2
1	Green Area EAS	September 2015	AJ	PS	ROUTE REVISION	3
2	Green Area EAS	September 2016	AJ	PS	SCALE	1:10,000
						0 100 200 300 m (All Locations Approximate)

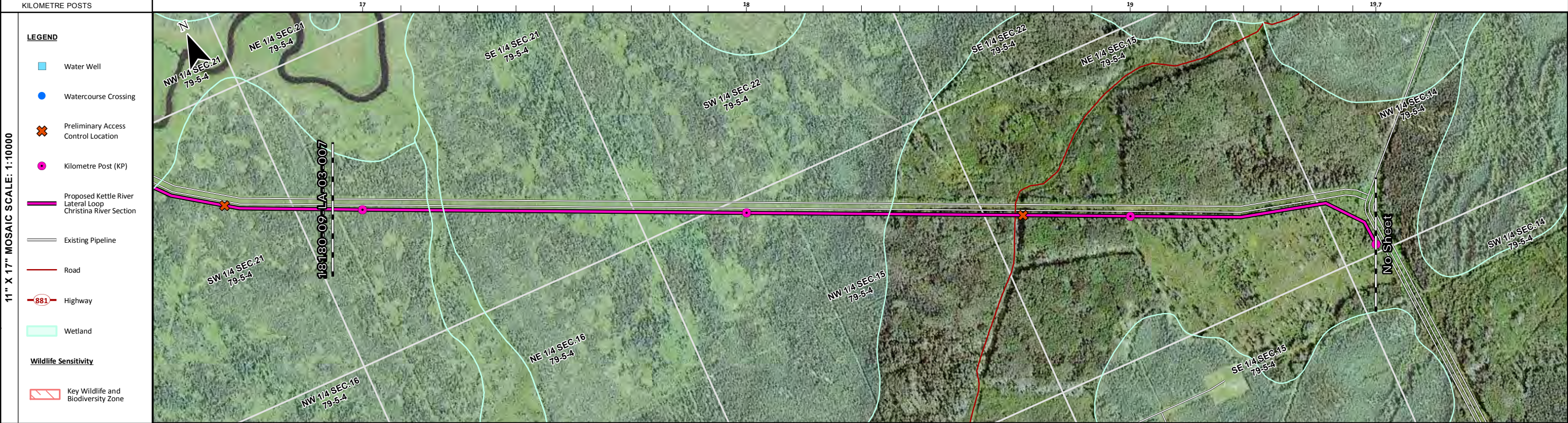
PROPOSED 2017 NGTL SYSTEM EXPANSION
KETTLE RIVER LATERAL LOOP
CHRISTINA RIVER SECTION
ENVIRONMENTAL ALIGNMENT SHEETS
PROJECTION: UTM 12N
DATUM: NAD83
CH2M REF: 650028

OWNERSHIP		CROWN										
LAND USE		GREEN AREA - FORESTED										
RESOURCE BAND	FISHERIES RESOURCES (NAME/CLASSIFICATION)											
	VEGETATION											
	SOILS	GRAY LUVISOL, ORGANIC										
	HISTORICAL OR HERITAGE RESOURCES											
	TRADITIONAL LAND USE											
WETLAND		TF										
KILOMETRE POSTS		121314										
11" X 17" MOSAIC SCALE: 1:10000	<div><div><div>LEGEND</div><div><div><div><div></div></div>Water Well</div><div><div><div></div></div>Watercourse Crossing</div><div><div><div></div></div>Preliminary Access Control Location</div><div><div><div></div></div>Kilometre Post (KP)</div><div><div><div></div></div>Proposed Kettle River Lateral Loop Christina River Section</div><div><div><div></div></div>Existing Pipeline</div><div><div><div></div></div>Road</div><div><div><div></div></div>Highway</div><div><div><div></div></div>Wetland</div><div><div><div>Wildlife Sensitivity</div><div><div></div>Key Wildlife and Biodiversity Zone</div></div></div></div></div><div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><div></div></div><div><div></div></div></div><div><div><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September 2016 Page 15 of 16

RESOURCE BAND	OWNERSHIP				CROWN	
	LAND USE				GREEN AREA - FORESTED	
	FISHERIES RESOURCES (NAME/CLASSIFICATION)					
	VEGETATION					
	SOILS				GRAY LUVISOL, ORGANIC	
	HISTORICAL OR HERITAGE RESOURCES					
	TRADITIONAL LAND USE					
	WETLAND			SS	TF	



CONSTRUCTION MITIGATION ¹	EQUIPMENT CLEANING STATION		
	FISHERIES TIMING RESTRICTIONS ⁵		
	WATER CROSSING PROCEDURES ⁵		
	WILDLIFE RESTRICTIONS ²		MIGRATORY BIRD NESTING PERIOD; MAY 1 TO AUGUST 10
	VEGETATION	WETLAND RESTRICTIONS ³	WET12-1, WET12-2, WET13-1
		UPLAND RESTRICTIONS ⁴	
	SOILS	HANDLING	
		SALVAGE DEPTH	
		SALVAGE CRITERIA	NO STRIPPING REQUIRED, EXCEPT WHERE GRADING
	RECLAMATION		PRELIMINARY LOCATIONS FOR ACCESS CONTROL MEASURES
	HISTORICAL		NO SEEDING IN WETLANDS. ALLOW FOR NATURAL RECOVERY
	TRADITIONAL LAND USE		
	OTHER	KEY WILDLIFE ²	

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PREPARED FOR:

TransCanada

PREPARED BY:

ch2m

REVISIONS						MAP NUMBER	18180-09-LA-03-008 OF 008	PROPOSED 2017 NGTL SYSTEM EXPANSION KETTLE RIVER LATERAL LOOP CHRISTINA RIVER SECTION ENVIRONMENTAL ALIGNMENT SHEETS		
NO.	DESCRIPTION	DATE	BY	CHKD	DATE	09/2016				
0	Green Area EAS	March 2015	SL	PS	REVISION	2				
1	Green Area EAS	September 2015	AJ	PS	ROUTE REVISION	3				
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							1:10,000	UTM 12N	NAD83	650028
							0 100 200 300 m (All Locations Approximate)			