TRANSMOUNTAIN

CELEBRATING 60 YEARS OF SERVICE 1953 to 2013

Trans Mountain Pipeline ULC

Trans Mountain Expansion Project

An Application Pursuant to Section 52 of the National Energy Board Act

December 2013

Volume 6C Facilities Environmental Protection Plan

KINDER MORGAN CANADA

NATIONAL ENERGY BOARD

IN THE MATTER OF

the *National Energy Board Act*,
R.S.C. 1985, c. N-7, as amended, ("*NEB Act*")
and the Regulations made thereunder;

AND IN THE MATTER OF

the *Canadian Environmental Assessment Act*, 2012,
S.C. 2012, c. 37, as amended,
and the Regulations made thereunder;

AND IN THE MATTER OF

an application by Trans Mountain Pipeline ULC
as General Partner of Trans Mountain Pipeline L.P.
(collectively "Trans Mountain")
for a Certificate of Public Convenience and Necessity and
other related approvals pursuant to Part III of the *NEB Act*

APPLICATION BY TRANS MOUNTAIN FOR APPROVAL OF THE TRANS MOUNTAIN EXPANSION PROJECT

December 2013

To: The Secretary
The National Energy Board
444 — 7th Avenue SW
Calgary, AB T2P 0X8

Trans Mountain Expansion Project
Application Pursuant to Section 52 of the *National Energy Board Act*

Guide to the Application

Application	
Transmittal - Letter to the National Energy Board	
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Volume 2	Project Overview, Economics and General Information
Volume 3A	Public Consultation
Volume 3B	Aboriginal Engagement
Volume 3C	Landowner Relations
Volume 4A	Project Design and Execution – Engineering
Volume 4B	Project Design and Execution – Construction
Volume 4C	Project Design and Execution – Operations and Maintenance
Volume 5A	Environmental and Socio-Economic Assessment – Biophysical
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Volume 8A	Marine Transportation
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This volume contains:

Volume 6C			
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Section 2.0	Environmental Protection Plan Organization	Appendix H	Water Quality (Resource-Specific Mitigation)
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Section 4.0	Notification of Interested Parties	Appendix J	Vegetation (Resource-Specific Mitigation)
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Section 6.0	Pre-Construction Activities	Appendix L	Wildlife and Wildlife Habitat (Resource-Specific Mitigation)
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Section 9.0	Access Road for Facilities	Appendix O	Air Quality (Resource-Specific Mitigation)
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Appendix C	Management Plans		
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Appendix F	Soils (Resource-Specific Mitigation)		

NEB FILING MANUAL CHECKLIST

CHAPTER 3 – COMMON INFORMATION REQUIREMENTS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
3.1 Action Sought by Applicant			
1.	Requirements of s.15 of the Rules.	Volume 1 Section 1.1	---
3.2 Application or Project Purpose			
1.	Purpose of the proposed project.	Volume 2 Section 1.1	---
3.4 Consultation		Volumes 3A, 3B, 3C; Volumes 5A, 5B Section 3; Volume 8A Section 3	--
3.4.1 Principles and Goals of Consultation			
1.	The corporate policy or vision.	Volume 3A Section 1.2.1 Volume 3B Section 1.2.1	--
2.	The principles and goals of consultation for the project.	Volume 3A Section 1.2.2 Volume 3B Section 1.2.2 Volume 5A Section 3.2.1 Volume 5B Section 3.2.1	--
3.	A copy of the Aboriginal protocol and copies of policies and principles for collecting traditional use information, if available.	Volume 3B Section 1.3.5	--
3.4.2 Design of Consultation Program			
1.	The design of the consultation program and the factors that influenced the design.	Volume 3A Section 1.3 Volume 3B Section 1.3 Volume 5A Section 3.1.1, 3.2.2 Volume 5B Section 3.1.1, 3.2.2	--
3.4.3 Implementing a Consultation Program			
1.	The outcomes of the consultation program for the project.	Volume 3A Section 1.7 Volume 3B Section 1.5 Table 1.5.1 Volume 5A Section 3.1.5, 3.2.4 Volume 5B Section 3.1.5, 3.2.4	--
3.4.4 Justification for Not Undertaking a Consultation Program			
2.	The application provides justification for why the applicant has determined that a consultation program is not required for the project.	N/A	N/A
3.5 Notification of Commercial Third Parties			
1.	Confirm that third parties were notified.	Volume 2 Section 3.2.2	--
2.	Details regarding the concerns of third parties.	Volume 2 Section 3.2.2	--
3.	List the self-identified interested third parties and confirm they have been notified.	N/A	N/A
4.	If notification of third parties is considered unnecessary, an explanation to this effect.	N/A	N/A

CHAPTER 4 – SECTIONS 4.1 AND 4.2: COMMON REQUIREMENTS FOR PHYSICAL PROJECTS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
4.1 Description of the Project			--
1.	The project components, activities and related undertakings.	Volume 2 Section 2.0; Volume 4A	--
2.	The project location and criteria used to determine the route or site.	Volume 2 Section 4.0; Volume 4A	--
3.	How and when the project will be carried out.	Volume 2 Section 2.3; Volume 4B Section 2.0	--
4.	Description of any facilities, to be constructed by others, required to accommodate the proposed facilities.	N/A	N/A
5.	An estimate of the total capital costs and incremental operating costs, and changes to abandonment cost estimates.	Volume 2 Section 2.9	--
6.	The expected in-service date.	Volume 2 Section 1.1; Volume 4B Section 2.1	--
4.2 Economic Feasibility, Alternatives and Justification			
4.2.1 Economic Feasibility			
1.	Describe the economic feasibility of the project.	Volume 2 Section 3.5	--
4.2.2 Alternatives			
1.	Describe the need for the project, other economically-feasible alternatives to the project examined, along with the rationale for selecting the applied for project over these other possible options.	Volume 2 Section 3.0; Volume 8A Section 2.2	--
2.	Describe and justify the selection of the proposed route and site including a comparison of the options evaluated using appropriate selection criteria.	Volume 2 Section 4.0; Volume 8A Section 2.2	--
3.	Describe the rationale for the chosen design and construction methods. Where appropriate, describe any alternative designs and methods evaluated and explain why these other options were eliminated.	Volume 2 Section 4.0; Volume 8A Section 2.2	--
4.2.3 Justification			
1.	Provide a justification for the proposed project	Volume 2 Section 3.4	--

GUIDE A – A.1 ENGINEERING

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.1.1 Engineering Design Details			
1.	Fluid type and chemical composition.	Volume 4A Section 3.1.1	--
2.	Line pipe specifications.	Volume 4A Section 3.2.8	--
3.	Pigging facilities specifications.	Volume 4A Section 3.3.1, 3.3.2	--
4.	Compressor or pump facilities specifications.	Volume 4A Section 3.4	--
5.	Pressure regulating or metering facilities specifications.	Volume 4A Section 3.5	--
6.	Liquid tank specifications, or other commodity storage facilities.	Volume 4A Section 3.4	--
7.	New control system facilities specifications.	Volume 4A Section 3.3	--
8.	Gas processing, sulphur or LNG plant facilities specifications.	N/A	N/A
9.	Technical description of other facilities not mentioned above.	N/A	N/A
10.	Building dimensions and uses.	Volume 4A Section 3.3, 3.4, 3.5	--
11.	If project is a new system that is a critical source of energy supply, a description of the impact to the new system capabilities following loss of critical component.	N/A	N/A
A.1.2 Engineering Design Principles			
1.	Confirmation project activities will follow the requirements of the latest version of CSA Z662.	Volume 4A Section 2.2	--
2.	Provide a statement indicating which Annex is being used and for what purpose	Volume 4A Section 2.3	--
3.	Statement confirming compliance with OPR or PPR.	Volume 4A Section 2.1	--
4.	Listing of all primary codes and standards, including version and date of issue.	Volume 4A Section 2, Table 5.1.1	--
5.	Confirmation that the project will comply with company manuals and confirm manuals comply with OPR/PPR and codes and standards.	Volume 4A Section 2.6, Table 5.1.2	--
6.	Any portion of the project a non-hydrocarbon commodity pipeline system? Provide a QA program to ensure the materials are appropriate for their intended service.	N/A – all hydrocarbons	N/A
7.	If facility subject to conditions not addressed in CSA Z662: • Written statement by qualified professional engineer • Description of the designs and measures required to safeguard the pipeline	Volume 4A Section 2.9	--
8.	If directional drilling involved: • Preliminary feasibility report • Description of the contingency plan	Volume 4A Section 2.12	--
9.	If the proposed project involves the reuse of materials, provide an engineering assessment in accordance with CSA Z662 that indicates its suitability for the intended service.	Volume 4A, Section 2.7	--
10.	If new materials are involved, provide material supply chain information, in tabular format.	Volume 4A Section 2.7	
11.	If reuse of material is involved, provide an engineering assessment in accordance with CSA Z662 that indicates its suitability for the intended service.	Volume 4A, Section 2.7	--
A.1.3 Onshore Pipeline Regulations			
1.	Designs, specifications programs, manuals, procedures, measures or plans for which no standard is set out in the OPR or PPR.	--	Existing standards will be followed
2.	A quality assurance program if project non-routine or incorporates unique challenges due to geographical location.	--	No unique challenges
3.	If welding performed on a liquid-filled pipeline that has a carbon equivalent of 0.50% or greater and is a permanent installation: • Welding specifications and procedures • Results of procedure qualification tests	--	Welding on liquid filled pipe will not be conducted

GUIDE A – A.2 ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

The following table identifies where information requested in the National Energy Board (NEB) Filing Manual Guide A – A.2 Environmental and Socio-economic Assessment checklist may be found in the various volumes of the Application for the Trans Mountain Expansion Project.

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
A.2.5 Description of the Environmental and Socio-Economic Setting				
1.	Identify and describe the current biophysical and socio-economic setting of each element (*i.e.*, baseline information) in the area where the project is to be carried out.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
2.	Describe which biophysical or socio-economic elements in the study area are of ecological, economic, or human importance and require more detailed analysis taking into account the results of consultation (see Table A-1 for examples). Where circumstances require more detailed information in an ESA see: i. Table A-2 – Filing Requirements for Biophysical Elements; or ii. Table A-3 – Filing Requirements for Socio-economic Elements.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
3.	Provide supporting evidence (*e.g.*, references to scientific literature, field studies, local and traditional knowledge, previous environmental assessment and monitoring reports) for: • information and data collected; • analysis completed; • conclusions reached; and • the extent of professional judgment or experience relied upon in meeting these information requirements, and the rationale for that extent of reliance.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
4.	Describe and substantiate the methods used for any surveys, such as those pertaining to wildlife, fisheries, plants, species at risk or species of special status, soils, heritage resources or traditional land use, and for establishing the baseline setting for the atmospheric and acoustic environment.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
5.	Applicants must consult with other expert federal, provincial or territorial departments and other relevant authorities on requirements for baseline information and methods.	Volume 5A: ESA - Biophysical • Sections 3.0, 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 3.0, 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Sections 3.0 and 4.2 Volume 8B: Technical Reports	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
A.2.6 Effects Assessment				
Identification and Analysis of Effects				
1.	Describe the methods used to predict the effects of the project on the biophysical and socio-economic elements, and the effects of the environment on the project (*i.e.*, changes to the Project caused by the environment).	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.5 and 5.6	---
2.	Predict the effects associated with the proposed project, including those that could be caused by construction, operations, decommissioning or abandonment, as well as accidents and malfunctions. Also include effects the environment could have on the project. For those biophysical and socio-economic elements or their valued components that require further analysis (see Table A-1), provide the detailed information outlined in Tables A-2 and A-3.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.6 and 5.7 Volume 8B: Technical Reports	---
Mitigation Measures for Effects				
1.	Describe the standard and project specific mitigation measures and their adequacy for addressing the project effects, or clearly reference specific sections of company manuals that provide mitigation measures. Ensure that referenced manuals are current and filed with the NEB.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports Volume 6B: Pipeline Environmental Protection Plan (EPP) Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 6E: Environmental Alignment Sheets Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 3.0, 4.0, 6.0, 7.0, and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7 Volume 8B: Technical Reports	---
2.	Ensure that commitments about mitigative measures will be communicated to field staff for implementation through an Environmental Protection Plan.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 6E: Environmental Alignment Sheets Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 3.0, 4.0, 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
3.	Describe plans and measures to address potential effects of accidents and malfunctions during construction and operation of the project.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 4.0, 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7	---
Evaluation of Significance				
1.	After taking into account any appropriate mitigation measures, identify any remaining residual effects from the project.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
2.	Describe the methods and criteria used to determine the significance of remaining adverse effects, including defining the point at which any particular effect on a valued component is considered "significant".	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
3.	Evaluate significance of residual adverse environmental and socio-economic effects against the defined criteria.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
4.	Evaluate the likelihood of significant, residual adverse environmental and socio-economic effects occurring and substantiate the conclusions made.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
A.2.7 Cumulative Effects Assessment				
Scoping and Analysis of Cumulative Effects				
1.	Identify the valued components for which residual effects are predicted, and describe and justify the methods used to predict any residual results.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
2.	For each valued component where residual effects have been identified, describe and justify the spatial and temporal boundaries used to assess the potential cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
3.	Identify other physical works or activities that have been or will be carried out within the identified spatial and temporal boundaries for the cumulative effects assessment.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
4.	Identify whether the effects of those physical works or activities that have been or will be carried out would be likely to produce effects on the valued components within the identified spatial and temporal boundaries.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
5.	Where other physical works or activities may affect the valued components for which residual effects from the applicant's proposed project are predicted, continue the cumulative effects assessment, as follows: • consider the various components, phases and activities associated with the applicant's project that could interact with other physical work or activities; • provide a description of the extent of the cumulative effects on valued components; and • where professional knowledge or experience is cited, explain the extent to which professional knowledge or experience was relied upon and justify how the resulting conclusions or decisions were reached.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
Mitigation Measures for Cumulative Effects				
1.	Describe the general and specific mitigation measures, beyond project-specific mitigation already considered, that are technically and economically feasible to address any cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
Applicant's Evaluation of Significance of Cumulative Effects				
1.	After taking into account any appropriate mitigation measures for cumulative effects, identify any remaining residual cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
2.	Describe the methods and criteria used to determine the significance of remaining adverse cumulative effects, including defining the point at which each identified cumulative effect on a valued component is considered "significant".	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
3.	Evaluate the significance of adverse residual cumulative effects against the defined criteria.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
4.	Evaluate the likelihood of significant, residual adverse cumulative environmental and socio-economic effects occurring and substantiate the conclusions made.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
A.2.8 Inspection, Monitoring and Follow-up				
1.	Describe inspection plans to ensure compliance with biophysical and socio-economic commitments, consistent with Sections 48, 53 and 54 of the *NEB Onshore Pipeline Regulations (OPR)*.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP	Volume 8A: Marine Transportation • Section 4.3	---
2.	Describe the surveillance and monitoring program for the protection of the pipeline, the public and the environment, as required by Section 39 of the *NEB OPR*.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP	Volume 8A: Marine Transportation • Section 4.3	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
3.	Consider any particular elements in the Application that are of greater concern and evaluate the need for a more in-depth monitoring program for those elements.	Volume 5A: ESA - Biophysical • Sections 9.0 and 10.0 Volume 5B: ESA - Socio-Economic • Sections 9.0 and 10.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP (Socio-Economic Management Plan of Appendix C)	Volume 8A: Marine Transportation • Section 4.5	---
4.	For *Canadian Environmental Assessment (CEA) Act, 2012* designated projects, identify which elements and monitoring procedures would constitute follow-up under the *CEA Act, 2012*.	Volume 5A: ESA - Biophysical • Section 10.0 Volume 5B: ESA - Socio-economic • Section 10.0	N/A	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
Table A-1 Circumstances and Interactions Requiring Detailed Biophysical and Socio-Economic Information				
Physical and meteorological environment		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0 and 7.0	N/A	---
Soil and soil productivity		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Soil Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 5.3, 6.0 and 7.0	N/A	---
Water quality and quantity (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Groundwater Technical Report • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Wetland Evaluation Technical Report • Marine Sediment and Water Quality – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 7.0 • Quality Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Ecological Risk Assessment of Marine Transportation Spills Technical Report	---
Air emissions (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Marine Air Quality and Greenhouse Gas – Marine Transportation Technical Report • Air Quality and Greenhouse Gas Emissions Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 7.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Air Quality and Greenhouse Gas Emissions	---
Greenhouse gas emissions (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0 and 7.0 Volume 5C: ESA - Biophysical Technical Reports • Air Quality and Greenhouse Gas Emissions Technical Report	Volume 8A: Marine Transportation • Sections 4.2 and 4.3 Volume 8B: Technical Reports • Marine Air Quality and Greenhouse Gas Emissions	---
Acoustic environment (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0, and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Acoustic Environment Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3 and 4.4 Volume 8B: Technical Reports • Marine Noise (Atmospheric)	---
Fish and fish habitat (onshore and marine), including any fish habitat compensation required		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Marine Resources - Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Ecological Risk Assessment of Westridge Marine Terminal Spills	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
Wetlands		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Wetland Evaluation Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	N/A	---
Vegetation		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Vegetation Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	N/A	---
Wildlife and wildlife habitat (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Wildlife and Wildlife Habitat Technical Report • Wildlife Modeling and Species Accounts Report • Marine Resources –Westridge Marine Terminal Technical Report • Marine Birds – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2. 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Marine Birds – Marine Transportation Technical Report • Ecological Risk Assessment of Westridge Marine Terminal Spills	---
Species at Risk or Species of Special Status and related habitat (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Vegetation Technical Report • Wildlife and Wildlife Habitat Technical Report • Wildlife Modeling and Species Accounts Report • Marine Resources –Westridge Marine Terminal Technical Report • Marine Birds – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2. 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Marine Birds – Marine Transportation Technical Report • Marine Transportation Spills Ecological Risk Assessment Technical Report	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
Human occupancy and resource use (onshore and marine)		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Managed Forest Areas Technical Report • Agricultural Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report	---
Heritage resources		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0 and 7.0 Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 6.3.3	N/A	---
Navigation and navigation safety		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0 and 7.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report	Volume 8A: Marine Transportation • Section 5.2	---
Traditional land and resource use		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Traditional Land and Resource Use Report • Pipeline and Facilities Human Health Risk Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Traditional Marine Use Report for Marine Transportation • Marine Transportation Human Health Risk Assessment Technical Report	---
Social and cultural well-being		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	N/A	---
Human health and aesthetics		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Community Health Technical Report • Viewshed Modelling Analysis Technical Report • Pipeline and Facilities Human Health Risk Assessment Technical Report Volume 7 Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Qualitative Human Health Risk Assessment of Westridge Marine Terminal Technical Report Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Transportation Human Health Risk Assessment Technical Report • Marine Transportation Spills Human Health Risk Assessment Technical Report	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
	Infrastructure and services	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Community Health Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report	---
	Employment and economy	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Worker Expenditures Analysis Technical Report	N/A	---

GUIDE A – A.3 ECONOMICS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.3.1 Supply			
1.	A description of each commodity.	Volume 2 Section 3.1.1	--
2.	A discussion of all potential supply sources.	Volume 2 Section 3.3.2	--
3.	Forecast of productive capacity over the economic life of the facility.	Volume 2 Sections 3.3.1, 3.4.1	
4.	For pipelines with contracted capacity, a discussion of the contractual arrangements underpinning supply.	Volume 2 Section 3.3.2	--
A.3.2 Transportation Matters			
Pipeline Capacity			
1.	In the case of expansion provide: • Pipeline capacity before and after and size of increment • Justification that size of expansion is appropriate	Volume 2 Sections 1.1, 2.1, 3.5	--
2.	In case of new pipeline, justification that size of expansion is appropriate given available supply.	N/A – expansion	N/A
Throughput			
1.	For pipelines with contracted capacity, information on contractual arrangements.	Volume 2 Section 3.2.1	--
2.	For non-contract carrier pipelines, forecast of annual throughput volumes by commodity type, receipt location and delivery destination over facility life.	N/A	N/A
3.	If project results in an increase in throughput: • theoretical and sustainable capabilities of the existing and proposed facilities versus the forecasted requirements • flow formulae and flow calculations used to determine the capabilities of the proposed facilities and the underlying assumptions and parameters	Volume 2 Section 3.1	--
4.	If more than one type of commodity transported, a discussion pertaining to segregation of commodities including potential contamination issues or cost impacts.	N/A	N/A
A.3.3 Markets			
1.	Provide an analysis of the market in which each commodity is expected to be used or consumed.	Volume 2 Section 3.4.2	--
2.	Provide a discussion of the physical capability of upstream and downstream facilities to accept the incremental volumes that would be received and delivered.	Volume 2 Section 3.4.2	--
A.3.4 Financing			
1.	Evidence that the applicant has the ability to finance the proposed facilities.	Volume 2 Section 3.2.2	--
2.	Estimated toll impact for the first full year that facilities are expected to be in service.	Volume 2 Section 3.2.1	--
3.	Confirmation that shippers have been apprised of the project and toll impact, their concerns and plans to address them.	Volume 2 Section 3.2.1	--
4.	Additional toll details for applications with significant toll impacts.	Volume 2 Section 3.2.1	
A.3.5 Non-NEB Regulatory Approvals			
1.	Confirm that all non-NEB regulatory approvals required to allow the applicant to meet its construction schedule, planned in-service date and to allow the facilities to be used and useful are or will be in place.	Volume 2 Section 1.5	--
2.	If any of the approvals referred to in #1 may be delayed, describe the status of those approval(s) and provide an estimation of when the approval is anticipated.	Volume 2 Section 1.5	--

GUIDE A – A.4 LANDS INFORMATION

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.4.1 Land Areas			
1.	• Width of right-of-way and locations of any changes to width • Locations and dimensions of known temporary work space and drawings of typical dimensions • Locations and dimensions of any new lands for facilities	Volume 2 Section 5.2	--
A.4.2 Land Rights			
1.	The type of lands rights proposed to be acquired for the project.	Volume 2 Section 5.3	--
2.	The relative proportions of land ownership along the route of the project.	Volume 2 Section 5.3.2	--
3.	Any existing land rights that will be required for the project.	Volume 2 Section 5.4	--
A.4.3 Lands Acquisition Process			
1.	The process for acquiring lands.	Volume 2 Section 5.4.1, 5.4.2	--
2.	The timing of acquisition and current status.	Volume 2 Section 5.4.3	--
3.	The status of service of section 87(1) notices.	Volume 2 Section 5.4.4	--
A.4.4 Land Acquisition Agreements			
1.	A sample copy of each form of agreement proposed to be used pursuant to section 86(2) of the NEB Act.	Volume 2 Section 5.4.2	--
2.	A sample copy of any proposed fee simple, work space, access or other land agreement.	Volume 2 Section 5.5.2	--
A.4.5 Section 87 Notices			
1.	A sample copy of the notice proposed to be served on all landowners pursuant to section 87(1) of the NEB Act.	Volume 2 Section 5.4.4, Appendix D	--
2.	Confirmation that all notices include a copy of Pipeline Regulation in Canada: A Guide for Landowners and the Public.	Volume 2 Section 5.4.4	--
A.4.6 Section 58 Application to Address a Complaint			
1.	The details of the complaint and describe how the proposed work will address the complaint.	N/A	N/A

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

***CEA Act, 2012* Requirement**	**Section in *CEA Act, 2012***	**Application Volume and Section**
The environmental effects of the designated project, including:		
the environmental effects of malfunctions or accidents that may occur in connection with the designated project;	s.19.1(a)	Volume 5A ESA - Biophysical: • Section 7.0 Volume 5B ESA - Socio-economic: • Section 7.0 Volume 7 Risk Assessment and Management of Pipeline and Facility Spills Volume 8A Marine Transportation: • Sections 4.3 and 5.0
any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out;	s.19.1(a)	Volume 5A ESA - Biophysical: • Section 8.0 Volume 5B ESA - Socio-economic: • Section 8.0 Volume 8A Marine Transportation: • Section 4.4
the significance of the effects referred to in paragraph (a);	s.19.1(b)	Volume 5A ESA - Biophysical: • Sections 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 7.0 and 8.0 Volume 8A Marine Transportation: • Sections 4.3 and 4.4
comments from the public – or, with respect to a designated project that requires that a certificate be issued in accordance with an order made under section 54 of the *National Energy Board Act*, any interested party – that are received in accordance with this *act*;	s.19.1(c)	Volume 3A Public Consultation Volume 3B Aboriginal Engagement Volume 3C Landowner Relations Volume 5A ESA - Biophysical: • Section 3.0 Volume 5B ESA - Socio-economic: • Section 3.0 Volume 8A Marine Transportation: • Section 3.0
mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project;	s.19.1(d)	Volume 5A ESA - Biophysical: • Sections 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 7.0 and 8.0 Volume 5C ESA – Biophysical Technical Reports Volume 5D ESA - Socio-economic Technical Reports Volume 6B Pipeline Environmental Protection Plan Volume 6C Facilities Environmental Protection Plan Volume 6D Westridge Marine Terminal Environmental Protection Plan Volume 6E Environmental Alignment Sheets Volume 8A Marine Transportation: • Sections 4.3, 4.4 and 5.0 Volume 8B Technical Reports
the requirements of the follow-up program in respect of the designated project;	s.19.1(e)	Volume 5A ESA - Biophysical: • Section 10.0 Volume 5B ESA - Socio-economic: • Section 10.0
the purpose of the designated project;	s.19.1(f)	Volume 5A ESA - Biophysical: • Section 2.0 Volume 5B ESA - Socio-economic: • Section 2.0 Volume 8A Marine Transportation: • Section 1.1

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

***CEA Act, 2012* Requirement**	**Section in *CEA Act, 2012***	**Application Volume and Section**
alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alterative means;	s.19.1(g)	Volume 5A ESA - Biophysical: • Sections 2.0 and 4.0 Volume 5B ESA - Socio-economic: • Sections 2.0 and 4.0 Volume 8A Marine Transportation: • Section 2.2
any change to the designated project that may be caused by the environment;	s.19.1(h)	Volume 5A ESA - Biophysical: • Section 7.10 Volume 8A Marine Transportation: • Section 4.3
the results of any relevant study conducted by a committee established under section 73 or 74; and	s.19.1(i)	N/A
any other matter relevant to the environmental assessment that the responsible authority, or, – if the environmental assessment is referred to a review panel – the Minister, requires to be taken into account.	s.19.1(j)	Volume 8A Marine Transportation Volume 8B Technical Reports Volume 8C TERMPOL Reports These volumes take into consideration the *Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project* (September 10, 2013) (NEB 2013)
The environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge.	s 19.3	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3 and 4.4 Volume 8B Technical Reports
Subsection 5(1) of *CEA Act, 2012* defines environmental effects as a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:		
fish as defined in section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that *Act*;	s.5(1)(a)(i)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
aquatic species as defined in subsection 2(1) of the *Species at Risk Act;*	s.5(1)(a)(ii)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*, and	s.5(1)(a)(iii)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
any other component of the environment that is set out in Schedule 2.	s.5(1)(a)(iv)	N/A
Subsection 5(1) of the *CEA Act, 2012* defines environmental effects as (b) a change that may be caused to the environment that would occur		
on federal lands,	s.5(1)(b)(i)	Volume 5A ESA - Biophysical: • Section 7.0 Volume 5B ESA - Socio-economic: • Section 7.0
in a province other than the one in which the *act* or thing is done or where the physical activity, the designated project or the project is being carried out, or	s.5(1)(b)(ii)	N/A No changes are anticipated in provinces other than Alberta and BC in relation to the ESA.
outside Canada.	s.5(1)(b)(iii)	Volume 8A Marine Transportation: • Sections 4.3, 4.4 and 5.0
Subsection 5(1) of the *CEA Act, 2012* defines environmental effects as (c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on:		

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

***CEA Act, 2012* Requirement**	**Section in *CEA Act, 2012***	**Application Volume and Section**
health and socio-economic conditions;	s.5(1)(c)(i)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.3 and 4.4 Volume 8B Technical Reports
physical and cultural heritage;	s.5(1)(c)(ii)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0 and 7.0
the current use of lands and resources for traditional purposes; or	s.5(1)(c)(iii)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.3 and 4.4 Volume 8B Technical Reports
any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	s.5(1)(c)(iv)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0 and 7.0

FACILITIES ENVIRONMENTAL PROTECTION PLAN FOR THE TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

December 2013

ESA-NEB-TERA-00006C

[redacted]

Prepared for:

TRANSMOUNTAIN

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BACKGROUND

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system).

The TMPL system commenced operations 60 years ago and now transports a range of crude oil and petroleum products from Western Canada to locations in central and southwestern British Columbia (BC), Washington State and offshore. The TMPL system currently supplies much of the crude oil and refined products used in BC. The TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, and Jasper) and BC (Clearwater, Kamloops, Hope, Abbotsford, and Burnaby).

The TMPL system has an operating capacity of approximately 47,690 m^3/d (300,000 bbl/d) using 23 active pump stations and 40 petroleum storage tanks. The expansion will increase the capacity to 141,500 m^3/d (890,000 bbl/d).

The proposed expansion will comprise the following:

- Pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and BC with about 987 km of new buried pipeline.
- New and modified facilities, including pump stations and tanks.
- Three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The expansion has been developed in response to requests for service from Western Canadian oil producers and West Coast refiners for increased pipeline capacity in support of growing oil production and access to growing West Coast and offshore markets. NEB decision RH-001-2012 reinforces market support for the expansion and provides Trans Mountain the necessary economic conditions to proceed with design, consultation, and regulatory applications.

Application is being made pursuant to Section 52 of the *National Energy Board Act* (*NEB Act*) for the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). The NEB will undertake a detailed review and hold a public hearing to determine if it is in the public interest to recommend a Certificate of Public Convenience and Necessity (CPCN) for construction and operation of the Project. Subject to the outcome of the NEB hearing process, Trans Mountain plans to begin construction in 2016 and go into service in 2017.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities and to consult with landowners, regulatory authorities, stakeholders, and the general public. Information on the Project is also available at www.transmountain.com.

The scope of the Project will involve:

- using existing active 610 mm (NPS 24) and 762 mm (NPS 30) OD buried pipeline segments;
- constructing three new 914 mm (NPS 36) OD buried pipeline segments totalling approximately 987 km:
  - Edmonton to Hinton – 339.4 km;
  - Hargreaves to Darfield – 279.4 km;
  - Black Pines to Burnaby – 367.9 km;

- reactivating two 610 mm (NPS 24) OD buried pipeline segments that have been maintained in a deactivated state:
  - Hinton to Hargreaves – 150 km;
  - Darfield to Black Pines – 43 km;
- constructing two, 3.6 km long 762 mm (NPS 30) OD buried delivery lines from Burnaby Terminal to Westridge Marine Terminal (the Westridge delivery lines);
- installing 23 new sending or receiving traps (16 on the Edmonton-Burnaby mainlines), for in-line inspection tools, at nine existing sites and one new site;
- adding 35 new pumping units at 12 locations (*i.e.,* 11 existing and one new pump station site);
- reactivating the existing Niton Pump Station that has been maintained in a deactivated state;
- constructing 20 new tanks located at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by demolition of 2 existing tanks at Edmonton (1) and Burnaby (1), for a net total of 18 tanks to be added to the system; and

Figure B-1 illustrates the regional location of the TMEP and the existing TMPL system in Alberta and BC.

TRANS MOUNTAIN

FIGURE B-1

PROJECT OVERVIEW
ALBERTA AND BRITISH COLUMBIA

TRANS MOUNTAIN
EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: LCC Modified. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2013 Esri

tera ENVIRONMENTAL CONSULTANTS

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.

MAP NUMBER 201312_MAP_TERA_ESA_00503_REV0			PAGE SHEET 1 OF 1
DATE December 2013	TERA REF. 7894		REVISION 0
SCALE 1:2,250,000	PAGE SIZE 11x17		DISCIPLINE ESA
DRAWN AJS	CHECKED TGG		DESIGN TGG

0 25 50 75 100 km

ALL LOCATIONS APPROXIMATE

201312_MAP_TERA_ESA_00503_Rev0.mxd

The Facilities EPP addresses the construction, deactivation, reactivation and upgrades to the pump stations and associated facilities, installation of new terminal tanks and associated infrastructure, the use and improvement of temporary facilities and the acquisition of additional lands for these facilities.

Pump Station Facilities

Pump stations are positioned along the existing TMPL system at 23 locations to maintain pressure and move the product along the line and monitor flow. To accommodate the expansion, the Project will include the construction and operation of new pump stations serving the new pipeline at 10 of the existing pump station sites at Edmonton, Gainford, Wolf, Edson and Hinton in Alberta, and at Rearguard, Blue River, Blackpool, Kamloops and Kingsvale in BC. The addition of one unit to the Sumas Pump Station will be made to support increased volumes to the Puget Sound system. Two new pump stations will also be constructed and operated at a new greenfield site at Black Pines, BC to serve both the existing pipeline and new pipeline.

Pump stations are generally located within a fenced area on approximately 4 hectares (ha) of land and contain the following: pumps and motors housed in a building; an electrical service building; an operator building; an electrical substation; and station piping and valves. Pump stations will be connected to the provincial power grid via new or existing power lines. Trans Mountain or a third party (*e.g.,* AltaLink Management Ltd., BC Hydro and Power Authority [BC Hydro]) will apply to the appropriate provincial regulatory authorities for electrical facilities necessary to connect with the provincial transmission lines. Existing access will be utilized for all pump stations with the exception of Black Pines, which will require construction of a permanent 5 m wide gravelled access road approximately 25 m in length, subject to final site selection and detailed engineering and design.

There will be one new 2,500 HP pumping unit installed on the NPS 24 pipeline heading south along the Puget Sound line from the Sumas Pump Station into Washington State. At the existing Wolf, Alberta and Blue River, BC pump stations will be modified or replaced and connected to the new pipeline, and pumps at the existing Jasper Pump Station, Alberta will be relocated from the TMX Anchor Loop pipeline to serve the TMPL system (currently deactivated). Valves, controls and other instruments will also be installed as part of the pump station modifications.

As an outcome of the TMEP, the Niton Pump Station will be reactivated (currently deactivated) to serve the existing pipeline and the existing pump stations at Wolf and Blue River will be deactivated, since they will no longer be required for the existing TMPL system. The infrastructure that is currently in place at deactivated pump stations will remain onsite should there be the need to reactivate any of the stations at some point in the future. The existing electrical service building and variable frequency drive building will, however, serve the new pump stations at Wolf and Blue River. The deactivated stations will be disconnected from the existing TMPL system and purged with nitrogen. All associated reactivation and deactivation activities will be conducted within the current fenced areas and no new disturbance will be required (see Table 2.3-2).

Although no changes to pumping capacity are anticipated at the Darfield Pump Station, valve modifications and installation of a new scraper trap (sending and receiving) are planned.

No work is planned at the following pump stations: Stony Plain and Chip, Alberta; and Albreda, Chappel, Finn, McMurphy, Stump, Hope, Wahleach and Port Kells, BC.

A summary of the location, components, present land use, land requirements and ancillary facilities (including scraper traps) at each pump station is provided in Table 2.1-3. Pump station schematics are provided in Volume 4A.

The location, components, present land use, land requirements and ancillary facilities (including sending and receiving traps) of each pump station are summarized in Table B-1 below.

TABLE B-1

TECHNICAL DETAILS – PUMP STATION ACTIVITIES

Pump Station and Location	Activities	Land Use and Land Requirements	Nearest Residence/Receptor from Facility Fence Line
Edmonton • RK 0.0 • SW 5-53-23 W4M	• new pump station[1] consisting of four electrically driven 5,000 HP pumps plus one spare[2] added to serve TMEP • scraper facilities (sending) on TMEP • upgrades to existing substation • a new power line (to be determined by provincial regulatory authority)[3] • fencing	industrial/within existing Trans Mountain-owned lands	• 1.9 km northwest and southeast
Gainford • RK 117.5 • NE 13-53-6 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps to serve TMEP • a new substation • fencing	industrial and forested (clearing required)/within existing Trans Mountain-owned lands	• 140 m east
Niton • RK 191.4 • SW 34-53-13 W5M	• reactivate two existing 2,000 HP pumps to serve TMPL	industrial/within existing Trans Mountain-owned lands	• 1 km southwest
Wolf • RK 206.2 • NW 19-53-14 W5M	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • existing pump building will be deactivated • fencing	industrial/within existing Trans Mountain-owned lands	• 600 m west-southwest
Edson • RK 247.1 • SW 18-53-18 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • new scraper facilities (sending and receiving) on TMEP • replace existing substation • a new power line (to be determined by provincial regulatory authority)[3] • fencing and onsite gravel road	industrial/within existing Trans Mountain-owned lands	• 360 m west
Hinton • RK 339.4 • NW 33-49-26 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • reconfigure existing scraper trap • fencing	industrial/will require acquisition of approximately 0.32 ha (35 m x 90 m) new land outside existing Trans Mountain-owned lands to the west	• 820 m southwest
Jasper • NW 2-46-1 W6M	• relocate two existing 2,500 HP pumps from the TMX Anchor Loop pipeline to TMPL (currently deactivated) • drag resistant agent injection facility requiring small storage tank (with secondary containment) and a high pressure injection pump	industrial/within Crown lands currently leased by Trans Mountain	• 1.3 km southeast
Rearguard • RK 498.3 • d-068-K/083-D-14	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • upgrades to existing substation • remove scraper facilities (sending and receiving) from Hargreaves • fencing and onsite gravel road	industrial and disturbed forested (clearing required)/will require acquisition of approximately 0.7 ha (70 m x 100 m) new land outside existing Trans Mountain-owned lands to the east	• none within 2 km
Blue River • RK 614.7 • a-035-F/083-D-03	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • existing pump building will be deactivated.	industrial/within existing Trans Mountain-owned lands	• 30 m east and south
Blackpool • RK 736.8 • c-073-B/092-P-09	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • upgrade existing transformer • fencing and onsite gravel road	industrial/within existing Trans Mountain-owned lands	• 150 m north-northwest

TABLE B-1 Cont'd

Pump Station and Location	Activities	Land Use and Land Requirements	Nearest Residence/Receptor from Facility Fence Line
Darfield • RK 769 • d-075-B/092-P-08	• new scraper facilities (sending and receiving) on TMEP • fencing	industrial and agricultural/will require acquisition of approximately 0.07 ha (23 m x 30 m) new land outside existing Trans Mountain-owned lands extending from the northwest corner of the property line	• 150 m south
Black Pines • RK 811.8 • d-041-K/092-I-16	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • new pump station[1] consisting of two electrically driven 2,500 HP pumps serving TMPL • new substation to serve both lines • new scraper facilities (sending and receiving) on TMPL and TMEP • new access road approximately 5 m x 25 m • new 138 kV power line approximately 50 m x 2.2 km[3] • fencing and onsite gravel road	forested (clearing required)/requires acquisition of approximately 150 m x 150 m (2.3 ha) of privately-owned land	• 600 m south
Kamloops • RK 850.8 • d-094-E/092-I-09	• new pump station[1] consisting of three electrically driven 5,000 HP pumps plus one spare[2] added to TMEP • replace existing substation • new substation to serve TMEP • new scraper facilities (sending and receiving) on TMEP	industrial with grading required/within existing Trans Mountain-owned lands	• 520 m southeast
Kingsvale • RK 955.6 • b-023-L/092-H-15	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • replace existing substation • new 138 kV power line approximately 50 m by 23.5 km[3] • fencing	forested (clearing and grading required)/within existing Trans Mountain-owned lands	• 300 m southwest
Sumas • RK 1113.8 • c-073-B/092-G-01	• one electrically driven 2,500 HP pump serving the Puget Sound line • upgrade existing substation	industrial/within existing Trans Mountain-owned lands	• 110 m southwest

Notes: 1 Pump stations may require the installation of an electrical services building, pump building and operator building, as well as motors, instrumentation, station piping and valves. Existing electrical service buildings and operator buildings will be used where possible.

2 Spare pumps will remain inactive during normal operations.

3 Power line routing and the new access road will be confirmed during the detailed engineering and design phase.

Temporary Facilities

Temporary Access Roads and Shoo-flies

Existing infrastructure will be used, where practical, to access during construction. Access to the new pipeline construction right-of-way, where it is not contiguous with the existing pipeline alignment, will be from existing public and private access points and roads (respecting traffic safety and concern for other users), controlled existing access, rights-of-way of others (*e.g.,* Canadian National Railway Company [CN], Telus, Spectra), and existing shoo-flies and trails. Only approved access will be used.

Where sufficient existing access is not sufficient or available, access may be improved along existing trails, as necessary, during construction by widening, re-grading or other means. Former access trails may also be reactivated and existing rights-of-way of others may be used to reduce disturbance.

Where new temporary access is required, all applicable authorizations and approvals will be sought on private and public lands, including parks and protected areas. Temporary access roads and shoo-flies will typically be 5 m wide to accommodate equipment and machinery.

Temporary Facility Sites

In addition to the pipeline easement and associated temporary workspace, land will be required for temporary sites, including:

- staging and stockpile sites;
- equipment storage sites;
- construction office sites;
- construction work camps (likely one in Alberta and two in BC);
- trenchless crossing work areas;
- borrow pits; and
- log decks.

Where required, temporary facilities will be located within previously disturbed areas to reduce overall Project disturbance. All temporary facility sites will be reviewed from an environmental perspective prior to their use.

Sewage and grey water will be treated in a temporary treatment facility, onsite at each facility and hauled to regional facilities for disposal. If permitted, potable water at the facilities will be drawn from adjacent sources, such as the Athabasca, Fraser, North Thompson, Coldwater and Coquihalla rivers, at rates acceptable to the appropriate regulatory authorities and filtered before use. Otherwise, potable water will be trucked in to each work camp site.

Tank Facilities

To serve the expanded pipeline, a total of 20 new storage tanks will be constructed: 5 at the Edmonton Terminal, 1 at the Sumas Terminal and 14 at the Burnaby Terminal. The new welded steel tanks will be similar in structure to the existing tanks at the terminals and installed on stable, engineered foundations within a bermed containment area.

After the site has been rough graded, foundations for each tank will be constructed. Foundation design parameters may vary across terminals based on the results of detailed geotechnical surveys. Leak-detection systems consisting of a passive-weeping channel between the liner and tank floor will be installed. An internal tank liner, covering the bottom and about 1 m up the shell, will be provided for corrosion prevention. Cathodic protection will be installed on all new tanks as an added measure to protect against corrosion. Tank control systems will include a radar gauging system for high and low level monitoring and overfill protection. Redundant instrumentation for overfill protection will be provided.

All tanks will have secondary containment consisting of compacted clay or a geo-synthetic liner. Secondary containment will be capable of containing 100% of the working volume of the largest tank plus 10% of the working volume of other tanks that share a common impoundment. The bermed area will be graded to direct all surface water to a runoff containment area, where it can be inspected before release. Surface runoff within these containment areas will be released through manually controlled valves following water quality monitoring. Drainage features will be designed and installed to ensure that no runoff originating off-site will be allowed to enter the proposed development area.

Additional components include valves, metering and provers, pumps and inter-connecting pipes. The existing fire-protection system and stormwater management system will be expanded to accommodate the additional tanks at each site. Final details will be determined during detailed engineering and design phase.

A summary of technical details associated with the proposed storage tanks at the Edmonton, Sumas and Burnaby terminals is provided in Table 2.1-3 of Volume 5A, and Table B-2 of this EPP. Terminal

schematics are provided in Volume 4A. Finalized details regarding terminal design will be determined during detailed engineering and design phase.

TABLE B-2

TECHNICAL DETAILS – STORAGE TANKS AND ASSOCIATED FACILITIES AT THE EDMONTON, SUMAS AND BURNABY TERMINALS

Technical Details	Edmonton Terminal	Sumas Terminal	Burnaby Terminal
Location	• RK 0 • SW 5-53-23 W4M	• RK 1117.5 • a-097-B/092-G-01	• RK 1179.8 • a-025-D/092-G-07
Nearest Residence/Receptor from Facility Fence Line	• 1.9 km northwest and southeast	• 60 m south	• approximately 50 m south
Product	diluted bitumen, synthetic bitumen, diluted synthetic bitumen, light crude and synthetic crude		
Existing Storage Tank Capacity	• 19 tanks with an approximate capacity of 429,270 m^3 (2.7 Mbbl)[1]	• 6 storage tanks with an approximate capacity of 113,830 m^3 (716,000 bbl)	• 13 tanks with an approximate capacity of 270, 280 m^3 (1.7 Mbbl)
New Storage Tank Capacity	• 2 x 34,980 m^3 (220,000 bbl) • 2 x 63,600 m^3 (400,000 bbl) • 1 x 11,920 m^3 (75,000 bbl)	• 1 x 27,820 m^3 (175,000 bbl)	• 1 x 39,750 m^3 (250,000 bbl) • 11 x 45,310 m^3 (285,000 bbl) • 2 x 45,310 m^3 (335,000 bbl)
Maximum Tank Height	21.3 m	17.1 m	18.3 m
Roof Type	external floating roof	fixed steel roof with internal floating roof	
Overall Site Area	47.2 ha	43.3 ha (only 11.6 ha currently disturbed)	76.7 ha
Total Containment Capacity	will allow for 110% of the capacity of the largest tank and stormwater		
Runoff Containment Area Size/Capacity	1-in-100-year storm event with a 24 hour duration period		
Pump Sizes	Seven 800 HP booster pumps (electric drive)	None	Eight 500 HP booster pumps (electric drive)
Test Water Source	from existing storage ponds filled with water diverted from nearby creeks (subject to existing or future permit approval conditions) and/or purchased from the municipal water supply		
Land Requirements	within existing Trans Mountain fence line on previously disturbed industrial lands	within the existing Trans Mountain property boundary, however, existing fence line will be moved approximately 20 m north (20 m x 350 m [0.7 ha] of new disturbance) to accommodate a new access road and earthworks for modifications to the tank secondary containment berm	within existing Trans Mountain fence line on previously disturbed industrial lands, however, disturbance to natural watercourses within the existing site boundaries will result in the loss of riparian vegetation as well as a change in natural-surface flow patterns
Associated Infrastructure	onsite access roads to each new tank, power requirements/upgrades	onsite access road to the new tank, power requirements/upgrades are not required due to small increase in load at this facility	onsite access roads to each new tank and other associated facilities, power requirements/upgrades will be determined by BC Hydro (anticipated that approximately 5 MW of additional power will be required)
Other Activities	an existing 12,720 m^3 (80,000 bbl) tank will be dismantled and replaced by the new 11,920 m^3 (75,000 bbl) tank	to make space available for the new tank, a power line will be relocated approximately 20 m to the north and an existing containment berm will be dismantled and the area graded to support the foundation for the new tank. A new containment berm will be constructed before the new tank is put into operation	new scraper facilities for new line (receiving) and Westridge delivery lines (sending), and an existing 12,720 m^3 (80,000 bbl) tank will be dismantled and replaced by one of the 45,310 m^3 (285,000 bbl) tanks

Note: 1 Trans Mountain is currently in the process of constructing the Edmonton Terminal Expansion Project, which involves constructing 10 new tanks and associated facilities at the Edmonton Terminal. This project was approved by the NEB in March 2008 and is now being constructed under Amending Order AO-005-XO-T246-04-2008. In February 2013, Trans Mountain applied to the NEB to vary Amending Order AO-005-XO-T246-04-2008 to permit construction of four additional tanks at the Edmonton Terminal for a total of 14 tanks. The NEB issued an Amending Order AO-006-XO-T246-04-2008 on June 20, 2013 and the four additional tanks are expected to come into service by late 2014. Furthermore, in July 2013 Trans Mountain applied to the NEB (File OF-Fac-Oil-T260-2013-04 01) to construct an additional two tanks at the Edmonton Terminal. Pending regulatory approval, the two tanks are expected to come into service by late 2014 or early 2015.

ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Full Name
AENV	Alberta Environment
AESRD	Alberta Environment and Sustainable Resource Development
ATV	All terrain vehicle
bbls	barrels
BC	British Columbia
BC MOE	British Columbia Ministry of Environment
BC OGC	British Columbia Oil and Gas Commission
CCME	Canadian Council of Ministers of the Environment
CPCN	Certificate of Public Convenience and Necessity, subject to approval of the Governor in Council and issued by the NEB, permits the construction and operation of a pipeline.
COP	Code of Practice
DFO	Fisheries and Oceans Canada
EHS	KMC's Environment, Health and Safety Management System, as adopted by Trans Mountain for the TMEP.
EPP	Environmental Protection Plan
ESA	Environmental and Socio-Economic Assessment
GHG	greenhouse gas
HP	Horsepower
HSE	Health, Safety and Environment
KMC	Kinder Morgan Canada Inc.
LFH	leaf, fermentation and humus
m^3	cubic metres
Mbbl	thousand barrels
NEB	National Energy Board
NPS	Nominal Pipe Size
OD	outside diameter
PCEM	Post-Construction Environmental Monitoring
Project	Trans Mountain Expansion Project
RAP	restricted activity period
RK	Reference Kilometre Post
SARA	*Species at Risk Act*
TERA	TERA Environmental Consultants
TMEP	Trans Mountain Expansion Project
Trans Mountain	Trans Mountain Pipeline ULC
TWS	temporary workspace
WHMIS	Workplace Hazardous Materials Information System

GLOSSARY

Term	Definition
air quality	A measure of the chemical pollutant loading in the atmosphere. As a measure or metric, it is generally related to human health endpoints, odour thresholds or environmental effects that are developed and regulated by municipal, provincial or federal regulatory authorities. Ambient air quality objectives or standards have been developed to reflect the more stringent effect and measured or predicted levels are commonly compared to these values as a gauge of compliance as well as the degree of quality of the air.
appropriate regulatory authority	The regulator(s) that will be consulted prior to and during construction regarding approvals, notifications, constraints and the direction of activities.
borrow material	Imported, non-native soil, aggregate or consolidated materials that are used during pipeline construction.
development zone	The non-vegetated, gravel padded or paved area located within the boundaries of a facility footprint.
Construction Right-of-Way	Right-of-way area comprised of temporary workspace and the permanent easement that is disturbed during construction. Consists of four newly constructed 914 mm OD (NPS 36) pipeline segments from Edmonton to Hinton, Alberta, Hargreaves to Darfield, BC, Black Pines to Hope, BC, and Hope to Burnaby, BC, and one (1) newly constructed pipeline segment containing two pipelines at 762 mm OD (NPS 30) from Burnaby to Westridge
Development Zone	The area located within the facility footprint where facility infrastructure is located.
droughty soils	Soils with low plant available soil moisture due to light texture or high soil moisture diffusivity that contributes to low sod strength, high soil pulverization and erosion potential.
Environment, Health and Safety Policy	KMC's EHS Management System which has been adopted by Trans Mountain. This is the formalization of Trans Mountain's commitment to conduct business in a safe and environmentally responsible manner supported through a series of commitments.
Environmental Education Program	A training system that identifies regulations, legislation, and valuable environmental components that might be encountered throughout TMEP activities. The recommendations of the valuable environmental components are discussed, as well as public relations and communication with regards to TMEP activities and the surrounding environment.
feasible	Capable of being reasonably accomplished or brought about, given environmental and economic consideration.
Forest Districts	Sub regions or forest land governed by the BC Ministry of Forests, Lands and Natural Resource Operations.
Horizontal Directional Drill	A trenchless crossing method allowing for guided installation of a pipeline along a prescribed bore path by using a surface-launched drilling rig having minimal effect on the surrounding area. Commonly used for watercourse or dense infrastructure crossing.
hydrostatic testing	The use of water for pressure testing a pipeline to a pressure of at least 25% greater than the planned operating pressure in order to expose potential defects or leaks and ensure integrity.
Kinder Morgan Canada Inc.	Kinder Morgan Canada Inc. (KMC) is a corporation owned by Kinder Morgan Energy Partners. KMC operates Trans Mountain Pipeline L.P., a general partner of Trans Mountain Pipeline ULC (Trans Mountain)
Lower Mainland Region	Geographic area located approximately west of Hope, BC to Vancouver, BC
merchantable timber	Timber that will be sold to a timber processor.
Mitigation measures	Measures for the elimination, reduction or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.
National Energy Board	An independent federal agency established in 1959 by the Parliament of Canada to regulate international and interprovincial pipelines and associated facilities.
Noxious weeds	A plant designated in accordance with the regulations as a Noxious weed and includes the plant's seeds; A person shall control a Noxious weed that is on land the person owns or occupies (*Weed Control Act*).
practical	Capable of or suitable to being put into effect, given economic and environmental considerations.
Pit Development Plan	A plan that specifies the site preparation, excavation and environmental protection measures that would be implemented when developing a new borrow site or extracting material (*e.g.,* gravel, sand) from an existing borrow site.
Prime Contractor	Main company contracted for the coordination, supervision and completion of the Trans Mountain Expansion Project.
Prohibited Noxious weeds	A plant designated in accordance with the regulations as a Prohibited Noxious weed and includes the plant's seeds; A person shall destroy a Prohibited Noxious weed that is on land the person owns or occupies (*Weed Control Act*).
right-of-way	A legally defined strip of land with defined boundaries in which the pipeline runs through properties owned by others.
root zone material	LFH and organic material enriched mineral surface soil developed under forest vegetation.
salvageable timber	Merchantable timber without a market or non-merchantable timber salvaged for use during and after pipeline construction.
shoo-flies	Vehicle and equipment access to the construction right-of-way from each side of a watercourse crossing where vehicle and equipment crossing of the watercourse on the right-of-way is not practical.
topsoil	Organic material enriched mineral surface soil developed under grass or grass and shrub/tree vegetation.
warranted	Justify or necessitate a course of action.

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1.0 INTRODUCTION

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system).

The TMPL system commenced operations 60 years ago and now transports a range of crude oil and petroleum products from Western Canada to locations in central and southwestern British Columbia (BC), Washington State and offshore. The TMPL system currently supplies much of the crude oil and refined products used in BC. The TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, and Jasper) and BC (Clearwater, Kamloops, Hope, Abbotsford, and Burnaby).

The TMPL system has an operating capacity of approximately 47,690 m^3/d (300,000 bbl/d) using 23 active pump stations and 40 petroleum storage tanks. The expansion will increase the capacity to 141,500 m^3/d (890,000 bbl/d).

The proposed expansion will comprise the following:

- Pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and BC with about 987 km of new buried pipeline.
- New and modified facilities, including pump stations and tanks.
- Three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The expansion has been developed in response to requests for service from Western Canadian oil producers and West Coast refiners for increased pipeline capacity in support of growing oil production and access to growing West Coast and offshore markets. NEB decision RH-001-2012 reinforces market support for the expansion and provides Trans Mountain the necessary economic conditions to proceed with design, consultation, and regulatory applications.

Application is being made pursuant to Section 52 of the *National Energy Board Act* (*NEB Act*) for the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). The NEB will undertake a detailed review and hold a public hearing to determine if it is in the public interest to recommend a Certificate of Public Convenience and Necessity (CPCN) for construction and operation of the Project. Subject to the outcome of the NEB hearing process, Trans Mountain plans to begin facility construction in 2016 and go into service in 2017.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities and to consult with landowners, regulatory authorities, stakeholders, and the general public. Information on the Project is also available at www.transmountain.com.

The scope of the Project will involve:

- using existing active 610 mm (NPS 24) and 762 mm (NPS 30) OD buried pipeline segments;
- constructing three new 914 mm (NPS 36) OD buried pipeline segments totalling approximately 987 km:
  - Edmonton to Hinton – 339.4 km;
  - Hargreaves to Darfield – 279.4 km;
  - Black Pines to Burnaby – 367.9 km;

- reactivating two 610 mm (NPS 24) OD buried pipeline segments that have been maintained in a deactivated state:
  - Hinton to Hargreaves – 150 km;
  - Darfield to Black Pines – 43 km;
- constructing two, 3.6 km long 762 mm (NPS 30) OD buried delivery lines from Burnaby Terminal to Westridge Marine Terminal (the Westridge delivery lines);
- installing 23 new sending or receiving traps (16 on the Edmonton-Burnaby mainlines), for in-line inspection tools, at nine existing sites and one new site;
- adding 35 new pumping units at 12 locations (*i.e.,* 11 existing and one new pump station site);
- reactivating the existing Niton Pump Station that has been maintained in a deactivated state;
- constructing 20 new tanks located at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by demolition of 2 existing tanks at Edmonton (1) and Burnaby (1), for a net total of 18 tanks to be added to the system.

The Facilities EPP is based on:

- KMC's Environment, Health and Safety Policy (KMC 2012), which has been adopted by Trans Mountain;
- the Environmental and Socio-Economic Assessment (ESA) - Volumes 5A and 5B of the Project;
- results of the biophysical and engineering field programs completed to date;
- feedback obtained through engagement;
- Trans Mountain's commitments made in the ESA, to regulatory authorities and to the public;
- industry standard/best management documents (*e.g.,* Environmental Handbook for Pipeline Construction [Alberta Environment {AENV} 1988], Environmental Protection and Management Guide [BC Oil and Gas Commission {OGC} 2013], etc.); and
- professional experience based upon over 30 years of pipeline planning in western Canada.

Trans Mountain expects that a decision to proceed with construction will lead to the development of detailed engineering plans (to be submitted for approval from the NEB) and pre-construction activities, including clearing and infrastructure development up to one year in advance of construction. Facilities construction will occur over two years, during both summer and winter seasons. A summary of the pump stations, season of construction and construction details is provided in Table 1.0-1.

TABLE 1.0-1

PROPOSED FACILITIES CONSTRUCTION SCHEDULE

Facility[1]	2015	2016				2017			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Edmonton Terminal									
Edmonton Pump Station									
Gainford Pump Station									
Wolf Pump Station									
Edson Pump Station									
Hinton Pump Station									
Jasper Pump Station									
Rearguard Pump Station									
Blue River Pump Station									
Blackpool Pump Station[2]									
Black Pines Pump Station[2]									
Kamloops Pump Station									
Kingsvale Pump Station									
Sumas Pump Station									
Sumas Terminal									
Burnaby Terminal									

Notes: 1 Access and clearing activities may start as early as January 2016 at any given location.

2 Activities at Darfield Pump Station (valve modifications and installation of a new scraper trap) will be conducted in conjunction with construction activities at either Blackpool or Black Pines pump stations.

1.1 Purpose

The purpose of the Facilities EPP is to communicate to field personnel in a clear, concise and user friendly format Trans Mountain's environmental procedures and mitigation measures to be implemented during construction of Project facilities to avoid or reduce potential adverse environmental effects.

Specifically, the Facilities EPP:

- identifies potential mitigation measures to be implemented during facility (pump stations, terminal, power line and associated facilities) construction activities;
- provides instructions for carrying out construction activities in a manner that will avoid or reduce adverse environmental effects; and
- serves as reference information for the environmental inspection staff to support decision-making and provides direction to more detailed information (*i.e.,* resource-specific mitigation, management and contingency plans, etc.).

1.2 Roles and Responsibilities for Environmental Compliance

The construction and commissioning of the Project is the responsibility of Trans Mountain's Major Projects Group. The Major Projects Group has been assembled to oversee the design and execution of large expansion projects. The roles and responsibilities of the relevant personnel related to environmental compliance are provided in Figure 1.2-1 and Table 1.2-1. These roles and responsibilities will be updated once construction plans are further developed.

An organization chart for environmental compliance is provided in Figure 1.2-1 while Table 1.2-1 provides a description of environmental roles and responsibilities.

Figure 1.2-1
Preliminary Environmental Compliance Organizational Chart for Each Pump Station and Terminal Facility

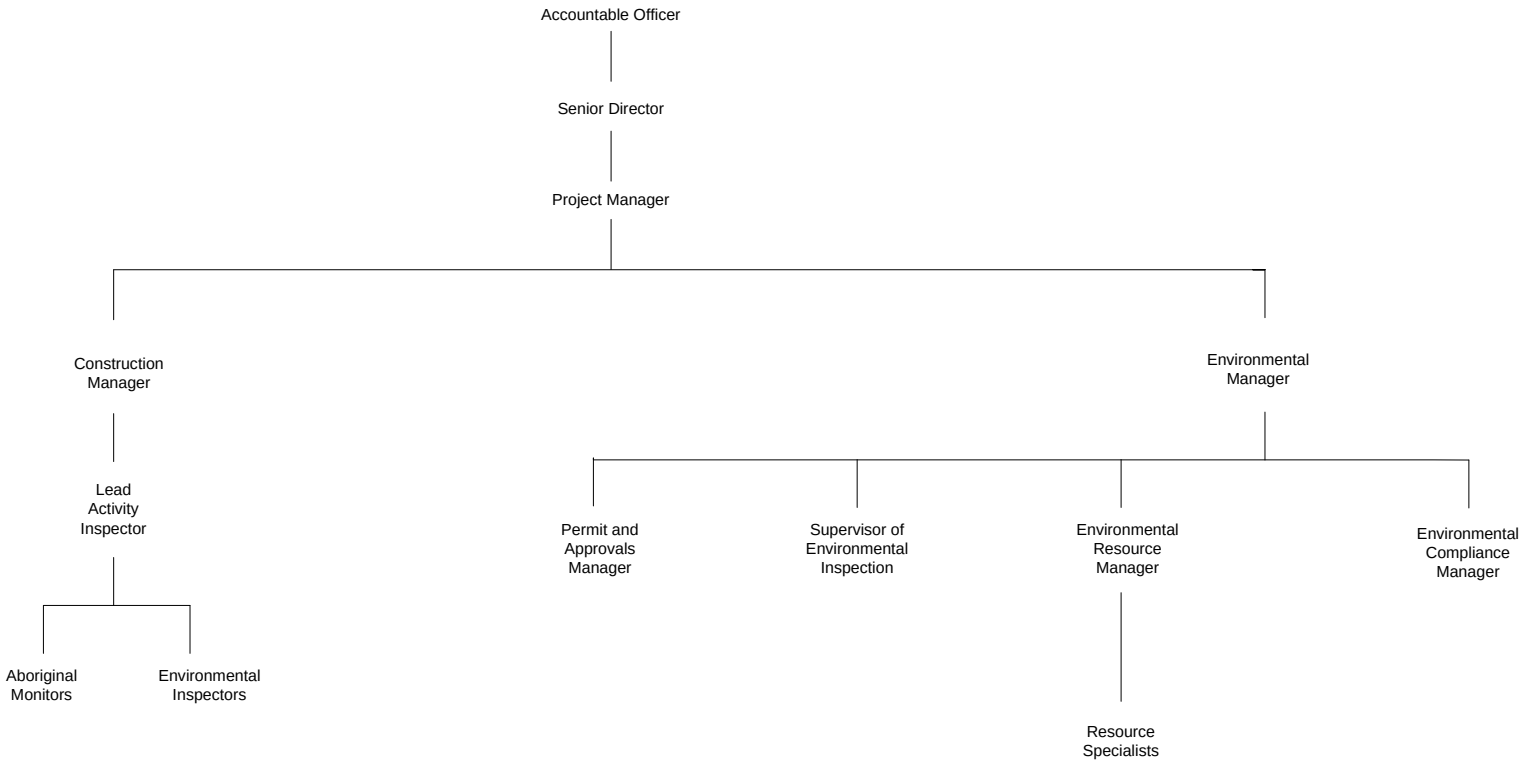

TABLE 1.2-1

ROLES AND RESPONSIBILITIES

Role	Responsibilities
Accountable Officer	• Ensure Trans Mountain has documented polices and goals and continues to be committed to ongoing use of the EHS Management System. • Demonstrate leadership and direction to the environmental program. • Ensure all Trans Mountain and Contractor staff are aware of the Environmental Inspector's environmental responsibilities and receive training appropriate to their roles on the Project. • In coordination with legal services, responsible for the NEB application for 'Leave to Open' prior to putting the TMEP pipeline and facilities into service. • Responsible for ensuring applicable conditions of the NEB CPCN are signed-off.
Senior Director	• Provide leadership and direction to the environmental programs for the Major Projects Group. • Assume ultimate authority for environmental performance for the Major Projects Group. • Ensure there are sufficient, qualified and trained personnel to conduct the Project in an environmentally responsible manner to ensure environmental compliance. • Ensure that NEB CPCN conditions have been met and appropriate environmental authorizations are in place. • Responsible for ensuring suitable environmental programs (Inspection and Compliance) are in place to ensure commitments are met. • Ensure that EPPs, Environmental Alignment Sheets, Environmental Facility Drawings and permits are included in contract bid documents. • Ensure that Contractors have an opportunity to tour environmentally sensitive areas during the bid process. • Ensure environmental compliance audits are implemented and action items for the Project are followed through. • Report on environmental performance to Executives and the Director of EHS. • Ensure Management of Change (MOC) procedures are in place and followed.
Project Manager	• Ensure Contractors understand the EPPS and environmental sensitivities of the Project during contracting process. • Resolve conflicts between construction management and environmental considerations. • Review environmental compliance reports including incident reports and follow-up actions. • Ensure environmental performance and compliance of the Contractors is a topic of discussion at their regularly scheduled meetings. • Ensure environmental responsibilities are integrated in all levels of the Project organization.
Environmental Manager	• Report to the Project Manager on environmental compliance. • Work closely with the Environmental Compliance Manager in implementing of the Environmental Compliance Program and Environmental Compliance Plan to ensure environmental approvals and permits for construction are acquired and environmental commitments are met. • Provide overall environmental coordination and communication for the Project. • Work with Senior Directors and Project Manager to ensure sufficient, qualified and trained personnel are in place to implement the Environmental Compliance Program and Environmental Compliance Plan. • Ensure KMC policies and Environmental Manual that have been adopted by Trans Mountain are available and adhered to. • Review Environmental Inspection reports from the Supervisor of Environmental Inspection to evaluate Project resource needs and compliance issues. • Develop and oversee environmental education program for the Project. • Conduct on-going consultation with regulatory authorities. • Oversee the work of the Environmental Compliance Manager, Permit and Approvals Manager, and Environmental Resource Manager. • Work closely with the Environmental Compliance Manager to evaluate processes to ensure they are working effectively to ensure compliance. • Help to resolve conflicts between construction activities and environmental considerations. • Conduct site visits to ensure inspection and compliance programs are effective. • Assist with training of the Environmental Inspector on communications, reporting requirements and permit conditions. • Review weekly compliance report from the Environmental Compliance Manager.
Environmental Compliance Manager	• Report to the Environmental Manager regarding environmental compliance issues. • Develop, maintain and ensure understanding and implementation of the Environmental Compliance Plan. • Coordinate and facilitate environmental compliance audits. • Develop and maintain the environmental commitment tracking table that will be used to develop an issue tracking list that will be used in the environmental as-built report. • Accompany regulatory authority representatives on field reviews/inspections, where warranted. • Provide advice on interpreting of environmental compliance requirements and ensuring compliance with Project specifications and environmental permits. • Use the MOC procedures to approve or deny requests for environmental changes generated in the field. • Receive environmental non-compliance reports and relay information and response actions to internal parties.

TABLE 1.2-1 Cont'd

Role	Responsibilities
Environmental Compliance Manager (cont'd)	• Work with KMC's Emergency Response Line (ERL) to ensure regulatory authority notifications are made in cases of reportable incidents (*e.g.,* releases). • Ensure spill reports are completed. • Communicate and address environmental issues raised by regulatory authorities. • Prepare the weekly compliance report for the Environmental Manager and Supervisor of Environmental Inspection. • Report non-compliances and spills to regulatory authorities.
Permit and Approvals Manager	• Oversee all elements of environment permit acquisition and compliance. • Confirm understanding of permit requirements with regulatory authorities and handle any permit-related issues. • Determine if regulatory approval is necessary for substantial changes to mitigation measures. • Work with construction and engineering teams to determine and gather the information necessary to resolve environmental issues and acquire new permits or permit revisions. • Ensure permit binders are kept up-to-date in field offices.
Environmental Resource Manager	• Coordinate the work of the Resource Specialists to handle specific environmental sensitivities. • Plan environmental specialist participation in the construction program. • Ensure schedule windows for fish and wildlife are met. • Ensure appropriate equipment and materials are onsite to assess compliance with commitments.
Supervisor of Environmental Inspection	• Work with Construction manager to resolve onsite conflicts that may occur from time to time between Contractors, technical Inspectors and Environmental Inspection on environmental issues. • Communicate clearly and on a timely basis with the Environmental Manager and Environmental Compliance Manager regarding major environmental issues including serious non-compliance events. • Coordinate with the Environmental Manager to ensure appropriate environmental resources are onsite. • Provide a daily summary report to the Project Manager, Environmental Manager and Environmental Compliance Manager on Contractor compliance with Project mitigation requirements, permit conditions and environmental specifications on a daily basis.
Lead Activity Inspector	• Ensure the construction right-of-way is marked and flagged, as required, prior to construction progressing through sensitive areas. • Liaise with regulatory authorities to address concerns, maintain positive and effective communications with regulatory authority representatives and facilitate agreement in the field. • Communicate clearly and on a timely basis with the Supervisor of Environmental Inspection regarding major environmental issues and non-compliance events. • Have the authority, in consultation with the Environmental Inspector, to halt construction during specific non-compliance activities that have potential to have adverse effects on the environment. • Communicate with the Environmental Resource Manager on Resource Specialists, as required, for specific activities and environmentally sensitive areas. • Coordinate with the Environmental Compliance Manager, as needed, on interpretation of permits and compliance issues throughout the Project. • Inspect and document Contractor compliance with project mitigation requirements, permit conditions and environmental specifications on a daily basis. • Oversee environmental training activities for the construction spread. At the daily construction meeting, discuss issues or trends noted in the weekly Environmental Compliance Report prepared by the Environmental Compliance Manager.
Environmental Inspector	• Document environmental compliance and environmental activities on a daily basis and maintain a photographic record. • Responsible for environmental issues resolution, field decision making and reporting. • Coordination with the Construction Manager, Lead Activity Inspectors, construction Contractor representatives and Environmental Inspector. • Ensure the Project is constructed in compliance with environmental conditions and requirements contained with the Project Application, environmental specifications, standards and permits through inspection and documentation/photographs. • Have the authority, in consultation with the Lead Activity Inspectors, to halt construction during specific non-compliance activities that have potential to have adverse effects on the environment. • Inform Lead Activity Inspectors daily of the environmental issues in their area. • Work closely with construction Contractor representatives to discuss environmental sensitivities and commitments that must be met. • Assess work areas ahead of construction noting concerns and site-specific issues, site conditions and provide advance notice to the Construction Manager and Lead Activity Inspectors to allow proactive planning of the work to avoid adverse effects. • Enforce compliance with environmental legislation, commitments, approvals and permits. • Keep track of issues not immediately resolved by entering them into the Issues Tracking List. • Provide listed issues to the Contractors to resolve in an agreed timeline before they escalate into a non-compliance.
Aboriginal Monitor	• Work with the Environmental Inspector to provide traditional knowledge to the construction program to ensure protection of the environment. • Discuss upcoming traditional and western science elements with the Environmental Inspector to ensure protection and monitoring. • Monitor mitigation success in protecting the environment.

TABLE 1.2-1 Cont'd

Role	Responsibilities
Environment, Health and Safety Department	• Review environment performance. • Ensure maintenance and implementation of the Trans Mountain Environmental Management System. • Participate in monthly safety and environmental stewardship meetings to facilitate timely discussion of joint environmental issues and expectations. • The KMC Legal Department will commission environmental compliance audits, which will be coordinated by the EHS Department using the services of a third-party consulting firm to provide the Lead Auditor. Ancillary auditors will be provided by KMC.
Construction Manager	• Ensure compliance with company specifications, permit conditions, construction contracts and applicable codes. • Notify Project Manager and Environmental Manager of changes to Project work schedule as defined in the application or permit using the MOC process. • Actively participate with the Environmental Manager and Environmental Compliance Manager to evaluate and improve environmental compliance. • Coordinate with Lead Activity Inspectors on work schedules, environmental sensitivities, environmental resource needs and permit conditions. • Conduct on-going consultation with regulatory authorities. • Read and understand the Environmental Compliance Plan and provide written acknowledgement. • Conduct Project construction meetings to ensure environmental compliance requirements are coordinated in daily activities.
Technical Inspectors	• Understand the environmental commitments associated with construction operations they are tasked with supervising. • Provide support in inspecting for and ensuring compliance with the environmental requirements of their construction activity. • Verify that environmental requirements and requests from the Environmental Inspector are carried out by their assigned crews. • Read and understand the Environmental Compliance Plan and provide written acknowledgement.
Engineering Manager	• Ensure construction plans and modifications to Project activities, schedules and issues are communicated in a timely manner to the appropriate personnel within the environment team by using the Project MOC process. • Ensure compliance with specifications, permit conditions and construction contracts and applicable codes.
Contractor Supervisors and Foreman	• Review and understand the environmental requirements prior to establishment of contracts and during all phases of construction. • Responsible for conducting the Project in an environmentally responsible manner and incorporating all Project environmental requirements into daily construction activities. • Verify all construction personnel attend environmental orientation prior to work on the construction right-of-way. • Attend environmental education sessions designed for onsite supervisors. • Implement EPP mitigation measures during construction. • Respond to Environmental and Lead Activity Inspector requests during construction to ensure compliance with Project environmental requirements. • Ensure work is performed in compliance with company specifications, contract documents, environmental permit/approval conditions, landowner line lists and applicable codes. • Read and understand the Environmental Compliance Plan and provide written acknowledgement.
Resource Specialist	• Confirm if mitigation objectives have been met and provide feedback to Supervisor of Environmental Inspection and Construction Manager. • Provide input to work plans of specific activities such as watercourse crossings, deterring wildlife from work area and soil handling (handling of specific environmental sensitivities). • Provide input in the event of an unanticipated discovery of valued resources such as a cultural resource site that was not previously mapped. • Assist the Environmental Inspector as needed.

1.2.1 Accountability

The Construction Manager - the Construction Manager hired for the Project will be required to have experience in pipeline planning and construction. The Construction Manager will have an understanding of issues which may be encountered during construction and take a preventative approach rather than a reactive approach to environmental issues. The Construction Manager must have a demonstrated positive attitude toward environmental protection and a track record of successful environmental issue resolution.

The Environmental Manager – is responsible for directing the development and implementation of the environmental components of the Project, including the reinforcement of KMC's EHS Management System as adopted by Trans Mountain, Trans Mountain's environmental management objectives and ensuring that environmental commitments are integrated into contract documents and enforced during all

phases of construction. The Environmental Manager will: oversee Trans Mountain's commitment to attain high standards of environmental compliance; acquire necessary environmental permits and maintain regulatory authority contacts; lead periodic audits and inspections; and direct environmental inspection services. Incidents including spills, permit infractions and corrective actions will also be monitored by the Environmental Manager.

The Permit and Approvals Manager - will oversee the acquisition and compliance of necessary environmental permits during all phases of construction. The Permit and Approvals Manager will report to the Environmental Manager, and work with the construction and engineering teams to determine the regulatory approvals, new permits, and/or permit revisions that may be necessary in order to resolve environmental issues, or accommodate substantial changes to the mitigation measure.

The Environmental Compliance Manager - is accountable for ensuring environmental compliance during construction of the Project. All incidents that qualify as being in non-compliance of applicable laws (*e.g.,* spills), commitments made by Trans Mountain and/or specific approval conditions by regulatory authorities, will be reported to the Environmental Compliance Manager. The Environmental Compliance Manager will take necessary steps to rectify the situation through appropriate notification of regulatory authorities, implementation of suitable mitigation measures and record keeping of the circumstances that resulted in the non-compliance, any remedial measures taken and any recommendations for future monitoring.

The Environmental Inspector - is accountable for inspection and monitoring duties that ensure compliance with local, provincial and federal environmental legislation, regulations, compliance with permit/approval conditions and this Facilities EPP. The Environmental Inspector will have the authority to suspend construction activities during specific non-compliance activities that have the potential to have adverse effects on the environment. The Environmental Inspector will establish a cooperative working relationship with the Construction Manager and provide support in the decision to suspend work in conjunction with the Construction Manager. Regular liaison with appropriate regulatory authorities during construction will be the responsibility of the Environmental Inspector.

Responsibilities of the Environmental Inspector will be to ensure that construction activities are conducted in a manner consistent with the Facilities EPP, environmental commitments and applicable legislation and regulations during all phases of construction. The Environmental Inspector will communicate environmental requirements to field construction management regarding how to comply with these commitments and regulations/legislation within the context of construction activities and environmental conditions.

The Environmental Inspector will monitor construction activities and record the implementation of mitigation measures and advise the Lead Activity Inspector of the measures the Contractor is to implement to limit environmental disturbance. The Environmental Inspector will remain apprised of construction activities, including sensitive sites with the applicable Lead Activity Inspector, to ensure that all resource-specific environmental features are clearly marked and construction inspection personnel are aware of onsite issues (*e.g.,* soil conditions, weeds, rare plant communities, etc.). In addition, the Environmental Inspector will visit sensitive sites with the applicable Lead Activity Inspector, Contractor personnel, and Resource Specialists to plan construction activities at these sites and ensure Resource Specialists are present, where and when warranted, and to monitor activities during key construction events/environmental sensitive periods. The Environmental Inspector will have the authority, in consultation with the Lead Activity Inspector, to halt construction activities during specific non-compliance activities that have the potential to have adverse effects on the environment.

To document the environmental inspection process, the Environmental Inspector will generate a daily report that provides a synopsis of the day's activities. The daily reports will record where environmental mitigation measures were successful, recommendations and actions taken on major decisions, including wet conditions shut-down, procedures implemented in the case of unforeseen environmental issues or discoveries, non-compliance and conflicting permit/approval requirements. Unresolved issues or items identified for future follow-up will be documented/recorded. The daily reports will allow pertinent environmental information from the field to be provided to the Project management team at the corporate level to allow for prompt responses by Trans Mountain, when warranted (*e.g.,* non-compliance issues). At

the completion of the Project, the Environmental Inspector will be responsible for or contributing to the completion of an as-built report.

The Lead Activity Inspector – is in charge of all Activity Inspectors and providing them direction and supervision throughout the pipeline construction work. The duties and responsibilities of the Lead Activity Inspector requires knowledge and experience in all phases of pipeline inspection. The Lead Activity Inspector acts as a client representative to monitor compliance with all provisions of various regulatory permits, including personal contact with designated officials from appropriate regulatory authorities. The Lead Activity Inspector will supervise all phases of the field quality control and technical staff assigned to the project to observe adherence to client company's construction contract drawings and specifications. Furthermore, the Lead Activity Inspector will delegate responsibilities and define limits of appropriate regulatory authority to each Activity Inspector. The Lead Activity Inspector will make sure all members of the inspection team know their respective duties.

The Resource Specialists – are responsible to ensure that the mitigation objectives are met. The Resource Specialist will report to the Supervisor of Environmental Inspection, and assist the Environmental Inspector, as requested. The Resource Specialist will provide input to activity work plans that may affect specific resources, or in the event of an unanticipated discovery of a valued resource.

1.2.2 Decision-Making Process

The Environmental Inspector will work with other team members and consider the following criteria when deciding which protection measures and/or procedures to implement during construction of the facilities portion of the Project and, where warranted, implement the MOC process as outlined in Section 3.0:

- site conditions at the time of construction (*e.g.,* slope gradient and aspect, soil texture, frozen/non-frozen surface, etc.);
- weather conditions at the time of construction (*e.g.,* wind, precipitation forecast, air temperature, etc.);
- permit/approval conditions;
- options available as identified in the Facilities EPP;
- equipment and/or materials availability at the time of construction;
- consultation with geotechnical and civil engineers;
- Contractor experience with conducting specific construction techniques;
- inspection staff experience with implementing applicable protection measures and/or procedures; and
- applicable EHS Management System.

1.2.3 Emergency Response Plans

To comply with the systematic Safety Management Program approach as from Section 47 of the *National Energy Board Onshore Pipeline Regulations*, (*NEB OPR*), an Emergency Response Plan (ERP) will be developed and implemented for TMEP construction. The TMEP ERP for construction will be separate from, and complementary to, the Trans Mountain operations ERP and will lay out the guidelines for the development of the prime contractors' detailed Site Specific ERPs. The TMEP ERP for construction will address legislative requirements and be based on recognized industry standards of practice.

The Site-Specific ERPs will address potential construction emergency situations requiring response by TMEP construction resources (as supplied by the prime contractors), Trans Mountain operations resources, or external resources, in keeping with the philosophy of using the most immediately available resources. It is expected that the Site Specific ERPs will address personal injury or health incidents, environmental damage, fires, floods, earthquakes, rock slides, avalanches, sabotage, trespass, and other

emergency situations that may arise in the context of construction. The Site Specific ERPs will consider the contractors' risk assessments (Section 5.1.2 of Volume 4B) completed as part of an employer's duty to ensure that the health and safety of every employee is protected required by section 124 of the *Canada Labour Code.* The Site Specific ERPs will identify emergency response roles and responsibilities and the detailed procedures, including notifications, to be followed in the event of various types of emergencies.

Regular audits will be conducted on the Site Specific ERPs to provide assurance that they will function effectively in case of emergencies.

2.0 ENVIRONMENTAL PROTECTION PLAN ORGANIZATION

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

2.1 Organization

The Facilities EPP identifies the potential mitigation and reclamation measures that may be implemented during detailed design, pre-construction, construction and post-construction activities at all TMEP facilities (excluding the Westridge Marine Terminal) and contingency plans to address potential effects, events or conditions that may arise during construction. In addition, the Facilities EPP outlines environmental inspection and construction inspection roles and responsibilities during and following construction.

The Facilities EPP applies to TMEP facility sites (excluding Westridge Marine Terminal), temporary workspace (TWS), temporary and permanent access roads, borrow sites and power lines. An EPP for the Westridge Marine Terminal is provided under separate cover (see Volume 6D).

Potential environmental mitigation measures are identified under the heading "Potential Mitigation Measures" by "Activity/Concern" in accordance with the progression of construction activities, and are intended to be read in conjunction with the Environmental Facility Drawings. The Environmental Alignment Sheets (provided in Volume 6E of the ESA) and resource-specific mitigation tables for environmental resources and issues, as provided in Appendices E through Q, identify specific locations where mitigation measures are to be implemented for the Project.

The Facilities EPP provides Trans Mountain, it's Contractors and personnel with an understanding of the general environmental and socio-economic background of TMEP facility sites, the extent and limitations of the EPP, information to identify specific or unique mitigation measures to be implemented to address environmental and socio-economic issues associated with TMEP facility sites, and general mitigation measures or industry-accepted standards and procedures that are typically applied during facility construction. These measures are generally provided in accordance with the sequence of construction of a TMEP facility or grouped by TMEP component.

Section 1.0 Introduction outlines the purpose of the Facilities EPP and provides an overview of roles and responsibilities.

Section 2.0 Environmental Protection Plan Organization provides details regarding the layout and general scope and limitations of the Facilities EPP.

Section 3.0 Environmental Compliance provides information pertaining to the tools, processes and documentation to facilitate compliance with all legislation, regulatory approvals, permits, commitments and the specific requirements set forth in the Facilities EPP.

Section 4.0 Notification of Interested Parties provides details regarding specific activities to be followed to ensure all appropriate regulatory authorities, Aboriginal communities, landowners and interested parties are properly notified prior to commencing construction activities at TMEP facilities or, as warranted, during the construction period.

Section 5.0 Environmental Overview provides a brief overview of the environmental setting of the facility sites, unique environmental concerns that require specific and unique mitigation measures, and permits and authorizations that may be necessary prior to commencing facility construction.

Section 6.0 Pre-Construction Activities outlines the potential mitigation measures that may be implemented prior to commencement of facility construction activities. These measures include: delineation of facility sites, access and TWS; identification and marking of environmental resources, underground utilities; and vegetation management of weed infested lands.

Section 7.0 General Facility Construction Mitigation Measures provides an overview of the general measures that may be implemented during facility construction in all phases of work.

Section 8.0 Facility-Specific Construction Mitigation Measures outlines the potential mitigation measures associated with pump stations and tank farms that may be implemented during and

immediately following construction. This section includes: clearing and disposal; topsoil and root zone material handling, grading; hydrostatic testing; and construction clean-up and reclamation.

Section 9.0 Access Roads for Facilities outlines the specific mitigation measures associated with access road construction, drainage and erosion control, access closure and culverts, and construction clean-up that will be implemented during and immediately following construction.

Section 10.0 Borrow Sites outlines the specific mitigation measures associated with borrow pits including site preparation, excavation, dust control and construction clean-up that will be implemented during and immediately following construction.

Section 11.0 Power line Construction outlines the specific mitigation measures associated with power line construction including pole/tower installation, conductor stringing and site clean-up.

Section 12.0 References lists the sources and reference material used to create the mitigation measures and strategies cited in the Facilities EPP.

Appendices to this EPP include:

- Checklist (Appendix A) tracks commitments and approval conditions within the Facilities EPP for construction;
- Contingency Plans (Appendix B) provides measures to mitigate potential environmental effects that are not anticipated to occur during construction activities;
- Management Plans (Appendix C) provides additional description to measures outlined in the EPP that are anticipated to occur during construction activities;
- Contacts (Appendix D) provides the contact information of the appropriate regulatory authorities that will be consulted during planning and construction of the facility sites;
- Resource-Specific Mitigation Tables provide site-specific mitigation for:
  - Terrain Features (Appendix E);
  - Soils (Appendix F);
  - Hydrology (Appendix G);
  - Water Quality (Appendix H);
  - Aquatic Resources (Appendix I);
  - Vegetation (Appendix J);
  - Wetlands (Appendix K);
  - Wildlife and Wildlife Habitat (Appendix L);
  - Heritage Resources (Appendix M);
  - Socio-Economic and Agricultural Use (Appendix N);
  - Air Quality (Appendix O);
  - Noise (Appendix P);
  - Traditional Land Use (Appendix Q);

- Drawings (Appendix R) illustrate and describe general mitigation outlined in the EPP; and

- Details (Appendix S) describes site-specific mitigation to be implemented during Facility construction.

Environmental alignment sheets for the four proposed power lines will be provided in Volume 6E of the ESA prior to construction. Information provided in these appendices is designed to support the specific mitigation measures identified in the Facilities EPP and provide guidance to decision-making processes, should conditions arise that warrant implementation of remedial or contingency measures. Note the resource-specific mitigation provided in these appendices was outlined in the technical reports provided by the respective Resource Specialists.

2.2 Limitations of the Facilities EPP

The Facilities EPP has been prepared to address construction activities during frozen and non-frozen ground conditions. There may also be a need to revise specific measures as a result of ongoing regulatory, Aboriginal or stakeholder engagement, revisions to the scope of the facilities component of the TMEP, as determined through detailed engineering, or to address unforeseen resource-specific conditions that may arise during construction. If this is to occur, Trans Mountain will resolve the issue with the Construction Manager and the Environmental Inspector in consultation with the appropriate regulatory authorities and resource specialists (*e.g.,* wildlife biologist) in accordance with the process outlined in Section 3.0. The resolution and/or revision will be documented and communicated to the appropriate parties.

3.0 ENVIRONMENTAL COMPLIANCE

Introduction

Environmental compliance is facilitated through sharing of information, providing orientations and training, hiring qualified staff, and providing onsite inspection of activities through a proactive and adaptive inspection program. The following measures will be implemented to ensure environmental compliance during facility construction.

Objective

The objective of environmental compliance management is to ensure that:

- plans, programs, procedures and appropriately trained personnel are in place to facilitate construction of Project facilities by implementing industry-accepted standards and procedures suitable for the conditions and in accordance with applicable legislation and approval/permit conditions;
- systems and processes are in place that allow Trans Mountain and its Contractors to access Project environmental information to aid in decision-making at the field level; and
- The Environmental Inspector and Resource Specialists hired for the TMEP are qualified and properly trained.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern		Preparation Measures
EPP and Contract	1.	The Facilities EPP will form part of the contract documents. Should any conflict in contract and EPP requirements arise, the more stringent condition will apply.
EPP and Distribution	2.	Controlled copies of the Facilities EPP and associated environmental documents will be required to be reviewed by key construction and Contractor personnel prior to construction and will be available to all key facilities construction and Contractor staff members during construction.
	3.	The EPP will be a controlled document in accordance with Trans Mountain's document control procedures. A master document register for the EPP will be created that identifies the controlled copy number, ownership of the document, and the current version number. Revisions, if warranted, will be sent to the controlled copy holders (*e.g.,* appropriate regulatory authorities) with instructions on replacement and destruction of previous versions. The EPP will be controlled by section, which will facilitate the insertion and replacement of updated materials.
Environmental Facility Drawings	4.	The Environmental Facility Drawings, which will be appended to updated versions of the Facilities EPP, will provide additional background information regarding environmental requirements and are to be used in conjunction with the Construction Facility Drawings.

Activity/Concern	Preparation Measures
Communication	5. The Environmental Inspector will facilitate the transfer of environmental information and information updates to all identified Trans Mountain field staff and the Contractor in a timely manner. 6. Communication with environmental appropriate regulatory authority representatives should any issues arise will be the responsibility of the Environmental Inspector and the Construction Manager or the Environmental Manager. 7. Keep a complete set of environmental documents for each facility site at Trans Mountain's construction field office. 8. Assign an individual to prepare and deliver environmental orientation presentations to appropriate regulatory authorities and Contractor staff, as directed by the Construction Manager and the Environmental Manager. 9. Facilitate the transfer of environmental information and information updates (*e.g.,* construction schedule changes), as warranted, immediately to landowners, Aboriginal communities and stakeholder groups.
Consequence of Worker Non-Compliance	10. Those who show careless or wanton neglect of the environment or disregard the mitigation measures outlined in the Facilities EPP will be subject to appropriate disciplinary measures including, if appropriate, removal from the work site and/or dismissal.
Approvals, Licenses and Permits	11. Trans Mountain will work with regulatory authorities to determine the necessary approvals, licences and permits needed for a particular facility construction site or associated components prior to the commencement of construction on that facility site. The Contractor, subcontractors and the Environmental Inspector will be provided copies of all approvals, licenses and permits including the most recent updates and revisions, and will comply with all conditions presented to Trans Mountain. Trans Mountain will resolve any inconsistencies between approval/permit conditions and contract documents will be resolved prior to the commencement of construction.
Listed or Sensitive Species	12. Implement the Rare Ecological Community and Rare Plant Population Management Plan (see Appendix C) or the Wildlife Species of Concern Discovery Contingency Plan (see Appendix B) if listed or sensitive species are discovered during future vegetation and wildlife habitat studies conducted at facility sites or along access roads, borrow sites, power line routes and TWS, or during construction of facility sites and associated components. 13. Report sightings of sensitive species or species at risk to the Environmental Inspector and Construction Manager. Implement specific protection measures and report sightings in daily reports. 14. Refer to the environmental resource-specific mitigation tables for vegetation and wildlife and wildlife habitat sensitive resource features provided in Appendices J and L, respectively.
Traditional Land and Resource Use	15. Implement the contingency measures provided in the Traditional Land Use Sites Discovery Contingency Plan (see Appendix B) in the event traditional land use sites not previously identified are found during facility construction. 16. Refer to the environmental resource-specific mitigation tables for Traditional Land Use provided in Appendix Q.

Activity/Concern	Preparation Measures
Pre-Job Meeting	17. Prior to the commencement of construction at each facility, a pre-job meeting will be held with the engineering and environmental staff, the Environmental Inspector and the facility Contractor. Key regulatory authority and Aboriginal representatives will be invited to the pre-job meeting, as required. The objectives of the pre-job meeting are to: • review environmental and socio-economic issues at the site; • review key mitigation measures and contingency plans; • review Trans Mountain's commitments; • review approvals, licenses and permits; • review rules and regulations; • introduce team and define roles and responsibilities; and • address any outstanding concerns.
Environmental Inspector Qualifications	18. Trans Mountain will hire an Environmental Inspector with experience in construction of permanent above ground facilities and/or environmental inspection. The Environmental Inspector will have an understanding of facility construction techniques and take a preventative approach rather than a reactive approach to environmental issues. The Environmental Inspector must have a demonstrated positive attitude toward environmental protection and a track record of successful environmental issue resolution. In addition, the Environmental Inspector will be supported by appropriate Resource Specialists who will have expertise in a particular resource feature associated with the Project (*e.g.,* geotechnical engineer, botanist, wildlife biologist) and be available onsite or via consultation, when warranted.
Environmental Inspector Responsibilities	19. The Environmental Inspector's main responsibility is to ensure that all environmental and socio-economic commitments, undertakings and conditions of permits/approvals are met and that work is completed in compliance with applicable environmental legislation, Trans Mountain's policies, procedures, industry-accepted standards, procedures and specifications, that are current at the time of construction, in the most efficient and effective manner feasible. 20. Prior to the commencement of construction, the Environmental Inspector will review the Contractor's preliminary grade plan to ensure environmental resources (*e.g.,* rare plants, archaeological sites, etc.) will not be compromised as a result of facility site preparation activities. 21. The Environmental Inspector will provide advice regarding decisions or courses of action to deal with unexpected environmental matters (*e.g.,* a decision to shut-down construction due to wet/thawed soils). 22. The Environmental Inspector will follow the Spill Contingency Plan (see Appendix B) in accordance with federal and provincial regulations and legislation to Trans Mountain and advise the Environmental Manager on the clean-up and disposal of the material and any affected soils or vegetation. 23. The Environmental Inspector will prepare, collect, organize and disseminate all environmentally-related information and documentation that arises during construction, and will be responsible for the preparation of daily reports. 24. The Environmental Inspector will liaise with appropriate regulatory authorities and Aboriginal representatives in co-operation with the Construction Manager, assigned Aboriginal Liaisons and the Environmental Manager. 25. The Environmental Inspector will supervise environmental resource staff that may be required to support the Project.

Activity/Concern	Preparation Measures
Environmental Inspector Responsibilities (cont'd)	26. The Environmental Inspector will organize onsite meetings as requested by the Construction Manager and as the need arises, to address resource-specific issues as well as review construction methodologies with the Construction Manager.
Environmental Training and Orientation Program	27. An Environmental Education Program (Level II and III training) will be developed and implemented by the Trans Mountain Environmental Team to ensure that all Trans Mountain staff and Contractors will be informed of the environmental/community relations requirements and sensitivities around the Project prior to arrival on the facility site or associated component sites. Environmental training will include, at a minimum, the following: • the identification of sensitive features and valuable environmental components; • the processes to follow should a sensitive environmental feature be located and/or disturbed during construction; • initial response should a spill of any controlled substance occur; • the expectation that speed limits and signage, flagging and/or fences delineating the environmental features shall be respected at all times; and • the established protocol for wildlife encounters. 28. The Project Environmental Manager will ensure the Environmental Education Program/Environmental Orientation is consistent in all areas with respect to policies, agreements and applicable legislation and regulations. 29. Prior to the commencement of construction on each facility, environmental sessions (as part of the Environmental Education Program) will be held to address various environmental conditions to be dealt with during construction (*e.g.,* frozen/non-frozen soils) in biophysical regions (*e.g.,* parkland, mountainous, urban). 30. Multiple environmental sessions may be required as different Contractor personnel arrive on the facility sites (*e.g.,* earth works, testing). 31. The Lead Activity Inspector and the Environmental Inspector will be hired prior to the commencement of construction with sufficient lead time to enable training and participation in the orientation of other construction staff and in time to allow full review and understanding of the Facilities EPP. 32. The Lead Activity Inspector and the Environmental Inspector will complete a Level II and Level III Environmental Education Program. 33. During Level III training the Environmental Inspector will be briefed by the Project Environmental Manager and/or the Environmental Compliance Manager, as well as environmental consultants, on the environmental processes, decisions and agreements that have taken place to date. 34. The Environmental Inspector will review all Project-related environmental information. 35. Additional training and tailgate meetings will be held on an ongoing basis.
Contractor Supervisory and Inspection Staff Orientation	36. A Level II Environmental Education Program will be delivered to the Contractor senior supervisory and inspection staff by Trans Mountain's Environmental Inspection Team prior to construction.

Activity/Concern	Preparation Measures
Contractor General Staff Orientation	37. An Environmental Orientation will be developed and presented to ensure compliance with Trans Mountain requirements to ensure that all Trans Mountain staff and Contractors and visitors working at or visiting sites will be informed of environmental, socio-economic and community relation requirements and sensitivities regarding the Project prior to arrival on the facility sites or associated components.
Regulatory and Aboriginal Community Representatives	38. Regulatory representatives and Aboriginal community representatives will be invited to attend the Level II training sessions or, if necessary or requested, separate presentations will be provided.
Resource Specialists	39. The Resource Specialists will provide advice on mitigation measures for field issues and environmental resource features based on their specific areas of expertise. These areas of expertise include, but are not limited to: geohazards, soils, fish, watercourse crossings, archaeology, palaeontology, rare plants, wetlands, reclamation and wildlife.
Non-Compliances and Resolution	40. The Environmental Inspector will be notified by the Lead Activity Inspector or equivalent responsible person onsite when a non-compliance is identified. The Lead Activity Inspector will contact the Environmental Compliance Manager who will report the non-compliances and spills to the regulatory authority, if required. If the Lead Activity Inspector is not available during a non-compliance situation, the Environmental Inspector will contact the Environmental Compliance Manager and investigate the non-compliance, provide corrective direction or, where warranted, initiate work stoppage. 41. 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 will assist in this decision-making process. 42. If the work is shut-down, it will resume only when corrective actions have been developed and approved by Trans Mountain. Once approved by Trans Mountain, the Contractor will inform the work crew and work will proceed following the corrective action plan. 43. All non-compliances will be documented on the appropriate non-compliance forms and, if appropriate, the report will be supplemented with photographs. The Environmental Inspector will be responsible for documenting all environmental non-compliances and reporting to the Environmental Manager within 24 hours.
Decision-Making Criteria	44. The Lead Activity Inspector and the Environmental Inspector will consider the following criteria when deciding which protection measures and/or procedures to implement during the construction of the Project facilities and associated components: • site conditions at the time of construction; • weather conditions at the time of construction; • equipment and/or materials availability at the time of construction; • Contractor experience with conducting specific construction techniques; and • inspection staff experience with implementing applicable protection measures and/or procedures.

Activity/Concern	Preparation Measures
Decision-Making Criteria (cont'd)	45. The Construction Manager, or designate, the Environment Manager and the Lead Activity Inspector will formulate a plan of action in consultation with the appropriate regulatory authorities in the event that an unforeseen environmental issue arises during construction for which no mitigative measures have been approved.
Post-Construction Documentation	46. Environmental information (*e.g.,* erosion concerns or natural drainage patterns) will be collected throughout construction for post-construction documentation and assessment of the effectiveness of the procedures/measures used which can aid or inform the decision-making process.

Management of Change

During the course of construction, it may be necessary to modify or create new procedures to address site conditions not previously identified in the Facilities EPP. The following measures outline the process for the development or modification of procedures.

Activity	Preparation Measures
Management of Change	47. Contact the Lead Activity Inspector, the Environmental Inspector and the Construction Manager if site conditions warrant a change in procedure that may have environmental implications. 48. Modification to the procedure(s) will be developed in co-operation with the Construction Manager and the Project management team including engineering, Resource Specialists, and/or other expertise, as appropriate. 49. Include one or more of the following details when making a modification to the procedure(s), if required: • change to specific procedure (*e.g.,* soil handling, etc.); • location (*e.g.,* site description); • rationale for change; • environmental and safety criteria reviewed as part of modification request; • consideration of environmental objectives; • equivalent or approved standard of mitigation; • additional environmental mitigation measures required; • contract extra cost as a result of procedure change; • site sketch; and • sign-off by the Construction Manager and a Trans Mountain Project management team representative. 50. Changes to an existing procedure will be discussed with the appropriate regulatory authorities, stakeholders and Aboriginal representatives, as necessary, and the appropriate authorization will be acquired, should the revised procedures require further regulatory approval. 51. Document and communicate the resolution and/or revision to the appropriate parties.

4.0 NOTIFICATION OF INTERESTED PARTIES

Introduction

Notification of the construction schedule and timing of specific construction activities will facilitate awareness of upcoming activities and allow regulatory authorities, Aboriginal communities and other applicable interested parties to plan as appropriate for construction activities in the area of interest. The following measures will be implemented to ensure notification of interested parties in advance of, and during construction of facilities and associated components (*i.e.,* borrow sites, temporary access roads and TWS).

Objective

The objective of notification of interested parties is to ensure:

- interruptions to other land use activities are limited during construction of TMEP facilities and associated components;
- applicable interested parties are aware of TMEP construction activities at facilities; and
- relevant regulatory authority representatives are kept informed throughout TMEP facilities construction and associated components.

Company Measures

The following measures are the responsibility of Trans Mountain.

Contacts		Notification Measures
Municipal Authorities	1.	Notify the appropriate municipal regulatory authority prior to the anticipated construction schedule a minimum of 30 working days prior to construction (see Appendix D). Contact will be maintained until Project completion.
	2.	Inform all appropriate municipal resource agencies of the Project developments, as warranted.
Provincial Authorities	3.	Notify the appropriate provincial regulatory authority prior to the anticipated construction schedule a minimum of 15 working days prior to construction (see Contacts provided in Appendix D). Contact will be maintained until Project completion.
	4.	Notify Alberta Environment and Sustainable Resource Development (AESRD) upon entry to Crown lands to acquire confirmation numbers prior to conducting activities on Crown lands, as required by Crown disposition approval conditions.
	5.	Notify the Director 14 days (minimum) prior to the commencement of vehicle water crossings installation in Alberta in accordance with the *Code of Practice* (COP) *for Watercourse Crossings* (Government of Alberta 2013a). Notify the Director within 24 hours in the event of a contravention of the above COP.
	6.	Obtain a temporary diversion licence (TDL) from AESRD if water withdrawal for pressure testing will exceed 30,000 m^3, in Alberta adhere to all conditions of the TDL.
	7.	Inform all appropriate provincial resource agencies including Crown land authorities of the Project developments, as warranted. Adhere to *BC Wildlife Act* regulations and timing requirements, unless otherwise approved.

Contacts	Notification Measures
Federal Authorities	8. Notify the NEB prior to the anticipated construction schedule a minimum of five working days prior to construction (see Appendix D). Contact will be maintained until Project completion. 9. Notify the Canadian Wildlife Service if clearing is scheduled to occur during the migratory bird nesting period (May 7 to August 20 [wetlands April 20 to August 25] in Alberta; March 15 to August 15 in BC [Gregoire pers. comm.]). 10. Inform all appropriate federal resource agencies (*e.g.,* Industry Canada, Environment Canada) of the Project developments, as warranted (see Appendix D).
Regulatory Authority Liaison	11. Liaise with regulatory authority field representatives on a regular basis during construction will be the responsibility of the Environmental Inspector in co-operation with the Construction Manager and the Environmental Manager.
Aboriginal Communities	12. Provide Aboriginal communities with the anticipated TMEP construction schedule and facility location maps and install signage notifying of construction activities in the area, a minimum of two weeks prior to the commencement of construction in the vicinity of their respective communities. 13. Install signage notifying of construction activities in the area. 14. Work with Aboriginal representatives to develop strategies to most effectively communicate the construction schedule and work areas to its members.
Landowners and Lessees	15. Inform landowners and lessees of the TMEP construction schedule sufficiently ahead of facility construction. In addition, landowners and/or occupants will be notified so that livestock can be shifted to adjacent fields.
Guides and Outfitters	16. Notify guides and outfitters in the project area of facility construction schedule prior to the commencement of construction.
Snowmobile Clubs	17. Notify local snowmobile club(s) a minimum of 2 weeks prior to construction. Snowmobile clubs shall be informed of the facility construction potential hazards and construction schedule.
Project Notice	18. Contact stakeholders, guides and outfitters, and trappers prior to TMEP clearing and construction activities. Provide maps and schedules of the construction activities to enable them to select alternate areas for activity. Ensure any changes in the construction schedule are communicated, as warranted. 19. Provide notification to residents of construction within urban areas through newspapers, newsletters or radio advertisements. 20. Place an announcement in local papers notifying guides and outfitters, domestic hunters, trappers, fishermen, recreational users of the location and timing of clearing, construction and clean-up activities at least 14 days prior to the commencement of construction activities.
Resource Companies	21. Notify applicable companies for road, railway, power line and foreign pipeline crossings, if required, by crossing and transportation corridor use agreements. 22. Notify pipeline and utility companies with lines that are located within the vicinity of the facility site prior to commencing facility piping and tank pressure testing.

Contacts	Notification Measures
Construction Schedule Change	23. Review the individuals and groups that were initially notified of the construction schedule and notify of any changes in the construction schedule.

Contractor Measures

The following measures are to be implemented by the Contractor.

Contacts	Notification Measures
Municipal Authorities	24. Notify Bylaw Officers, if required, prior to conducting any burning. 25. Notify Utility Officers, if required by road crossing agreements, prior to construction. 26. Inform the community fire protection service of any hazardous material used or stored on the Trans Mountain facility sites. In addition, the service will also be given a general description of the type of work being completed (*e.g.,* welding), the emergency and fire equipment on the facility site, the type of emergency equipment and services that may be required from the department in the event of a fire or accident, and a list of medically trained personnel (*e.g.,* medic). See Appendix B for the Fire Contingency Plan. 27. Provide a list of emergency equipment at the construction site, a list of medically trained personnel on the facility site (*e.g.,* medic), and a list of emergency equipment and services that may be required from the community.
Water Users	28. Notify appropriate authorities and licensees, if required by COP (in Alberta) or Section 9 of the *Water Act* (in BC) requirements, prior to withdrawing water for hydrostatic testing.
Timber Haulers and Timber Mill	29. Notify timber haulers and timber mills prior to commencing clearing to inform them of anticipated volumes and schedule (as determined through Contractor contractual arrangements).
Post Signs	30. Install signs at recreation access points notifying users of construction activities in the vicinity. 31. Install signs at secondary road access points and within the vicinity of construction activities on secondary roads and highways to notify Forest Management Agreement holders (in Alberta) and Forest License holders (in BC) and dispositions holders of construction of the facility site and associated components.

Note: - See Appendix D for a contact list.

5.0 ENVIRONMENTAL OVERVIEW

Introduction

Environmental features and resources encountered during environmental surveys conducted at the TMEP facility sites and associated component sites require mitigation measures to address facility construction activities as well as to identify and address environmental issues or features that may not be routinely encountered.

Objective

The purpose of this section is to provide the Contractor with a brief overview of the environmental issues and features associated with the construction of the facility and associated components.

This environmental overview includes:

- the general environmental setting of the facility sites; and
- a listing of potential permits and authorization that may be necessary for construction of the facility sites and associated components.

5.1 Environmental Setting

The Project will consist of approximately 977 km of new 914.4 mm (NPS 36) OD crude oil pipeline, which will commence at the Edmonton Terminal, a tank terminal located near Edmonton, Alberta and will terminate at the Burnaby Terminal (Burnaby Tank Farm); and two 762 mm (NPS 30) OD pipelines will connect the Burnaby Terminal to the Westridge Marine Terminal.

A brief summary of the environmental setting of the TMEP facilities encountered on the Project is provided below:

- lies within an established corridor, which includes the TMPL system right-of-way, and within pre-disturbed areas, where practical. New pump station locations in Alberta include Edmonton, Gainford, Wolf, Edson and Hinton and in BC include Rearguard, Blue River, Blackpool, Black Pines, Kamloops, and Kingsvale;
- encounters a wide range of land uses, including agriculture, industrial, forested lands and disturbed forested lands with variable topography;
- encounters areas identified as potentially supporting rare vascular and non-vascular plants and communities, as well as weed infestations;
- lies within the following Natural Subregions in Alberta: Central Parkland; Dry Mixedwood; Lower Foothills; and Montane;
- lies within the following Biogeoclimatic Zones in BC: Interior Cedar-Hemlock; Sub-Boreal Spruce; Interior Douglas-fir; Ponderosa Pine; and Coastal Western Hemlock;
- encounters areas of merchantable timber;
- encounters land uses that may contain suitable habitat for wildlife species with special conservation status. Several provincially identified wildlife areas are encountered;
- encounters several potential archaeological sites; and
- lies within traditional land use sites and territories.

A brief summary of the facilities construction for the Project include:

- adding 35 new pumping units at 12 locations, 1 of which will comprise of a new pump station site;
- twenty new tanks located at the Edmonton, Sumas and Burnaby terminals; and
- reactivation of the Niton Pump Station in Alberta that has been maintained in a deactivated state.

5.2 Non-Routine Mitigation

Most of the environmental and land use issues on the facility footprint and/or associated components (*i.e.,* borrow sites, temporary access roads and TWS) are those that are routinely encountered during Project facility construction in Parkland, Boreal and Foothills areas of Alberta and Southern Interior Mountains, Southern Interior and Coast Mountains regions of British Columbia. The mitigative measures to be implemented to address those issues are also considered to be routine since they are commonly employed during facility construction projects in this region.

Table 5.2-1 identifies unique features or issues located on facility footprints (outside of the development zone) as well as the corresponding non-routine mitigation that will be implemented to address each unique issue.

TABLE 5.2-1

UNIQUE ISSUES REQUIRING NON-ROUTINE MITIGATION

Issue	Mitigation
Rare plant populations on the facility footprint	Site-specific mitigation will include avoidance, removal or protection (see Appendix J).
Potential to infect soils with clubroot disease or other crop disease	Power wash and misting stations will be established, where required, to clean equipment used during clearing and topsoil handling activities (see Appendix F). Basic shovel and sweep cleaning will be conducted on clearing and topsoil handling equipment before moving equipment off of cultivated fields. In addition, shovel and compressed air cleaning stations for topsoil handling equipment will be established at selected locations to prevent the spread of weeds (see Appendix J).
Potential to infect livestock with diseases	Powerwash and misting stations will be established to clean and disinfect equipment used during construction in areas frequented by livestock or near certain livestock facilities. In addition, personnel arriving from outside Canada will be required to have clothing and footwear disinfected, or have an appropriate period of non-farm visits prior to be allowed on livestock facilities. Equipment directly transported in from Alberta must be cleaned and disinfected prior to use on BC livestock yards (see Agricultural Management Plan in Appendix C).
Weed Introduction	Shovel and compressed air cleaning stations for clearing and topsoil handling equipment will be established at several locations to prevent the spread of weeds (see Appendix J).
Water Crossings Access	All watercourse crossings require temporary bridges or the use of existing bridges.
Wetlands	Salvage of 40-50 cm of upper surface material will be conducted at wetlands (see Appendix K) where wetlands will be filled as part of development zone construction and stored for use during reclamation.

5.3 Permits and Approvals

Trans Mountain will work with the appropriate regulatory authorities to determine which environmental permits, approvals and authorizations are necessary and required for the Project prior to the commencement of construction activities. Lists of the potential permits, approvals and authorizations are provided in Tables 5.3-1 and 5.3-2. While these tables are comprehensive, they are not exhaustive and additional permits may be required.

TABLE 5.3-1

POTENTIAL FEDERAL ENVIRONMENTAL PERMITS/APPROVALS

Regulatory Authority	Legislation	Permit, Approval, Authorization and/or Notification	Activity/Trigger
Aboriginal Affairs and Northern Development Canada	*Indian Act*	Section 28 Approval to cross an Indian Reserve	As required, approval for the construction right-of-way to cross reserve lands.
	First Nations Land Management Act	Section 20 Approval to cross an Indian Reserve	As required, approval for the construction right-of-way to cross reserve lands.
Canadian Transportation Agency	*Railway Relocation and Crossing Act*	Crossing Permit	Approval to cross railways with access roads and power lines.
Environment Canada	*Canadian Environmental Protection Act, 1999;* Disposal at Sea Regulations; Regulations Respecting Applications for Permits for Disposal at Sea	Section 127: Disposal at Sea Permit (previously called Ocean Dumping Permit)	Approval to dispose of materials at sea (*e.g.,* dredge spoil from the Westridge Marine Terminal expansion).
	Species at Risk Act (*SARA*)	Permit pursuant to Section 73 of *SARA* - Species at Risk Permit	Activities that affect a listed species, its critical habitat or residence.
Fisheries and Oceans Canada (DFO)[1]	*Fisheries Act. Section 32(2)*	Case-specific request for review	Authorization required if fish will be destroyed during construction.
	Fisheries Act. Section 35(2)	Case-specific request for review	Authorization required if construction will create serious harm to fish or any permanent alteration to, or destruction of, fish habitat.
	Operational Statements	Notification as per the applicable Operational Statements	As required, notifications for watercourse crossings that comply with DFO Operational Statements Marine Communications and Traffic Services (MCTS) oversight of marine traffic within Canadian jurisdiction.
	Section 52 of *Fishery (General) Regulation*	Authorization of Fish Collection for Scientific, Experimental, Educational or Public Display Purposes	Approval to collect salmon or *SARA* listed species during scientific studies.
	SARA	Permit pursuant to Schedule 1 Aquatic Species of *SARA* - Species at Risk Permit	Activities that may affect a listed fish species, its critical habitat or residence.
Industry Canada	*Radiocommunication Act*	Radio Licence	Radio communication.
Natural Resources Canada	*Explosives Act*	Ammonium Nitrate Fuel Oil (ANFO) Permit	Blending of ammonium nitrate and fuel oil.
		Sections 6 and 7: Explosives Transportation Permit	Approval to transport explosives.
		Temporary Magazine Licence	Approval for any storage place of explosives in amounts that exceed the regulations. If a factory is required to make explosives near the site, additional permits may be required. Additional permits may also be required, depending on the type of explosives (*e.g.,* an Ammonium Nitrate Fuel Oil Permission) and whether they are blended.
		Temporary Blaster's License or Blaster's Permit	Approval for the use of explosives.
Parks Canada	*Canada National Parks Act*	Special Activity Permits	Approval to conduct activities such as valve work.
Transport Canada	*Canada Shipping Act*	An act respecting shipping and navigation	Ensures compliance of vessels with relevant marine regulations.

Note: 1 As a result of the passage of the *Jobs, Growth and Long-term Prosperity Act* (Bill C-38), regulation requirements of some federal legislation are evolving and actual triggers and permitting requirements will be confirmed over the next year.

TABLE 5.3-2

POTENTIAL PROVINCIAL ENVIRONMENTAL PERMITS/APPROVALS

Regulatory Authority	Permit, Approval, Authorization and/or Notification
ALBERTA	
Alberta Culture	• *Historical Resources Act* clearance.
Alberta Environment and Sustainable Resource Development (AESRD)	• Public Land Agreement (Pipeline Land Agreement) on Crown land. • Fish Research License. • Temporary Field Authorization for access roads on Crown land. • Damage control permits for beaver, lodge and beaver dam removal. • *Water Act* approval for construction within a water body. • Notification under the *Code of Practice for Watercourse Crossings.* • Notification under the *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body.* • Notification under the *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines.* • Registration under the *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines.* • Timber, under the *Alberta Forests Act.* • Master Land Withdrawal and Consent Agreement.
Alberta Energy Regulator (AER)	• Environmental Field Report (EFR) for Pipeline Licence or Approval under the Alberta *Public Lands Act.*
Alberta Tourism, Parks and Recreation	• Research and Collection Permit.
Alberta Transportation and Infrastructure	• Roadside Development Permit. • Several other items (dangerous goods, overweight permit, etc).
BRITISH COLUMBIA	
BC Oil and Gas Commission	• NEB Pipeline Provincial Authorization Application for: - temporary occupation of Crown land for the pipeline right-of-way and for ancillary land uses (camps, access, workspaces, etc.); - authorizations under Section 9 of the *Water Act* (changes in and about a stream) for stream or water body crossings; - cutting permits under Section 47.4 of the *Forest Act* to harvest Crown timber; and - road use permits under Section 117 of the *Forest Act.* – Agricultural Land Reserve (ALR) authorizations for constructing a pipeline or facility, and for importing/removing soil from ALR lands. • Road permits under Section 14 of the *Land Act.* • Temporary Crown land access approval under Section 14 of the *Land Act.* • Section 8 *Water Act* Approval for short-term diversion or use of water.
BC Parks	• Park Use Permit.
BC Ministry of Forests, Lands and Natural Resource Operations (MFLNRO)	• Authorization under Section 40 of the BC *Wildlife Act* (temporary closure to hunting, trapping and guide outfitting if necessary during a construction activity) • General wildlife permit under the *Wildlife Act* and Approval or Notification for Changes In and About a Stream under Section 9 of the *Water Act* and Section 40 of the *Water* Regulations for beaver dam removal. • Scientific Fish Collection Permit. • *Heritage Conservation Act* Permit. • Road use permits. • Special Use Permit. • Burning Permit.
BC Ministry of Transportation and Infrastructure	• Road Use and Highway Crossing Permit • Several other items (overweight, highway access, land closure request)
BC Ministry of Environment	• Section 44 Notification under the BC *Water* Regulation (minor work near a stream) • Section 14 Permit under the BC *Environmental Management Act* for the introduction of waste into the environment • Section 7 Waste Discharge Permit under the *Oil and Gas Waste Regulation* for testing and disposing of test water with additives

Trans Mountain will work with municipal authorities to determine which permits and approvals are necessary and required to carry out TMEP activities.

6.0 PRE-CONSTRUCTION ACTIVITIES

Introduction

This section describes the potential mitigation measures that may be implemented prior to TMEP facility construction to ensure protection of environmental resource features, delineation of boundaries of the facility site and associated facilities, as well as marking buried and overhead utilities. The following potential mitigation measures will be implemented, as warranted, by Trans Mountain, its Contractors and subcontractors prior to commencement of construction activities.

Objectives

The objectives of these mitigation measures are to ensure:

- all identified environmental resources occurring on or immediately adjacent to facility sites are properly identified and marked in the field prior to construction to avoid or reduce potential Project-related adverse environmental effects;
- facility sites, access roads, borrow sites, power lines and TWS are properly delineated to prevent inadvertent trespass; and
- all approved access to and from the work sites is properly and clearly marked.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Workspace	1. Identify the need for extra workspace prior to clearing and construction. Take extra workspace at locations identified on the Environmental Facility Drawings that include: • sidehill to ensure sufficient storage space for graded material; and • locations where deep topsoils (*i.e.,* over 25 cm) are identified. 2. Ensure TWS does not encroach within vegetated buffers at watercourses/wetlands/lakes unless approved by the appropriate regulatory authority.
Construction Documentation	3. The Contractor and the Environmental Inspector will be provided the Facilities EPP, Environmental Facility Drawings, engineering drawings and copies of all environmental approvals and permits including the most recent updates and revisions. A complete set of construction documents including the Facilities EPP, Environmental Facility Drawings, engineering drawings and copies of environmental approvals and permits will be kept at the construction field office for each facility.
Approvals, Licences, Permits	4. Obtain necessary approvals, licences and permits required for a particular facility site prior to the commencement of the applicable activity or construction at that site (see Section 5.0). Inconsistencies between conditions of different permits will be rectified prior to construction.
Pre-Job Meeting	5. Hold a pre-job meeting prior to the commencement of construction at each facility site with the engineering and environmental staff, the Environmental Inspector, appropriate regulatory authorities and Aboriginal representatives and the facility Contractor. This meeting is designed to make supervisory construction personnel aware of the key environmental and socio-economic issues, key mitigation and contingency plans, Trans Mountain's commitments, approvals, licenses and permits, legislation and any outstanding concerns applicable to the construction area.

Activity/Concern	Potential Mitigation Measures
Environmental Inspection	6. The Environmental Inspector will ensure the implementation of the EPP during all critical phases (*i.e.,* clearing, topsoil/root zone material salvage, grading, clean-up and revegetation) of facility construction. 7. Prior to the commencement of construction, the Environmental Inspector will review the Contractor's preliminary Execution Plan, if applicable, to ensure environmental resources (*e.g.,* rare plants, archaeological sites, etc.) will not be compromised as a result of facility site preparation activities.
Pre-Construction Surveys	8. Complete all environmental surveys that are required prior to the commencement of facility construction and provide the key results of the surveys and any associated mitigation to Project inspection personnel and the Contractor. Provide the above personnel with updated resource-specific mitigation tables and, if warranted, updated Environmental Facility Drawings. Identify any resource-specific locations in the field where mitigation is necessary and record the locations accordingly (see Appendices E through Q).
Weeds	9. Conduct a pre-construction weed survey at each TMEP facility site. Flag areas identified as having noxious weed infestations prior to commencement of construction.
Hydrogeology	10. During Project field studies, the hydrogeological engineer in consultation with landowners and the appropriate regulatory authorities, will determine if springs and wells used for domestic purposes that are located within 50 m of the facility. If water wells are identified within 50 m of the facility site, they will be sampled for water quality and flow rate prior to the commencement of construction. 11. Locate and flag or fence registered or known water wells within 50 m of the facility site as identified in Appendix G.
Monitoring	12. Initiate pre-construction monitoring, where warranted, prior to the commencement of construction or, if appropriate, prior to the commencement of a specific activity (*e.g.,* pile installation). Monitoring may be necessary prior to, during and following construction for a specific construction activity in the vicinity of water wells or springs. At some locations, monitoring will be necessary to assess the effects on specific environmental features (*e.g.,* archaeological monitoring, rare plant, nesting birds, etc.). If required, ensure that applicable permits/approvals are in place to allow monitoring to be conducted.
Staking/Flagging/ Fencing	13. Stake all boundaries of the facility footprint and any additional TWS. Clearly flag or stake the boundaries of temporary and permanent access roads and borrow sites. 14. Flag or fence-off specific resource features (*e.g.,* archaeological site, rare plant species, wildlife habitat features) prior to commencing construction in the vicinity of the site. Clearly mark all sensitive environmental resources identified on the Environmental Facility Drawings within the immediate vicinity prior to clearing. Posts and rope or fencing may be necessary to delineate sensitive environmental resources on and adjacent to the facility site, TWS, access roads and borrow sites. 15. Confirm the accuracy of all environmentally sensitive resource locations associated with TMEP and ensure flagging is maintained during construction. 16. Delay final staking until after clearing and immediately prior to the commencement of construction activities.

Activity/Concern	Potential Mitigation Measures
Signage	17. Post signs in the vicinity of sensitive environmental features and use site identification numbers to ensure confidentiality and protection of resources, where warranted, to alert workers of their presence and ensure their protection. Alert Contractors that work will take place near sensitive features. 18. Post signs, stake or flagging (including name, number and RK) 100 m from each watercourse/wetland/lake or at the top of the approach slope following clearing to alert the Contractor of the upcoming watercourse/wetland/lake, if present.
Environmental Resource Delineation	19. Resource-specific protection measures will be listed on the Environmental Facility Drawings and in the resource-specific mitigation tables (see Appendix E through Q) prior to construction. The tables will be used to track mitigation measures implemented for environmental resource features and will become part of the facilities environmental as-built report.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity	Potential Mitigation Measures
Construction Documents	20. Maintain the Facilities EPP, Environmental Facility Drawings, engineering drawings as well as copies of environmental approvals and permits at each Contractor's field office.
Approvals, Licenses Permits	21. Ensure that all required approvals, licenses and permits are in place prior to commencing applicable construction activities.
Grade Plan	22. Prepare a grade plan and submit the preliminary Grade Plan to the Construction Manager and the Lead Activity Inspector for review to ensure that all mitigation measures and protection to be implemented for resource-specific environmental resources (*e.g.,* rare plants, archaeological sites, etc.) during facility site preparation activities are addressed. Revise the preliminary Grade Plan, if warranted.
Workspace	23. Obtain approval from the Construction Manager, landowner and appropriate regulatory authority prior to taking additional workspace in the field.
Scheduling	24. Delay final staking until immediately prior to the commencement of clearing and construction.
Survey Slash Lines	25. Fell all timber onto the facility site during survey line clearing. No fallen or leaning trees will be permitted outside of the facility site.
Weeds	26. Follow recommendations made in the pre-construction weed survey to limit the risk of spreading weed seeds (see Section 7.0 for general weed mitigation). 27. Implement weed management (*i.e.,* using proper application of herbicides, mowing, or a combination of both) at locations identified within the pre-construction weed survey to a level that is consistent with weed management observed adjacent to the facility site to reduce the potential for weed infestations following construction. Refer to the Weed and Vegetation Management Plan provided in Appendix C.

7.0 GENERAL FACILITY CONSTRUCTION MITIGATION MEASURES

Introduction

The potential mitigation measures provided in this section may be applicable throughout all phases of TMEP facility construction, as warranted. These general measures will be implemented, as warranted, by Trans Mountain, its Contractors and subcontractors prior to commencement of construction activities and will be followed by detailed specifications for each phase of facility construction.

Objective

The objective of the following mitigation measures is to avoid or reduce potential adverse environmental effects associated with general facility construction activities including: TWS, access roads, borrow sites and power lines. Construction will be completed in a manner that avoids or reduces adverse effects on residents in the area, nearby land users and socio-economic and environmental resources.

Company Measures

The following activity-specific measures are the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Discipline	1. Those who show careless or wanton neglect of the environment or disregard the Facilities EPP will be removed from the worksite.
Modifications of the EPP Measures	2. Develop new or alternative mitigation measures if the measures identified in the Facilities EPP prove to be ineffective at avoiding or reducing environmental effects. Develop alternative or new measures in co-operation with the Environmental Inspector, the Environmental Compliance Manager, the Environmental Manager and the NEB, if warranted, the applicable Resource Specialists. Ensure adequate time is allowed to obtain NEB approval. Use the MOC process to obtain necessary approvals outlined in Section 3.0. 3. Discuss the planned changes in mitigation to be implemented with the appropriate regulatory authority and, if required, obtain the appropriate approval prior to implementing the new measure(s). If the planned change in mitigation measures meets the environmental objectives and there is no specific regulatory approval required for the change, no additional discussions with regulatory authorities are necessary. 4. Document the change in mitigation and communicate the change to applicable construction personnel including the Construction Manager. Use of the MOC process to inform key personnel of the change. If warranted, monitor the effectiveness of the new/alternative mitigation.
Review Mitigation Measures for Sensitive Features	5. Review with the Contractor the mitigation to be implemented to avoid or reduce effects on rare plants, rare ecological communities, wildlife species of concern, archaeological features, resource-specific traditional land use sites and any other sensitive environmental or cultural features on or in proximity to the facility site. Conduct this review in advance of construction at known locations where any of the above features are known to be present to ensure that the Contractor has a full understanding of the procedures to be implemented (see Appendices E to Q). 6. Refer to environmental resource-specific mitigation tables for: terrain; soils; hydrology; aquatic resources; vegetation; wetlands; wildlife and wildlife habitat; heritage resources; land and resource use; air quality; noise; and traditional land use environmental features provided in Appendices E to Q, respectively.

Activity/Concern	Potential Mitigation Measures
Wildlife	7. Direct that a breeding bird nest survey be conducted by a qualified avian biologist prior to initiating activities in areas where pre-clearing or clearing activities have not been completed prior to the start of the migratory bird nesting period (May 7 to August 20 [wetlands April 20 to August 25] in Alberta; March 15 to August 15 in BC [Gregoire pers. comm.]). In the event that an active nest is discovered, it will be subject to site-specific mitigation measures (*e.g.*, protective buffer or nonintrusive monitoring). The appropriate mitigation strategy will be selected by the Environmental Inspector or Wildlife Resource Specialist from the Wildlife Species of Concern Discovery Contingency Plan (see Appendix B).
Species at Risk/Sensitive Species	8. Ensure that any mitigation measures concerning wildlife or plant species at risk are communicated to the Contractor and enforced by the Environmental Inspector. 9. Suspend activity if previously unidentified rare plants or rare ecological communities are found on or within 10 m adjacent to the facility site during construction only if disturbances to native vegetation are present. Implement the Rare Ecological Communities or Rare Plant Species Discovery Contingency Plan (see Appendix B).
Archaeological/ Palaeontological/ Historical Resources	10. Suspend work in proximity (*i.e.,* within 30 m) to archaeological, palaeontological or historical sites (*e.g.,* arrow heads, modified bone, pottery fragments, fossils) discovered during construction. No work at that particular location shall continue until permission is granted by the appropriate regulatory authority. Follow the contingency measures identified in the Heritage Resources Discovery Contingency Plan (see Appendix B). 11. Arrange for an archaeological excavation of previously unidentified sites encountered by TMEP facilities construction wherever such sites warrant attention and can be excavated without interfering with the construction schedule. When the sites cannot be immediately investigated, map and suitably flag these sites for later investigation. 12. Where a geodetic monument is disturbed during construction of the facility site or associated components, the Environmental Inspector will immediately report such disturbance to the appropriate regulatory authority. 13. Prohibit the collection of any historical, archaeological or palaeontological resources by Project personnel.
Noise Emissions	14. Schedule intermittent noise-producing events to avoid, where feasible, important habitat of wildlife species at risk/sensitive species during sensitive periods. 15. Schedule construction activities occurring within wildlife setback distances to take place within least risk windows, timing windows or outside of wildlife Restricted Activity Periods (RAPs) or proceed with the approval of the appropriate regulatory authority.
Waste and Hazardous Material Storage	16. Select and design construction yards and staging areas used to store hazardous materials and wastes to: • avoid watercourses/wetlands/lakes, sensitive vegetation, highly permeable soils, steep slopes and water supply wells; • prevent access by wildlife, and reduce the attractiveness of such sites to wildlife;

Activity/Concern	Potential Mitigation Measures
Waste and Hazardous Material Storage (cont'd)	• provide safe storage areas, including secondary containment, for all liquid hazardous materials and wastes; and • prevent vehicular incidents by providing unobstructed access (*e.g.,* for delivery vehicles, emergency vehicles).

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Scheduling	17. Complete all construction activities prior to the expiration of applicable permits and approvals. In the event that a permit or approval is likely to expire prior to the completion of the applicable construction activities, take steps well in advance of the expiration date to obtain renewal or extension of the permit/approval. 18. Schedule construction activities to be conducted within 300 m of residences, cabins, occupied campgrounds or parks, where feasible, in accordance with applicable municipal noise bylaws or approval conditions.
Modifications to the EPP Measures	19. Notify the Environmental Inspector in the event that mitigation measures identified in the Facilities EPP are ineffective at avoiding or reducing environmental effects or if alternative measures to address environmental issues are warranted due to site or weather conditions.
Contingency Plans and Emergency Contact List	20. Ensure all key personnel working on the construction site review the contingency plans, management plans and the emergency contacts list prior to commencement of facility construction (see Appendices B, C and D, respectively).
Seismic Events	21. Suspend work immediately in the event of a seismic event. Refer to Emergency Response Plan (see Volume 4C) for further response measures to be taken in the event of seismic activity occurring during construction.
Roads and Access	22. Confine construction activities to the allotted construction footprint and approved TWS (*e.g.,* grade areas). Restrict construction traffic to existing roads.
Construction Traffic	23. Review the Traffic and Access Control Management Plan (see Appendix C) for procedures developed to manage public access to areas with valued ecological values (*e.g.,* caribou habitat). 24. Establish speed limits, approved by Trans Mountain, on access roads. Post signs stating the applicable speed limits for construction traffic to avoid wildlife injury and mortality, maintain soil structure and reduce dust. During non-frozen conditions, limit construction traffic outside of the facility development zone to reduce the area subjected to potential soil compaction, to the extent feasible. 25. Shovel and sweep clean, as quickly as practical, any mud tracked onto roads following equipment crossings.
Public Access	26. Use signs and access barriers, where appropriate, to limit the potential sensory disturbance of wildlife and to avoid destruction to environmental features, soils and wildlife habitat near the construction site during construction in accordance with the Traffic and Access Control Management Plan (see Appendix C).

Activity/Concern	Potential Mitigation Measures
Trappers	27. Prohibit the vandalism or theft of trapper equipment or trapped animals if they are observed on site prior to clearing.
Fishing	28. Prohibit recreational fishing by Project personnel on or in the vicinity of the facility footprint. The use of the facility by construction personnel to access fishing sites will be prohibited.
Livestock	29. Report livestock encountered on the facility site to the Environmental Inspector who will contact the applicable landowner, lessee or regulatory authorities, when warranted.
Wildlife	30. Discuss wildlife issues that are identified during construction as necessary with the Lead Activity Inspector, the Environmental Inspector and Wildlife Resource Specialists as directed in the Wildlife Encounter Contingency Plan, Wildlife Species of Concern Discovery Contingency Plan (see Appendix B). 31. Adhere to applicable setback distances (see Appendix L) and associated timing constraints, to the extent feasible, during facility construction activities (*e.g.,* clearing and disposal, topsoil/root zone material salvage, grading, fill and gravel hauling/placement) to avoid noise-related disturbances during sensitive periods unless otherwise approved by the appropriate regulatory authority. 32. Construct the facility in a well-organized and efficient manner to limit the duration of sensory disturbance to wildlife. 33. In the event that potentially rare and endangered wildlife species, or their potential habitats are discovered during construction, implement the Wildlife Species of Concern Discovery Contingency Plan (see Appendix B). 34. Implement the Wildlife Encounter Contingency Plan (see Appendix B) in the event of an encounter with wildlife during construction, either at the site or on the commute to or from the construction site. 35. Ensure that there is no harassment or feeding of any wildlife. Always defer to wildlife to allow them safe movement through the site 36. Prohibit the recreational use of all-terrain vehicles (ATVs) or snowmobiles by construction personnel on the facility site or the adjacent construction right-of-way. 37. Report any incidents with wildlife (*e.g.,* collisions) to the Environmental Inspector, who will report to the appropriate authority and the local police detachment, if applicable. 38. Store food in air-tight containers in vehicles or equipment or the construction office. Do not store food in beds of pick-up trucks. 39. Refer to the environmental resource-specific mitigation tables for wildlife and wildlife habitat provided in Appendix L.
Rare Plants/Rare Ecological Communities	40. Review mitigation measures of rare plants/rare ecological communities with the Environmental Inspector in advance of construction to ensure there is full understanding of the procedures involved. 41. Refer to environmental resource-specific mitigation tables for rare plants/rare ecological communities provided in Appendix J.

Activity/Concern	Potential Mitigation Measures
Species at Risk/Sensitive Species	42. Report sightings of sensitive species or species at risk immediately to the Environmental Inspector. Implement the Rare Ecological Communities Or Rare Plant Species Discovery Contingency Plan or Wildlife Species of Concern Discovery Contingency Plan (see Appendix B) as appropriate. Record the location in the daily reports and locate and mark on the Environmental Facility Drawings. 43. Refer to environmental resource-specific mitigation tables for species at risk or their habitat provided in Appendices I to L.
Weeds	44. Ensure equipment arrives at all construction sites clean and free of soil or vegetative debris. Inspect and identify equipment deemed to be in appropriate condition with a suitable marker, such as a sticker. Any equipment arriving in a dirty condition will not be allowed onsite until it has been cleaned. 45. Consider salvaging topsoil/root zone material from the entire facility site if localized weed infestations are encountered, as outlined in the Weed and Vegetation Management Plan (see Appendix C). 46. Record immediately any sites located outside of the facility site development zone where equipment was specifically cleaned due to concerns associated with weeds and communicate to the Environmental Inspector. 47. Monitor weed growth on topsoil/root zone material piles during the course of construction and conduct corrective measures (*i.e.,* spraying), if warranted. 48. Conduct basic shovel and sweep cleaning before moving equipment from any locations identified as having a Prohibited Noxious or Noxious weed infestation (see Weed and Vegetation Management Plan and Agriculture Management Plan in Appendix C). 49. Additional mitigation to reduce weed growth and spread may be warranted if topsoil/root zone material replacement is delayed due to construction scheduling. 50. Refer to environmental resource-specific mitigation tables for vegetation provided in Appendix J.
Use of Herbicides	51. Restrict the application of herbicides to licensed applicators. 52. Restrict the application of herbicide within 30 m of known rare plant populations or rare plant communities. Spot spraying, wicking, mowing or hand-picking are acceptable weed control measures in proximity to rare plants and rare plant communities. 53. Prohibit the use of herbicides within 30 m of a watercourse/wetland/lake unless otherwise approved by the Environmental Inspector. 54. Refer to the Weed and Vegetation Management Plan provided in Appendix C.
Clubroot – Alberta and BC	55. Ensure all construction equipment and vehicles, as well as personnel footwear, arrive on the construction site in a clean condition to reduce the risk of introducing or spreading clubroot disease or other crop disease(s) prior to topsoil salvage activities. Refer to the Agricultural Management Plan (see Appendix C) for specific measures.
Phytophthora morum – BC Nurseries	56. Ensure all construction equipment and vehicles, as well as personnel footwear, arrive on the construction site in a clean condition and adhere to the nursery's Biosecurity Management Plan to reduce the risk of introducing or spreading *Phytophthora morum* prior to topsoil salvage activities. Refer to the Agriculture Management Plan (see Appendix C) for specific measures.

Activity/Concern	Potential Mitigation Measures
Avian Flu – BC Poultry Facilities	57. Ensure all construction equipment and vehicles, as well as personnel footwear, arrive on the construction right-of-way in a clean condition and adhere to the facility's Biosecurity Management Plan to reduce the risk of introducing or spreading Avian Flu prior to topsoil salvage activities. Refer to the Agriculture Management Plan (see Appendix C) for specific measures.
Watercourses, Wetlands and Lakes	58. Maintain the identified separation distances between the following areas and a watercourse/wetland/lake when constructing the facility site, unless otherwise approved: • fuel or hazardous material storage site - 300 m; • cleared area - 100 m; • burning site - 100 m; • subsoil pile - 100 m; and • oil change area - 100 m. 59. Adhere to water crossing requirements provided in environment resource-specific mitigation tables for aquatic resources provided in Appendix I and as indicated on the Environmental Alignment Sheets. 60. Ensure any disturbance of the approach to watercourses within the construction footprint or associated activities are reduced and stabilized and reclaimed to approximate preconstruction conditions. 61. Implement appropriate precautions to prevent deleterious substances (*e.g.,* gasoline, sediment, oil, wet concrete, etc.) from entering watercourses. Cleaning, fuelling and servicing of equipment will be conducted in an area where spills or wash water will not contaminate surface water or groundwater resources. An appropriate emergency spill kit will be available at all times. 62. Remove temporary vehicle crossing structures from all watercourses, as applicable, following the season of construction (within 6 months of installation) unless otherwise approved by the appropriate regulatory authority. Remove all crossing structures on segments constructed during the winter prior to spring breakup, unless the structure is designed to accommodate flood conditions. Remove snow or ice bridges, if used, cutting in a v-notch by physical means rather than blasting. 63. Prevent construction materials and debris from entering watercourses. 64. Install and maintain appropriate erosion and sediment control measures to prevent sediments from being transported into watercourses/wetlands/lakes. 65. Retain salvageable timber, where warranted, in the vicinity of water crossings for use in the construction of the watercourse vehicle crossings or reclamation works, if warranted. 66. Use existing vehicle crossings at watercourses crossed by access roads identified in Section 9.0 and within the aquatic resources tables (see Appendix I).

Activity/Concern	Potential Mitigation Measures
Wetlands	67. Ensure approvals are in place prior to works where the facility boundary encounters the boundaries of wetlands. 68. Narrow the proposed area of disturbance and protect the wetland by using fencing. Wetland boundaries will be clearly marked using signage, flagging or fencing and limit traffic in the vicinity of the flagged/fenced off area, if feasible. 69. Protect vegetation mat from construction disturbance, to the extent feasible. Any TWS located within the boundary of a wetland must be approved by the Environmental Inspector. 70. Locate all additional work areas (such as graded areas or additional topsoil/root zone material storage areas) a minimum of 10 m from wetland boundaries except where adjacent upland is cultivated or hay land, or disturbed land, unless otherwise approved. Ensure landowner/land authority approvals are in place for all additional TWS prior to use. 71. Conduct ground level cutting, mowing and/or mulching of wetland vegetation instead of grubbing. The method of removal of wetland vegetation will be subject to approval by the Environmental Inspector. 72. Prevent ground disturbance by using a protective layer such as frost packing, snow, ice or matting between wetland vegetation mat/seedbed and construction equipment. 73. Install berms and/or cross ditches on approach slopes to wetlands, where warranted. 74. Maintain sediment fences in place at non-peat wetland boundaries, where warranted, until a vegetation cover has stabilized the adjacent construction areas. 75. Allow wetlands to recover naturally (*i.e.,* do not seed wetland areas).
Archaeological/ Palaeontological Historical Resources	76. Follow any recommendations identified in the Historical Resources Impact Assessment for Alberta and Archaeological Impact Assessment for BC. Obtain the approval of the appropriate regulatory authority prior to commencing any construction activity located within 30 m of a monument, archaeological site or burial ground. 77. Avoid disturbance of geodetic or legal survey monuments, to the extent feasible. Where a geodetic monument is disturbed during construction of the pipeline or associated facilities, the Construction Manager will immediately report such disturbance to the appropriate regulatory authority. The Contractor will re-establish monuments, where feasible, in accordance with the instructions of the Dominion Geodesist. 78. Refer to environmental resource-specific mitigation tables for Heritage Resources provided in Appendix M.
Traditional Land and Resource Use	79. Implement the contingency measures identified in the Traditional Land Use Sites Discovery Contingency Plan (see Appendix B) in the event traditional land use sites not previously identified are found during facility construction. 80. Refer to the environmental resource-specific mitigation tables for Traditional Land Use provided in Appendix Q.
Dust Control	81. Ensure that watering of roads and sites does not generate excessive formation of surface water accumulation (*i.e.,* puddles or excessive mud generation), or result in overland water flow or sedimentation of the watercourses/wetlands/lakes.

Activity/Concern	Potential Mitigation Measures
Noise Emissions	82. Adhere to all federal (*i.e., Environment Canada, Motor Vehicle Safety Act, Oil and Gas Occupational Safety and Health Regulations,* etc.) and provincial (*i.e.,* Directive 038: Noise Control , *BC Noise Control Best Practices Guideline* [BC OGC 2009], Section 7.2 of the *Occupational Health and Safety Regulations*, etc.) guidelines and regulations for noise management. 83. Noise abatement and construction scheduling will be considered at noise-sensitive locations and during noise-sensitive periods, to limit disruption to sensitive receptors (*i.e.,* neighbouring landowners, wildlife migratory periods, nesting birds, etc.). 84. Enforce vehicle speed limits and inform Contractor truck drivers and mobile equipment operators that engine retarder braking in urban areas is prohibited. 85. Maintain equipment in good working condition and in accordance with manufacturer guidelines. 86. Maintain noise suppression equipment on all construction machinery and vehicles in good order. 87. Enclose noisy equipment and use baffles where and when feasible, to limit the transmission of noise beyond the construction site. 88. Use only the size and power of tools necessary to limit noise from power tool operations. 89. Locate stationary equipment, such as compressors and generators, away from noise receptors, to the extent feasible, and follow applicable municipal, provincial and federal guidelines. 90. Enclose noisy equipment and use baffles such as material storage and subsoil piles, where and when feasible, to limit the transmission of noise beyond the construction site. 91. Refer to environmental resource-specific mitigation tables for noise provided in Appendix P. 92. Maintain noise suppression equipment (*e.g.,* silencers) on all construction machinery and vehicles. 93. Implement mitigation measures where residences are located within 300 m of the construction right-of-way or facility site as outlined in the Noise Management Plan (see Appendix C). 94. Implement mitigation measures where night-time activity (*e.g.,* horizontal directional drill) on the construction right-of-way or facility site is located within 500 m of residences as outlined in the Noise Management Plan (see Appendix C). 95. Vary timing and shape of charge based on proximity to noise receptors.
Air Quality/ Odor/Green House Gas (GHG) Emissions	96. Trans Mountain will consult with and inform landowners of the potential to be affected by emissions from construction activities prior to commencement of these activities in proximity to the respective landowners. 97. Restrict the duration that vehicles and equipment are allowed to sit and idle to less than one hour unless air temperatures are less than 0°C. 98. Use multi-passenger vehicles for the transportation of crews to and from the job sites, where feasible.

Activity/Concern	Potential Mitigation Measures
Air Quality/ Odor/Green House Gas (GHG) Emissions (cont'd)	99. Ensure equipment is well-maintained during construction to reduce air emissions. 100. Conduct burning in accordance with burning permit requirements and *A Smoke Management Framework for British Columbia* (BC MOE 2011), as applicable. Comply with local government bylaws, the *Forest and Prairie Protection Act* (Alberta), *Open Burning Smoke Control Regulation* (BC) and the *Forest Fire Prevention and Suppression Regulation* (BC) when burning slash. 101. Limit smoke production during slash disposal by limiting pile size, reducing fuel moisture content, maintenance of loose burning piles free of soil and by using burning sloops or large capacity shredders. 102. Permit burning only when conditions exist that allow for adequate dispersion of smoke so that high concentrations of smoke does not locally affect human health or wildlife. 103. Control emissions to ambient air from construction at the facility sites or associated components so that concentrations of pollutants do not exceed "maximum desirable levels" defined in the *Canadian Environmental Protection Act* and other appropriate regulatory authority ambient air quality objectives. 104. Refer to environmental resource-specific mitigation tables for air quality provided in Appendix O.
Aesthetics	105. Paint tanks neutral colors so they blend into the surrounding environment. 106. Landscape facility sites to limit visual effects (*i.e.,* leave a vegetation buffer between facility sites and public roads). 107. Direct lighting for all construction activities downward and, where feasible, positioned to avoid or reduce annoyance of nearby residents. 108. Install lighting control systems in the facility site that permit the reduction of the amount of lighting during periods of low activity.
Drainage	109. Ensure the potential for soil erosion by water is reduced during construction activities by avoiding ponding of water or the unintentional channelization of surface water flow. 110. Provide surface drainage of adequate capacity across the facility site and other Project-related facilities. 111. Ensure the stormwater management system at the facility sites will be expanded to accommodate additional tanks, as applicable. 112. Install drainage features that ensure that runoff originating off-site will not be allowed to enter the development area. 113. Inspect all water conveyance installations (*e.g.,* ditches and culverts) and ensure they are functioning appropriately. Take appropriate action prior to and during the spring freshet to clear culverts blocked by ice or debris.
Wet/Thawed Soil Conditions	114. Adhere to the measures outlined in the Wet/Thawed Soils Contingency Plan (see Appendix B) during wet/thawed soil conditions. 115. In consultation with the Environmental Inspector, postpone construction, suspend equipment travel or utilize construction alternatives in the event of wet or thawed soils in order to reduce terrain disturbance and soil structure damage.

Activity/Concern	Potential Mitigation Measures
Wet/Thawed Soil Conditions (cont'd)	116. Initiate contingency measures once one of the following indicators occurs: rutting of topsoil/root zone material to the extent that admixing may occur; excessive wheelslip; excessive build-up of mud on tires and cleats; formation of puddles; and/or tracking of mud as vehicles leave the facility site. 117. Base a decision to postpone start-up or shut-down work on, but not limited to, the following factors: the weather forecast, planned construction activity and/or schedule. 118. The wet/thawed conditions shut-down decision will be made by the Construction Manager in consultation with the Lead Activity Inspector and the Environmental Inspector.
Erosion and Sedimentation	119. Install erosion and sediment control structures and materials (*e.g.,* subsoil berm or sediment fencing) and implement, as warranted, erosion control measures outlined in the Soil Erosion and Sediment Control Contingency Plan (see Appendix B) to ensure that sediments in surface water draining from the facility site do not adversely affect the surrounding terrain or watercourses/wetlands/lakes. In particular, control erosion on grade cuts adjacent to the development zone at facility sites. 120. Maintain or, when the area is stabilized, remove drainage and erosion control devices and materials, at all sites that are no longer in use including: borrow sites; subsoil disposal sites; and stockpile sites.
Welding Shavings	121. Use a tarp and/or magnets to collect the bevel shavings on a daily basis to prevent ingestion by wildlife.
Waste Disposal	122. Collect all construction debris (*e.g.,* welding rods, oil cans, ropes, bands, timbers, caps) and other waste materials on a regular basis and dispose of at an approved facility and in accordance with the Spill Contingency Plan (see Appendix B) and the Waste Management Standard (see Appendix C). Ensure wastes are recycled where practical. 123. Store all garbage in wildlife-proof containers when potential wildlife/human conflicts may occur.
Waste and Hazardous Material Storage	124. Follow measures outlined in the Waste Management Standard (see Appendix C) for storage of waste or hazardous materials on the work site. 125. Ensure all personnel will understand their responsibilities for proper handling, identification, documentation and storage of hazardous materials and wastes. 126. Ensure all personnel who will be handling hazardous materials and wastes will possess valid Workplace Hazardous Materials Information System (WHMIS) training. 127. Ensure an appropriate number of portable toilets will be made available to ensure facility construction crews have ready access to washroom facilities. Service and clean facilities regularly and ensure they are adequately secure. All site personnel are to use portable toilets as provided.

Activity/Concern	Potential Mitigation Measures
Waste and Hazardous Material Storage (cont'd)	128. Storage areas for hazardous materials and wastes at facility sites will be selected and designed to: • prevent access by wildlife, and reduce the attractiveness of such sites to wildlife; • provide safe storage areas, including secondary containment, for all liquid hazardous materials and wastes; and • prevent vehicular incidents by providing unobstructed access (*e.g.,* for delivery vehicles, emergency vehicles). 129. Store bulk hazardous materials in temporary construction yards or other designated areas except for quantities required for the daily construction activities. Store waste in temporary construction yards or other designated areas and remove during final clean up. Store fuel, oil or hazardous materials required to be stored onsite within secondary containment that is to be located greater than 300 m from a watercourse/wetland/lake. 130. Store bulk tanks containing hazardous materials (*e.g.,* fuel for construction equipment) in a bermed area lined with an impervious polyethylene liner. Containment berms will be large enough to contain 110% of the largest tank plus 10% of the aggregate tank volume within the containment area or as otherwise specified by regulatory requirements. Note that secondary storage for fuel storage tanks is required as noted above for volumes exceeding 1,000 L. Design and size secondary containment for hydrocarbons in accordance with applicable provincial and federal requirements. Remove any rainwater which accumulates within the containment structure, if authorized by the Environmental Inspector. If there is a visible hydrocarbon sheen, the water in the containment structure will be collected for proper storage and dispose of at an approved facility. 131. Visually inspect fuel tanks on a regular basis as well as when the tank is refilled. Maintain inspection records for each tank. Take remedial action as soon as a leak is detected. 132. Maintain documentation on all hazardous materials or wastes being stored at the facility sites. 133. Inspect hazardous material and waste storage area facilities on a routine basis in accordance with applicable regulation. Address problems or deficiencies in a timely manner. 134. Remove all secondary containment structures once temporary tanks/vessels are removed prior to the Operational Phase of the Project. 135. Clearly identify and secure hazardous materials and industrial waste storage areas. Clearly label controlled products stored in any containers to comply with WHMIS standards. 136. Ensure the construction sites are left in a tidy and organized condition at the end of each day.
Contaminated Soils	137. Implement the Contamination Discovery Contingency Plan (see Appendix B) and applicable measures for the Waste Management Standard (see Appendix C) in the event contaminated soils are encountered during construction.

Activity/Concern	Potential Mitigation Measures
Spill Prevention	138. Maintain all appropriate spill response equipment/supplies at all work sites. Assess the risk of resource-specific spills to determine the appropriate type and quantity of spill response equipment and materials to be stored onsite and a suitable location for storage. 139. Store all hazardous substances and fuels in proper containment systems, to prevent release to the environment. Handle all hazardous materials in accordance with applicable WHMIS protocols. 140. Post specific instructions at the field construction offices and in construction environmental training handbooks regarding applicable contacts and appropriate response actions to be taken in the event of a spill including the measures provided in the Spill Contingency Plan (see Appendix B) and contacts for spill reporting (see Appendix D). 141. Ensure that during construction no fuel, lubricating fluids, hydraulic fluids, methanol, antifreeze, herbicides, biocides, or other chemicals are released on the ground or into any watercourse/wetland/lake. In the event of a spill, implement the Spill Contingency Plan (see Appendix B).
Equipment Refuelling and Servicing	142. Report spills immediately to the Environmental Inspector who will notify the Environmental Compliance Manager for reporting to the appropriate regulatory authorities in accordance with the Spill Contingency Plan (see Appendix B). 143. Ensure that no fuel, oil or hazardous material is stored within 300 m of a watercourse/wetland/lake. 144. Ensure that operators and onsite construction foremen are trained to contain spills or leakage from equipment. 145. Place an impervious tarp or drip tray underneath equipment/vehicles while servicing equipment/vehicles when there exists the potential for accidental spills (*e.g.,* oil changes, servicing of hydraulic systems, etc.). 146. Ensure that bulk fuel trucks, service vehicles and pick-up trucks equipped with box-mounted fuel tanks carry spill prevention, containment and clean-up materials that are suitable for the volume of fuels or oils carried. Carry spill response supplies on bulk fuel and service vehicles that is suitable for use on land and water (*i.e.,* sorbent pads, sorbent boom and rope). 147. Conduct refuelling a minimum of 100 m (BC Ministry of Water, Land, Air Protection 2002) from any watercourse/wetland/lake unless otherwise approved by the appropriate regulatory authority. 148. Do not wash equipment or machinery in watercourses/wetlands/lakes. Control wastewater from construction activities, such as equipment washing or cement mixing, to avoid discharge directly into any body of water. 149. Employ the following measures to limit the risk of fuel spills in water. Where equipment refuelling is necessary and approved by the Environmental Inspector within 100 m of a watercourse/wetland/lake, ensure that: • approval has been obtained from appropriate regulatory authority; • all containers, hoses, nozzles are free of leaks; • all fuel nozzles are equipped with automatic shut-offs; • operators are stationed at both ends of the hose during fuelling unless the ends are visible and readily accessible by one operator; and • fuel remaining in the hose is returned to the storage facility.

8.0 FACILITY-SPECIFIC CONSTRUCTION MITIGATION MEASURES

Introduction

The potential mitigation measures provided in this section are designed to avoid or reduce effects to the environment during the construction of permanent above ground facilities. An Above Ground Facilities Planning Sheet will be prepared prior to construction to address resource-specific key issues and mitigation measures to be implemented for each site (see example at the end of Section 8.0). The following potential mitigation measures may be implemented, as warranted, by Trans Mountain, its Contractors and subcontractors during facility-specific construction activities.

Objective

The objective of these mitigation measures is to ensure that the permanent above ground facilities construction is conducted in a manner that reduces adverse effects on residents in the area, nearby land users and socio-economic and environmental resources.

8.1 Clearing and Disposal

Introduction

The following potential mitigation measures will be implemented as necessary by Trans Mountain, its Contractors and subcontractors during the clearing phase for facility construction.

Objective

The objective of these potential mitigation measures is to:

- restrict the facility site footprint;
- limit disturbance of vegetation (*i.e.,* merchantable timber and native vegetation) to the extent practical; and
- reduce surface disturbance to promote the natural regeneration of vegetation to nongravel-padded areas.

Company Measures

The following activity specific measures are the responsibility of Trans Mountain.

Activity/Concern		Potential Mitigation Measures
Approvals, Licenses Permits	1.	Ensure that all required approvals, licenses and permits are in place prior to commencing construction activities.
	2.	Obtain appropriate cutting and timber marking authorizations prior to construction.
	3.	Notify and consult with all affected land owners, timber tenure licensees or other forestry related permit holders prior to construction. This will involve the cooperation of the BC MFLNRO.
	4.	Coordinate timber harvesting and/or land clearing and debris disposal activities according to provincial legislation or agreements.
	5.	Complete danger tree assessments and danger tree removals in the forested areas located adjacent to the construction right-of-way, with the agreement of the land owner or the applicable provincial regulatory authority.
Timber Cruise	6.	Complete a timber cruise prior to construction.

Activity/Concern	Potential Mitigation Measures
Pre-Clearing	7. Pre-clear or pre-mow areas of native vegetation outside the restricted migratory bird activity period (RAP) to reduce the risk of birds nesting on the construction right-of-way where construction is scheduled to occur during the spring/summer period (see Appendix L, Table L-2).
Staking/Flagging/ Fencing	8. Where pre-clearing was employed, replace signs and re-stake/flag the facility site and TWS boundaries, resource-specific features (*e.g.,* archaeological site, traditional land use, rare plant species, wildlife habitat features, etc.) within the immediate vicinity of the environmental resource prior to clearing, where warranted, to alert workers of their presence and to ensure their protection during general clearing activities. Resource-specific feature locations will be identified within the resource-specific mitigation tables provided in Appendices E to Q.
Nests	9. Ensure that a migratory bird nest sweep is conducted by a qualified Wildlife Resource Specialist (*i.e.*, avian biologist) prior to initiating activities in areas where activities are scheduled during the migratory bird nesting period (see Appendix L). In the event that an active nest is discovered, it will be subject to site-specific mitigation measures (*e.g.*, protective buffer or nonintrusive monitoring). The appropriate mitigation strategy will be selected by the Lead Activity Inspector and the Environmental Inspector or Wildlife Resource Specialist from the Wildlife Species of Concern Discovery Contingency Plan (see Appendix B). 10. Ensure the clearing Contractor clears timber and shrubby vegetation from the facility site during the appropriate timing window. Refer to Appendix L for applicable dates. Clearing outside of the appropriate timing window or within the migratory bird RAP will only be allowed where nest surveys have been completed by a qualified Wildlife Resource Specialist within 7 days of the commencement of clearing and no nesting activity was observed within the applicable setback distance. 11. Suspend clearing within 30 m, minimum, of an active nest discovered during clearing. Note that buffers could be expanded if the nest is being used by a bird species with a special provincial and/or federal protection status. Fence or flag-off the area and contact the Lead Activity Inspector and the Environmental Inspector (see Wildlife Species of Concern Discovery Contingency Plan in Appendix B).

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Workspace	12. Obtain approval from the Construction Manager prior to taking additional workspace in the field.
Schedule	13. Conduct pre-clearing of timber and shrubby vegetation and/or pre-mowing of native grassland and tame pasture where directed by the Environmental Inspector, prior to the onset of the migratory bird nesting season (see Table L-3 provided in Appendix L). 14. Schedule hauling of timber potentially infected by a forest parasite (*e.g.,* mountain pine beetle) for the period either before or after the beetle flight period, to the extent feasible, unless otherwise approved by provincial forestry authorities.

Activity/Concern	Potential Mitigation Measures
Bar Ditch Ramps	15. Ramp bar ditches with snow/ice where the potential for a mid-winter thaw is low. 16. Install culverts in bar ditch ramps to maintain drainage. Culvert specifications will be determined by the Environmental Inspector. 17. Re-establish bar ditch ramps where removed following summer and winter pre-clearing to facilitate access to the construction site to complete clearing.
Hotline Exposure/Hydrovac	18. The hydrovac Contractor will ensure that all tanks are clean and free of contaminants prior to arriving onsite. 19. Salvage topsoil/root zone material prior to exposing hotlines. Topsoil salvage is not required prior to exposing hotlines for holes less than 1 m in diameter if soil will be removed using a hydrovac during frozen soil conditions or where the area to be exposed will be subsequently subject to topsoil/root zone material salvage as part of facility construction preparation activities. 20. Prior to initiating the hydrovac operation, the hydrovac Contractor will ensure that the Lead Activity Inspector and the Environmental Inspector has reviewed and approved a disposal site. 21. If temporary onsite storage is constructed (*e.g.,* sump or bermed area), salvage topsoil/root zone material from the area to be used for storage and size the storage area to be able to contain the slurry by preventing off-site migration of the stored slurry. Use impermeable clay to form a dike if necessary for containment. 22. Empty the hydrovac truck onto subsoil at approved sites. Ensure that hydrovac material is contained within the designated release area (*i.e.,* will not migrate to a watercourse/wetland/lake or onto topsoil/root zone material). 23. Implement the appropriate measures presented in the Contamination Discovery Contingency Plan (see Appendix B) and Hydrovac Cutting and Handling Disposal Management Plan (see Appendix C) if contaminated or potentially contaminated soils are discovered during hydrovac activities. 24. Ensure that hydrovac slurry will not be pumped into or allowed to flow into a watercourse/wetland/lake. 25. Hydrovac slurries may be temporarily stored on the Project footprint in a hydrovac truck, in clean oilfield storage tanks, at a site designed to safely store slurry or in a metal slop bin if other more practical storage options (*i.e.,* temporary pits) are not feasible for the site. 26. Backfill all hydrovac holes mineral soil and compact to ensure settling of material does not pose a hazard for wildlife and livestock, and does not subside or create ponding.
Temporary Vehicle Crossing Structures	27. Use existing bridges to access the facility site as identified on the Environmental Facility Drawings. 28. Ensure vehicle crossings are planned for straight sections of watercourses, to the extent feasible and where stable banks occur. 29. Facilitate access for clearing and disposal activities by constructing foreign line ramps with borrow material unless otherwise determined by the Lead Activity Inspector and the Environmental Inspector or the facility owner.

Activity/Concern	Potential Mitigation Measures
Temporary Vehicle Crossing Structures (cont'd)	30. Fording of watercourses is not permitted other than as described in relevant Fisheries and Oceans Canada Operations Statements (DFO OS) (BC and Alberta) for temporary crossings. 31. Construct or install temporary vehicle access across watercourses in a manner that follows provincial and federal guidelines, as applicable or unless otherwise authorized by appropriate regulatory authorities. 32. Install and remove temporary vehicle crossings in a manner that protects the banks from erosion and maintains the flows in the watercourse. 33. 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. Criteria will include protection of the riparian vegetation and fisheries values associated with the crossing as well as applicable legislation. 34. Ensure temporary vehicle crossing structures do not disrupt fish passage at fish-bearing watercourses and do not interfere with or impede flow or navigation at any location. 35. Use only clean ice/snow for construction of an ice/snowfill or ice bridge. Approaches to the bridge is to be constructed with compacted snow, ice or matting of sufficient thickness to protect the banks. Soils are not to be used for ice bridge approaches. 36. Withdraw a maximum of 10% of the instantaneous stream flow at any given time if water is necessary for the construction of a temporary crossing. Pump intakes should not disturb the streambed. Pumps should 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. 37. Use clear span bridges if ice thickness is insufficient to support an ice bridge. These temporary structures are to be installed perpendicular to the watercourse and designed to meet provincial requirements related to flood frequency levels unless recommended otherwise by a river engineer. Remove clear span bridges prior to spring break-up. 38. The use of log fills is only permitted in non-fish-bearing watercourses or where recommended by a Qualified Aquatic Environmental Specialist or Qualified Environmental Professional (Appendix I). The use of log fills must comply with all respective provincial guidelines. 39. Closed bottom structures (*i.e.,* culverts) will be considered for use to provide temporary vehicle access on non-fish-bearing watercourses only, or on a fish-bearing watercourse within a defined non-fish-bearing reach. 40. Open bottom structures (culverts) will be considered for use on both fish-bearing and non-fish-bearing watercourses and follow applicable provincial and federal guidelines. 41. The use of either closed or open bottom structures will comply with all respective provincial guidelines.
Workspace	42. Ensure that there is no clearing or grading beyond the stakes unless additional workspace rights have been obtained. Clear vegetation from only those areas essential for construction. 43. Avoid damage of adjacent areas where vegetation is not to be removed during clearing. Request assistance from the Lead Activity Inspector and the Environmental Inspector to determine the size of an avoidance buffer surrounding areas where clearing is to be avoided.

Activity/Concern	Potential Mitigation Measures
Clearing Limits	44. Confine all pre-clearing/mowing and general clearing activities within the staked/flagged facility construction boundaries. Adhere to clearing restrictions associated with special environmental features and buffer areas in addition to those areas outlined in the resource-specific mitigation tables (see Appendices E to Q).
Pre-Clearing/ Clearing	45. Ensure the clearing Contractor removes timber and shrubby vegetation and/or mows native or agronomic grasses from the facility construction site and TWS prior to the onset of the critical bird nesting season in the spring (typically May 7 in Alberta; March 15 in BC). 46. Install erosion and sediment control measures such as sediment fences as soon as feasible following pre-clearing to reduce the risk of erosion, as directed by the Lead Activity Inspector and the Environmental Inspector (see Drawing [Sediment Fence] provided in Appendix R).
Sensitive Terrain	47. Use hand clearing methods where directed by the Environmental Inspector to avoid or reduce disturbance to the ground surface on sensitive terrain. 48. Use cut-off type saw equipment that reduces terrain disturbance outside of the development zone. Use low ground pressure or equivalent equipment to transport salvaged logs to deck sites.
Leaning and Damaged Trees	49. Fell all trees damaged during construction activities immediately. Do not postpone felling or painting of damaged trees until clean-up. Remove any trees that fall outside the edge of the facility site. A tree that has fractured limbs or bark loss on 50% of its circumference is to be removed.
Forest Health Measures – General	50. Reduce or avoid damage to trees on the edge of the facility site to limit the potential for infection and spread of forest health pathogens. Remove trees that are inadvertently damaged. 51. Avoid stacking fallen infested trees near healthy standing or felled trees.
Forest Health Measures – BC	52. Carefully control the movement of woody debris and follow the relevant guidelines and restrictions of the local Forest Districts for control of mountain pine beetle and other forest pests, as warranted, as outlined in the Timber Management Plan (see Appendix C). 53. Use of a variety of techniques such as burning of merchantable timber or removal of all bark from conifer logs will be implemented if tree clearing and hauling occurs within the beetle flight period. Where logs are to be transported into Alberta or within BC, all bark from logs will be removed as per procedural guidelines that apply within the relevant Forest District. Check with the local Forest District contact as to the anticipated beetle flight period prior to transporting logs. 54. Dispose of all salvageable timber infested with mountain pine beetle (or other forest parasite) by burning or mulching to eliminate the risk of spread of forest parasites.
Merchantable Timber	55. Salvage and deck timber on the facility footprint as denoted in the Timber Management Plan (see Appendix C). 56. Salvage timber with equipment that is appropriate for the terrain conditions, limits damage to salvaged timber and harvests timber that meets the receiving mill's requirements (see Tables 8.1-1 and 8.1-2 for timber salvage requirements for Alberta and BC, respectively). 57. Salvage and deck timber (merchantable and salvageable) on privately-owned lands where requested on the Line List. Consider the timber to be non-salvageable and dispose of it accordingly if the landowner has not requested timber salvage.

Activity/Concern	Potential Mitigation Measures
Merchantable Timber (cont'd)	58. Use low-ground-pressure equipment, where warranted, to transport salvaged logs to deck sites. 59. 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. 60. Use cut-off type saw equipment and fell timber in a manner which reduces butt shatter and breakage. 61. Cut Douglas-fir and spruce stumps below a height of 45 cm. 62. Manage logging debris and slash to reduce secondary bark beetle habitat and wildfire hazard.
Log Deck Site Preparation	63. Locate deck sites within the facility site, wherever practical. Avoid additional clearing and grading.
Non-Merchantable Timber	64. Use brushcutters, brushhogs or other equipment, designed to avoid or reduce terrain disturbance to clear non-merchantable timber to assist in maintaining an intact ground surface in areas where grading is not warranted. 65. Ensure that deck sites are set back further than 30 m from existing foreign line/utility crossings and in accordance with the Timber Management Plan (see Appendix C). 66. Clear non-salvageable timber with a bulldozer equipped with a cutter blade or equivalent. This will assist in maintaining an intact ground surface in areas where grading is not warranted. Angle blade and make initial passes down boundaries of the facility construction sites. 67. Use brushcutters, brushhogs or other equipment to mulch/chip stumps of cleared non-salvageable timber to reduce terrain disturbance by maintaining an intact ground surface in areas where grubbing and grading is not warranted. 68. Ensure there is no disposal of upland woody debris in mineral wetland.
Grubbing	69. Avoid grubbing the facility site until just prior to construction if high seasonal rainfall is anticipated between clearing and facility construction. 70. Postpone root grubbing until immediately prior to grading within the facility boundary where pre-clearing occurred and where there is a potential for soil erosion to occur, due to sloping terrain and erodible soils. 71. Reduce the width of grubbing through wet areas during construction to facilitate the re-sprouting and/or natural regeneration of shrub communities. 72. Where grubbing and grading are not necessary, use a mulcher to chip stumps and mow surface vegetation (*i.e.,* shrubs, small trees) to ground level to preserve topsoil/root zone material and establish a smooth work surface. 73. Grub tree roots with a brush rake attachment on a bulldozer to preserve topsoil/root zone material. 74. Restrict root grubbing in wet areas, where practical, to avoid creation of bog holes. 75. Restrict root grubbing on steep erosion prone slopes, unless safety is a concern, in order to reduce soil disturbance and erosion. 76. Restrict grubbing within 2 m of the edge of the facility boundary to prevent damaging adjacent trees.

Activity/Concern	Potential Mitigation Measures
Slash Piling	77. Limb and buck felled materials to lengths manageable by construction equipment. 78. Use a brush rake attachment on a bulldozer to push slash and non-merchantable timber into piles along the edge of the facility site that have been previously cleared. This will facilitate preservation of any topsoil/root zone material. Leave a firebreak (8 m minimum) between piles or windrows or the adjacent forest.
Slash Disposal Alberta/BC	79. Confirm slash disposal requirements where disposal methods are subject to agreements with AESRD and BC Ministry of Forests, Land and Natural Resource Operations. 80. Conduct burning in accordance with burning permit requirements and *A Smoke Management Framework for British Columbia*, as applicable. 81. Dispose of all slash (salvageable timber or stumps) through burning, unless otherwise directed by the Environmental Inspector or the appropriate regulatory authority. Attain all applicable burning permits prior to disposal. 82. Monitor disposal of slash by mechanical means (*i.e.,* mulching), to ensure the maximum depth of mulch will not exceed 5 cm or in accordance with the applicable provincial legislation, whichever is less. 83. Avoid burning slash in the Lower Mainland Region, where air quality is an issue. Mulch in place or chip/haul slash to an approved disposal location. 84. Notify the appropriate regulatory authority prior to commencement of burning slash. When the fire risk is varying and when required, obtain and record the fire ratings daily to determine whether it is safe to burn. During slash disposal activities, maintain communication on a daily basis regarding time of ignition, location, extent and anticipated duration of burning activities. 85. Reduce the liability for causing poor visibility that could potentially lead to traffic accidents on highways. Consider alternatives before burning debris piles next to highways. 86. Follow the BC *Open Burning Smoke Control Regulation* and *the Forest Fire Prevention and Suppression Regulation* when burning. 87. Assess weather forecast information for wind speed and wind direction prior to burning within the vicinity of highways, watercourses/wetlands/lakes, residential areas, occupied campgrounds, school grounds, hospitals, or community care centres. Alternatively, mulch in place or chip/haul slash present within the above locations to suitable locations for burning. 88. Pile slash in a manner that allows for clean, efficient burning of all material. Implement techniques to limit smoke production including limiting pile size, reducing fuel moisture content and maintaining loose burning piles free of soil. 89. Utilize burning sleds, towed by heavy equipment to dispose of green woody debris. 90. Burn only when the fire hazard is low. No burning is to be conducted during high winds. 91. Burn only when weather conditions allow for adequate dispersion of smoke so that high concentrations of smoke do not locally affect human or wildlife health. Avoid burning when temperature inversions are present or predicted). 92. Ensure that slash burning crews have firefighting equipment on hand that is capable of controlling any fire that may occur as a result of their activities.

Activity/Concern	Potential Mitigation Measures
Slash Disposal Alberta/BC (cont'd)	93. Monitor burning at all times and prevent fire from spreading off-site. Extinguish burning embers before leaving the site and monitor burn sites to ensure no smouldering debris remains. Burn only when the fire hazard is low. Do not burn during high winds. Push unburned stumps along the edge of the facility site after attempting to burn them. 94. Store slash along the edge of the facility footprint, if burning is delayed. 95. Burn piles must be spread and mixed with water or snow to ensure they are properly extinguished. 96. Use infrared technology to scan burn sites to ensure no residual fire is left unextinguished.
Gates	97. Install locked gates at locations noted on the Environmental Facility Drawings to block unauthorized travel onto the facility site following clearing. Keep gates locked and assign security personnel, if warranted, to block access.
Hay/Crops	98. Arrange for landowners/lessees to harvest crops, if practical. Mow any remaining crops on the facility site to facilitate topsoil/root zone material handling.

TABLE 8.1-1

TIMBER SALVAGE REQUIREMENTS – ALBERTA

Salvage Requirements:	**Coniferous and Deciduous** 15 cm min. top, 10 cm min. base
Salvage Method:	Mechanical/Handcut
Decking	All salvaged timber to be limbed and decked in a manner accessible to hauling trucks (see Drawing [Log Decking] in Appendix R).
Locations	Wherever minimum salvage requirements are met; general locations will be indicated on the Environmental Facility Drawings.
Timing	Salvage to be conducted following Project approval. Hauling to be conducted immediately prior to/coincident with pipeline construction.
Salvage Contractor	To be determined through bid process following Project approval. A Timber Management Plan is to be prepared by the salvage Contractor prior to the initiation of clearing operations.
Hauling Contractor	To be determined through bid process following Project approval. Conduct salvage operations in accordance with the *Timber Management Regulations (Forest Act)* in the province of Alberta *Forests Act,* the *Forest and Prairie Protection Act* Regulations (Parts 1 and 2), *and Alberta Timber Harvest Planning and Operating Ground Rules* (Alberta Environmental Protection 1994) as they pertain to site clearing, debris disposal and required firefighting equipment.

TABLE 8.1-2

TIMBER SALVAGE REQUIREMENTS – BC

Salvage Requirements:	**Coniferous:** Minimum DBH 12.5 cm
Salvage Method:	Mechanical/Handcut
Decking	All salvaged timber to be limbed and decked in a manner accessible to hauling trucks and (see Drawing [Log Decking] in Appendix R).
Locations	Wherever minimum salvage requirements are met; general locations will be indicated on the Environmental Facility Drawings.
Timing	Salvage to be conducted following Project approval. Hauling to be conducted immediately prior to/coincident with pipeline construction.
Salvage Contractor	To be determined through an open bid process following Project approval. A Timber Management Plan is to be prepared by the salvage Contractor prior to the commencement of clearing operations.
Hauling Contractor	To be determined through bid process following Project approval. Conduct salvage operations in accordance with the British Columbia *Forest and Range Practices Act* and in coordination with the Ministry of Forests, Lands and Natural Resource Operations District Managers.

8.2 Topsoil/Root Zone Material Handling and Grading

Introduction

The following potential mitigation measures may be implemented, by Trans Mountain, its Contractors and subcontractors during topsoil/root zone material handling and grading activities.

Objective

The objective of these potential mitigation measures is to avoid or reduce effects on topsoil/root zone material productivity, surface drainage patterns, terrain contour and slope stability in order to facilitate reclamation of disturbed areas.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern		Potential Mitigation Measures
Approvals, Licenses Permits	1.	Ensure that all required approvals, licenses and permits are in place prior to commencing construction activities.
Resource-Specific Environmental Features	2.	Confirm that flagging, staking and/or fencing installed during survey activities (see Section 6.0) to identify resource-specific features (*e.g.,* Noxious or Prohibited Noxious weed infestations, archaeological sites, rare plant locations) are in place and are maintained throughout topsoil/root zone material salvage and grading activities.
	3.	Refer to environmental resource-specific mitigation tables for soils, rare plants and weeds, heritage resources and traditional land use features provided in Appendices F, J, M and Q, respectively.
	4.	Review with the Contractor resource-specific locations to be avoided during topsoil/root zone material salvage and grading activities. Review the finalized Grade Plan prepared by the Contractor to ensure that resource-specific locations are identified and will be avoided.
Droughty Soils	5.	Assess the wind erosion hazard, competency of the sod, and potential for soil pulverization due to droughty soils. Notify the Contractor if measures applicable to droughty, wind erodible soils, or where the biological soil crust has been disturbed, will be required to avoid or reduce the effect of soil pulverization and wind erosion.
	6.	Refer to environmental resource-specific mitigation tables for erodible soil features provided in Appendix F.
Monitoring of Soil/Root Zone Material Windrows	7.	Monitor soil windrows/berms for erosion and weed growth until the soil windrows are replaced. Direct the Contractor to initiate erosion control (*e.g.,* watering down, tackifier application) (see Soil Erosion and Sediment Control Contingency Plan in Appendix B) or weed control measures (*e.g.,* spraying, hand pulling) (see Weed and Vegetation Management Plan in Appendix C), if warranted.
Dust	8.	Trans Mountain will consult with and inform landowners with the potential to be affected by dust emissions from construction activities prior to commencement of these activities in proximity to the respective landowners.
	9.	Trans Mountain will ensure that dump truck loads are covered prior to travelling on public roads and gate seals are kept tight on dump trucks.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Workspace	10. Obtain approval(s) from the Construction Manager, landowners and appropriate regulatory authority prior to taking additional workspace in the field, where warranted.
Timing	11. Ensure that there is sufficient frost or low enough soil moisture to allow construction without causing excessive rutting or soil compaction outside of the development zone.
Known Archaeological Sites	12. Grading in proximity to known archaeological sites will not be permitted unless mitigation measures have been implemented, or otherwise approved by the appropriate regulatory authority. 13. Refer to environmental resource-specific mitigation tables for heritage resource features provided in Appendix M.
Snow Management and Windrow Gaps	14. Remove or pack snow on the work area adjacent to the development zone to increase frost penetration into the soil during the winter. In mid to late winter, pack snow on the work area to avoid premature thawing of the upper soils. Grade snow over the work area, if rough, to improve driving conditions. 15. Windrow or haul away surplus snow to the downslope side of the facility footprint prior to topsoil or root zone material salvage. 16. Use snow to create a level work surface, to the extent feasible, in order to avoid disturbance of the vegetation mat on cleared ungrubbed vegetation adjacent to the development zone where vegetation regeneration is required. Store mixtures of snow and soil in a manner that prevents sedimentation to watercourses/wetlands/lakes when the snow melts. 17. Discuss snow management issues with the Crown land authority if excessive snow depths are encountered during winter construction.
Sod/Vegetation Mat Conservation	18. Retain vegetation mat outside of the development zone if a competent vegetation mat layer exists, if feasible. In these areas, grade only within the development zone in order to reduce disturbance to the vegetation mat. Grading of the vegetation mat layer will not be permitted on level terrain in these areas. 19. Refer to environmental resource-specific mitigation tables for riparian vegetation at watercourses/wetlands/lakes and native vegetation features provided in Appendix J.
Topsoil/Root Zone Material Handling Contingency Measures	20. Implement the Soil Handling Contingency Plan (see Appendix B) during topsoil/root zone material salvage if any of the following are encountered: shallow bedrock; uneven boundary between topsoils and subsoils; poor colour separation between topsoils and subsoils; stony soils; and high winds. 21. Salvage topsoil/root zone material in areas of equipment and vehicle travel where it is determined that soils may be prone to pulverisation. 22. Implement the Wet/Thawed Soils Contingency Plan (see Appendix B) during wet/thawed soil conditions in the event wet or thawed soils are encountered during construction.
Topsoil/Root Zone Material Salvage Schedule	23. Pre-salvage topsoil/root zone material prior to freeze-up, if feasible. Attempt to have all topsoil/root zone material salvage completed prior to October 31, where feasible, for facilities to be constructed that winter in Alberta and Interior BC.

Activity/Concern	Potential Mitigation Measures
Topsoil/Root Zone Material Salvage – Full Facility Site	24. Salvage topsoil/root zone material from the development zone and areas to be graded within the facility footprint that will be disturbed during construction (see Drawing [Pump Station Construction – Topsoil/Root Zone Material Salvage] provided in Appendix R).
Topsoil/Root Zone Material Salvage Depth	25. Salvage all available topsoil/root zone material (minimum 15 cm or 50% organic material using the Environmental Facility Drawings as a guide, unless the material is unsuitable (*e.g.,* bedrock, gravel, rock). Where soils are not readily distinguishable by colour, the Environmental Inspector will provide direction based on an evaluation of soil texture and structure as well as the recommended depths noted on the Environmental Facility Drawings. 26. Refer to environmental resource-specific mitigation tables for terrain and weed environment features provided in Appendices E and J, respectively.
Agricultural Soils	27. Salvage the topsoil (Ap horizon and any Ah, Ahe or similar horizons). 28. Salvage very deep surface soils to a maximum depth of 70 cm, if encountered. 29. Salvage very shallow surface soils to a minimum depth of 15 cm. If minimum depth of surface soils cannot be salvaged because the underlying material is unsuitable (*e.g.,* bedrock, gravel, rock), salvage all available topsoil.
Topsoil/Root Zone Material Salvage - Frozen Soil Condition	30. Salvage topsoil/root zone material using specialized equipment capable of accurately separating variable depths of topsoil from subsoil (*e.g.,* frozen topsoil cutter, topsoil mulcher or equivalent, if available). If a frozen topsoil cutter or topsoil mulcher or equivalent is not available, rip frozen topsoil/root zone material to the same depth as the salvage requirements. Do not over rip and avoid overstripping.
Overstrip	31. Overstrip shallow topsoils to the depth as indicated on the Environmental Facility Drawings.
Storage or Topsoil/Root Zone Material/Subsoil	32. Keep grade subsoil windrow separate from topsoil/root zone material windrow/berm. Maintain a minimum separation distance of 1 m between topsoil/root zone and grade subsoil windrows (see Drawing [Pump Station Construction – Topsoil/Root Zone Material Salvage] provided in Appendix R). 33. Locate topsoil/root zone material windrows/berms along the boundaries of the facility footprint outside of the development zone area so they do not alter natural drainage patterns during periods of short and long-term storage and, if feasible, locate them on the upslope side of the site to avoid contamination from accidental spills.
Erosion of Topsoil/Root Zone Material Windrow	34. Tackify or apply water/snow or pack the topsoil/root zone material windrow with a sheepsfoot packer or other approved equipment, if the assessment by the Environmental Inspector indicates that soils are likely to be prone to erosion by wind (see Soil Erosion and Sediment Control Contingency Plan in Appendix B). 35. Revegetate the topsoil/root zone material windrows and areas of vegetation disturbed during construction to stabilize topsoil/root zone material and reduce weed growth. 36. Apply tackifier Soil Erosion and Sediment Control Contingency Plan to topsoil windrows in areas of known disease concern when there is potential for topsoil transfer during windy conditions, or if topsoil windrows are to be maintained over the winter, to prevent the possible spread of clubroot or other disease.

Activity/Concern	Potential Mitigation Measures
Erosion of Topsoil/Root Zone Material Windrow (cont'd)	37. Assess the wind erosion hazard, competency of the sod and potential for soil pulverization due to droughty soils. Implement measures applicable to droughty, wind erodible soils to reduce the effect of soil pulverization and wind erosion. 38. Refer to environmental resource-specific mitigation tables for soil erosion in Appendix F.
Dust Control	39. Apply water or approved tackifier to exposed soil piles if wind erosion occurs. 40. Apply water or approved tackifier to disturbed areas if traffic and wind conditions result in excessive dust. The frequency of dust abatement measures will be increased during periods of high wind. 41. Control dust emissions by applying dust suppressants, if warranted. Ensure the Environmental Inspector approves dust suppressants prior to use. 42. Additional dust abatement measures (*e.g.,* covering topsoil windrows, installing wind fences, applying a tackifier) will be implemented, when warranted, during clearing, topsoil/root zone material salvage and construction activities. 43. Ensure that watering of roads and sites does not generate excessive formation of surface water accumulation (*i.e.,* puddles or excessive mud generation), or result in overland water flow or sedimentation of watercourses/wetlands/lakes. 44. Reduce or avoid the potential for dust generation during earthworks (by limiting the drop height from a backhoe bucket into a dumptruck). The extent of the disturbed footprint outside of the development zone will be limited and promptly reclaimed following construction to stabilize the disturbed surface soils to limit the potential for dust generation.
Grading	45. Salvage topsoil/root zone material from areas to be graded and windrow to the edge of the facility site outside of the development zone. Avoid overstripping. The area stripped is to correspond to the area to be graded or the development zone (gravel padded area). 46. Ensure that there is no grading beyond the stakes unless additional workspace rights have been obtained. Grade only those areas essential for construction. 47. Cut and fill the development zone, if required, to level the surface to be developed. Grade the surface to facilitate water drainage into water conveyance features (*e.g.,* ditches and culverts). 48. Ensure graded material does not spread off-site. 49. Cut and fill the development zone, if required, to level the surface to be developed. 50. Grade the surface to facilitate water drainage into water conveyance features (*e.g.,* ditches and culverts). 51. Refer to environmental resource-specific mitigation tables for terrain, soils, archaeological and traditional land use environmental features provided in Appendices E, F, M and Q, respectively. 52. Clearly identify the topsoil/root zone material and grade spoil windrows with signs or staking where the topsoil/subsoil colour change is not obvious.

Activity/Concern	Potential Mitigation Measures
Contaminated Soils	53. Implement the Contamination Discovery Contingency Plan (see Appendix B) and applicable measures from the Waste Management Standard (see Appendix C) in the event contaminated soils are encountered during construction.
Temporary Berms/ Sediment Fences	54. Install sediment fences near the base of cut slopes following grading (see Drawing [Sediment Fence] provided in Appendix R). Inspect the temporary sediment control structures on a daily basis and repair, if warranted, before the end of each working day.
Monitor Soil Windrows	55. Monitor topsoil/root zone material windrows during the growing season for wind and water erosion, and weed growth until the soils are replaced or stored in berms. Implement remedial measures to control erosion and weed growth, when warranted (see Soil Erosion and Sediment Control Contingency Plan in Appendix B and the Weed and Vegetation Management Plan in Appendix C).
Containment Berms	56. Where additional bar ditches and containment berms are required following grading of the development zone and where berms are required around tanks, construct containment berms with grade subsoil or borrow material unless otherwise determined by the Lead Activity Inspector and the Environmental Inspector and the appropriate regulatory authority.

8.3 Hydrostatic Testing

Introduction

The following potential mitigation measures are to be adhered to during hydrostatic testing where water will be used to pressure test the pump stations and tanks. Water will typically be withdrawn from nearby watercourses/wetlands/lakes, or from an approved municipal source and hauled to the facility site in accordance with applicable permits/approvals for withdrawal of water.

Objective

The objective of these potential mitigation measures is to:

- ensure pressure testing activities are conducted in accordance with all approval conditions and permits; and
- reduce or avoid effects on watercourses/wetlands/lakes used during hydrostatic testing of facility piping and tanks.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Approvals, Licenses Permits	1. Ensure that all required approvals, licenses and permits are in place prior to commencing applicable hydrostatic testing activities. 2. Obtain a TDL under the *Water Act* from AESRD if water withdrawal for pressure testing in Alberta will exceed 30,000 m^3. Trans Mountain will adhere to all conditions of the TDL. 3. Obtain *Water Act* approvals under Sections 8 and 9 from the BC OGC for the short-term use of water and changes in and about a stream or wetland. 4. Obtain a Basin Section 8 Approval under the *Water Act* from BC OGC for water withdrawals of up to 45 m^3/day, to a maximum of 5,000 m^3/year, as specified to a drainage basin or basins identified by the OGC for pressure testing. Adhere to all conditions of the Basin Section 8 Approval.
Federal/Provincial Approvals	5. Obtain all applicable regulatory authority approvals for water withdrawal and discharge to allow for hydrostatic testing of the facility and ensure conditions of approvals are satisfied during water withdrawal for hydrostatic testing. 6. Conduct hydrostatic testing activities in accordance with the *NEB Onshore Pipeline Regulations*, provincial legislation, Transport Canada's *Minor Works for Water Intakes* (Transport Canada 2009) as well as the latest version of Canadian Standard Association (CSA) Z662 and the *Oil and Gas Waste Regulation* Section 7(2)(e), BC Reg. 254/2005. Trans Mountain must authorize the Contractor's preferred water withdrawal sources for testing purposes (*i.e.,* must have sufficient quantity and quality of water). 7. Follow all conditions of federal/provincial/permits/approvals, if applicable, during hydrostatic testing.
Provincial Legislation Alberta	8. Follow applicable notification, sampling and reporting requirements outlined in AESRD's *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines* (Government of Alberta 1999a). Ensure that written notice of water withdrawal is provided to the AESRD Regional Director a minimum of 7 days prior to commencement of water withdrawal and that applicable sampling and reporting requirements are completed.

Activity/Concern	Potential Mitigation Measures
Provincial Legislation Alberta (cont'd)	9. Follow applicable notification, sampling registration and reporting requirements outlined in AESRD's *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines* (Government of Alberta 1999b). Complete and submit the registration form a minimum of 7 days prior to commencing hydrostatic testing if test water volumes released to the environment exceed 1,000 m^3.
	10. Ensure that test water withdrawn from one drainage basin will not enter surface waters in another drainage basin.
Notifications	11. Refer to notification requirements related to pressure testing in Section 4.0.
Water Additives	12. Review potential issues associated with the testing program including water quality and, if appropriate, identify any chemical additives to be used during the testing program. Obtain approval, if required, for the use of the additives. Provide direction to the testing Contractor related to the handling, storage, use and disposal of the testing additives including water sampling, if warranted, and disposal of test water containing additives.
Discharge	13. Ensure that the appropriate testing and treatment measures are implemented in accordance with Section 7(2)(a) and 7(3) of the BC *Oil and Gas Waste Regulation,* BC Reg. 254/2005.
Sampling	14. Conduct sampling and testing of potential test water sources and soils at discharge sites, if warranted, to abide by requirements related to test water withdrawal/discharge and any other application/approval requirements.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Workspace	15. Obtain approval from the Environmental Inspector and Construction Manager, landowner and appropriate regulatory authorities prior to taking additional workspace in the field, where warranted.
Code of Practice Conditions – Alberta	16. Follow all applicable COP conditions. Ensure that water withdrawal rates and volumes do not exceed those specified in the respective COP (Government of Alberta 1999a,b). Follow all applicable notification, sampling and reporting requirements as identified in the COP conditions for the withdrawal and discharge of hydrostatic test water.
Section 8 Water Act Conditions - BC	17. Follow all applicable Section 8 *Water Act* approval conditions. Ensure that water withdrawal rates and volumes do not exceed those specified in the respective condition. Follow all applicable notification, sampling and reporting requirements as identified in the *Water Act* approval conditions for the withdrawal and discharge of hydrostatic test water.
Federal Approvals	18. Follow all conditions of federal permits/approvals, if applicable, during hydrostatic testing.
Approvals/Permits	19. Maintain copies of all applicable pressure testing approvals/permits and notifications onsite during pressure testing.
Notification of Inspectors	20. Notify the Construction Manager and the Lead Activity Inspector and the Environmental Inspector a minimum of 12 hours prior to commencing water withdrawal and test water discharge activities.

Activity/Concern	Potential Mitigation Measures
Equipment and Workers	21. Ensure sufficient workers and equipment are available onsite to repair any rupture, leak or erosion problem that might arise during testing.
Safety	22. Follow all safety precautions and regulations required for pressure testing as outlined in the Worker and Public Safety Plans.
Water Trucks	23. Ensure that water trucks, if used to transport test water to fill site, are clean.
Fill Lines	24. Ensure all applicable approvals are in place from the appropriate regulatory authorities for the construction of fill lines from the water source to the fill point of the facility piping or tank. 25. Verify that the appropriate approvals have been obtained and implement the applicable mitigation measures if clearing, topsoil/root zone material salvage or grading is necessary for the laying of fill lines off of the facility site.
Scheduling	26. Follow construction work windows as outlined in the resource-specific mitigation tables for aquatics (see Appendix I), unless otherwise approved by the appropriate regulatory authority.
Water Sources	27. Determine test water needs for each facility. 28. Identify an alternate test water source if the intended water source will provide inadequate streamflow/volume for testing purposes. The Contractor will assist Trans Mountain in obtaining required approvals/permits or the provision of required notifications. 29. Prepare water withdrawal and water discharge site planning sheets to document potential resource-specific issues and associated mitigation at water withdrawal and discharge sites. 30. Complete the Water Withdrawal and Discharge Form provided in the Water Withdrawal and Discharge Procedures Management Plan (see Appendix C) for each water withdrawal and discharge site. 31. Confirm that approvals and/or notifications are in place for the intended test water sources and that adequate streamflow or water volume is present for the testing program.
Sump Excavation	32. Avoid excavation of sumps for use in withdrawing water to the extent feasible. 33. Employ sediment reduction methods (*e.g.,* sediment mat, sediment fence, sand bag, coffer dam, etc.), where warranted, to protect downstream fish, fish habitat and water users from increased sedimentation or reduced water quality where excavation of a sump in the substrate of the water course is necessary.
Erosion Control	34. Include resource-specific measures in water withdrawal plans (see Sections 7.0 and 8.0) to stabilize both the substrate of the water source and approaches to water sources to ensure that accelerated erosion will not occur during equipment installation, use or removal. 35. Monitor fill and discharge lines for leaks. Repair or control leaks to prevent erosion.
Isolate Pumps	36. Isolate test pumps, generators and fuel storage tanks with an impermeable lined dike or depression to capture and retain any spills of fuels or lubricants. 37. Ensure any leaks in the fill and discharge lines are controlled to prevent erosion.

Activity/Concern	Potential Mitigation Measures
Screen Intake	38. Ensure pump intakes are placed in a manner that reduces or avoids disturbance to the streambed and are screened in accordance with the DFO's screening requirements, to prevent the entrapment of fish or wildlife (*Freshwater Intake End-of-Pipe Fish Screen Guideline* [DFO 1995]). 39. Utilize screen pump intakes with a maximum mesh size of 2.54 mm and with a maximum approach velocity of 0.038 m/s where fish habitat is present. 40. Maintain screens clear of debris.
Withdrawal	41. Follow the mitigation measures related to water withdrawal provided in the Water Withdrawal and Discharge Procedures Management Plan (see Appendix C) during hydrostatic testing. 42. Ensure the water level in a lake does not fall more than 10 cm once water withdrawal has started if the *Water Act* approval requires this (BC Oil and Gas Commission 2010). Retain a copy of the water withdrawal approval/permit onsite and ensure the Environmental Inspector has reviewed the water withdrawal approval/permit prior to the commencement of withdrawal activities. 43. Ensure that the withdrawal rate and volume will not exceed 10% of the flow rate of the watercourse or of the volume of the body of water unless otherwise approved by the appropriate authority when withdrawing water in Alberta. Do not disturb the streambed when installing pump intakes. 44. Terminate or reduce the rate of water withdrawal if the approved minimum flow or depth of water in the source watercourse/wetland/lake is reached during a water withdrawal, unless otherwise approved by the appropriate regulatory authority. Resume or increase the rate of water withdrawal only when flows or water levels exceed approved minimum values. 45. Implement additional mitigation in consultation with the regulatory agencies authorities in the event that water volumes exceed the allowable volumes and continued water withdrawal is allowed.
Chemical Recovery	46. Recover all remaining water and water contaminants (*e.g.,* methanol) in tanks and return to the supplier or dispose of contaminated test water at approved sites/facilities. 47. Recover methanol or methanol/water mix, if used, and return to the supplier or dispose of in accordance with appropriate government regulations. Ensure the method and location of disposal has been approved by Trans Mountain and is in accordance with applicable regulations. 48. Ensure that if test water contains chemical additives, the test water is sampled and treated, if warranted, and discharged in accordance with applicable federal and provincial requirements directed by the appropriate regulatory authority.
Pre-test Pigging Debris	49. Collect pre-test pigging debris and water. Discharge the water at an acceptable location onsite in a manner that does not cause erosion or allow unfiltered or sediment-laden water to directly re-enter a watercourse/wetland/lake. Dispose of the remaining material with other construction waste, in accordance with appropriate federal and provincial guidelines.

Activity/Concern	Potential Mitigation Measures
Dewatering	50. Follow all measures outlined in the Water Withdrawal and Discharge Procedures Management Plan and in the Water Withdrawal and Discharge Form (see Appendix C) related to dewatering. 51. Ensure that the appropriate testing and treatment measures are implemented in accordance with Sections 7(2) and 7(3) of the BC *Oil and Gas Waste Regulations* when dewatering in BC. 52. Ensure that the appropriate testing and treatment measures are implemented in accordance with provincial legislation, including Schedule 1, Requirements for Release to Land of the AESRD *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines* (Government of Alberta 1999b) when dewatering in Alberta. 53. Monitor discharge locations to ensure that no erosion, flooding or icing occurs. If conditions become saturated to the extent that adequate natural filtration is no longer occurring, suspend dewatering and move the discharge to another approved location (confirm that appropriate approvals and, if warranted, soil testing have been completed) or construct a holding pond for the water and release the water when natural filtration is again feasible. 54. Ensure the areas that are to receive discharged water are approved by the Lead Activity Inspector and the Environmental Inspector in accordance with the appropriate regulatory authority guidance. 55. Conduct sampling of the test water and soils at the discharge site, when required, and in accordance with applicable federal/provincial requirements. 56. Dewater onto approved areas where water will be filtered through vegetation and soils before returning to a watercourse/wetland/lake. Provide scour protection (*e.g.,* use of rock aprons, plastic sheeting, plywood, straw bales, etc.) or an energy diffuser (*e.g.,* cone with baffles, frog's foot) at the discharge site as directed by Trans Mountain. The rate of discharge will be reduced if these measures are ineffective. 57. Dewater into a bar ditch, if feasible, or onto nonarable land. Ensure that there is no dewatering onto cultivated lands or directly back into a watercourse/wetland/lake unless otherwise allowed by water discharge approvals and the Lead Activity Inspector and the Environmental Inspector. 58. Preserve water quality to the extent feasible including preventing the introduction of foreign material (*e.g.,* debris, sediment) into the receiving watercourse/wetland/lake.
Sample Collection	59. Collect samples of source water, hydrostatic test water and soil of the receiving environment and analyze according to the parameters listed in the Water Withdrawal and Discharge Procedures Management Plan (see Appendix C).
Pigging Debris	60. Collect pigging debris and dispose of at an acceptable location (*e.g.,* landfill). Dispose of remaining construction waste, in accordance with the appropriate regulatory authority.
Daylighting	61. Follow applicable EPP protection measures if exposure (daylighting) of below-grade sections of facility piping is needed for inspection or repairs.

8.4 Construction Clean-Up and Reclamation

Introduction

Clean-up and reclamation are important steps in returning construction sites to a condition similar to pre-construction. Construction clean-up and reclamation will focus on the disturbed areas located outside of the development zone that will be revegetated to a suitable vegetation cover. Note that further details on reclamation measures and techniques are provided in the Reclamation Management Plan (see Appendix C). The following potential mitigation measures may be implemented, as warranted, by Trans Mountain, its Contractors and/or subcontractors during construction clean-up and reclamation activities.

Objective

The objective of these mitigation measures is to:

- remove construction debris and materials;
- re-establish the Project facility site to a stable condition acceptable for operational requirements;
- effectively use reclamation techniques that prevent surface material loss due to wind and water erosion;
- establish a vegetative cover (outside of the development zone) compatible with surrounding vegetation and land uses and to deter the proliferation of weeds; and
- maintain equivalent land productivity, ensuring the ability of the land to support various land uses similar to the uses that existed prior to construction.

8.4.1 General Measures

The following potential mitigation measures are applicable to clean-up and reclamation activities. Further detail is provided for mitigation measures related to clean-up and reclamation in the subsections that follow.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Approvals, Licenses Permits	1. Ensure that all required approvals, licenses and permits are in place prior to commencing applicable construction activities.
Scheduling	2. Schedule construction and clean-up activities in peatlands during frozen soil conditions, where feasible (Alberta and Interior BC). Follow activity restriction guidelines and road bans and consider spring melt when scheduling clean-up and reclamation activities.
Assess Erosion Hazard	3. Assess the erosion hazard prior to the commencement of rough and final clean-up. This assessment, to be conducted by the Environmental Inspector, in consultation with the Construction Manager, will consider topography, degree of disturbance, soil erodibility, snow depth, access limitations, timing constraints, and the likely schedule for rough clean-up, final clean-up and seeding. Request assistance in conducting the assessment, if warranted, from the Environmental Manager, or the Geotechnical, Soil or Reclamation Resource Specialist. 4. Direct the Contractor to implement appropriate erosion control measures that may be in addition to those identified on the Environmental Facility Drawings or noted elsewhere in the Facilities EPP.

Activity/Concern	Potential Mitigation Measures
Seeding	5. Review and retain seed Certificates of Analysis for each species in the various seed mixes. 6. Review and, if appropriate, approve of the Contractor's planned seeding procedures including the seeding equipment to be used on the facility site, calibration procedures for drill/broadcast seeders and the schedule for seeding.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Scheduling	7. Commence clean-up immediately following construction activity. Complete rough clean-up prior to or after the spring thaw, where applicable. Perform final clean-up during the growing season. 8. Postpone clean-up work on excessively wet soils until conditions are suitably dry. 9. Revegetate as soon as feasible to reduce or avoid soil erosion and establish long-term cover. 10. Reclaim all disturbances within one growing season. If feasible, seed and plant seedlings during early spring to take advantage of the spring precipitation. 11. Follow activity restriction guidelines and road bans and consider spring breakup, where applicable, when scheduling clean-up and reclamation activities (see Appendix D for applicable contact information).

8.4.2 Rough Clean-Up

The following potential mitigation measures for rough clean-up may be implemented following facility construction.

Activity/Concern		Potential Mitigation Measures
Scheduling	1.	Commence clean-up immediately following construction activity.
Debris	2.	Remove all remaining garbage and debris from the facility site.
Water Conveyance Structure Re-establishment	3.	Re-establish water conveyance structures to facilitate drainage of the facility site.
Topsoil/Root Zone Material Windrows	4.	Walk down the topsoil/root zone material windrow and, if applicable, windrow snow over the topsoil/root zone material to reduce the risk of wind erosion during the winter. Consider tackifying or watering down the topsoil/root zone material windrow if snow is not available.
Burn Piles	5.	Confirm burn piles are properly extinguished prior to completion of rough clean-up.
Infrared Scanning	6.	Conduct infrared scanning of burn piles to locate any hot spots. Contact the appropriate regulatory authority to determine optimum time for scanning.

8.4.3 Final Clean-Up/Reclamation

The following potential mitigation measures for final clean-up and reclamation may be implemented following rough clean-up.

Activity/Concern	Potential Mitigation Measures
Scheduling	1. Revegetate as soon as practical following final clean-up to establish a long-term cover and reduce or avoid soil erosion. Seed immediately following topsoil/root zone material replacement.
	2. Reclaim all disturbances within one growing season following construction. If feasible, seed and plant seedlings during early spring to take advantage of the spring precipitation.
	3. Contact the local land authorities, to determine the appropriate schedule for planting of seedlings.
Contour Replacement	4. Recontour areas disturbed during facility construction outside of the development zone to pre-construction contours (where feasible) and drainage channels if frozen soil conditions prevented completion of this task during facility construction.
	5. Regrade areas with vehicle ruts and erosion features.
Subsoil Compaction	6. Determine locations where subsoil compaction has occurred, outside of the fenced development zone, by comparing compaction levels on and off the facility site. Sites compared will be in close proximity and have similar drainage, soil moisture, and aspect.
	7. Rip compacted subsoils with a multi-shank ripper or breaking disc to a depth of 30 cm or the depth of compaction, whichever is deeper. If soils are moist, postpone ripping of subsoils until soils dry to ensure that the soils fracture when ripped.
Excess Rock	8. Dispose of excess rock displaced from excavation at an approved location as determined by the Environmental Inspector or the appropriate regulatory authority.
Topsoil/Root Zone Material Replacement	9. Replace topsoil/root zone material evenly over all portions of the facility site, outside the development zone, that have been stripped (see Drawing [Pump Station Construction – Topsoil/Root Zone Material Salvage] provided in Appendix R).
	10. Postpone replacement during wet conditions or high winds to prevent damage to soil structure or erosion of topsoil/root zone material.
Vegetation Mat/Sod Conservation	11. Avoid scalping the vegetation mat/sod layer during topsoil/root zone material replacement on cleared/ungrubbed riparian vegetation, native grasslands, hay and tame pasture. Use specialized equipment (*e.g.,* clean-up bucket) that limits the risk of scalping during the final pass of topsoil/root zone material replacement and is approved by the Environmental Inspector.
Topsoil/Root Zone Material Storage Berms	12. Establish long-term topsoil/root zone material storage berms at locations away from regular facility operational activity and areas with potential for overland water flow and storage berm erosion.
Cultivation	13. Cultivate or rip cultivated fields and hay, tame pasture, bush or woodlands on areas utilized during construction found outside of the fenced development zone, where poor sod development exists to a depth adequate to alleviate surface compaction and in a manner acceptable to the landowner. Do not cultivate into the subsoil.

Activity/Concern	Potential Mitigation Measures
Cultivation (cont'd)	14. Limit cultivation in areas of fine textured soils to prevent pulverization of the soil. 15. Disc and harrow only if the site is to be seeded immediately; otherwise leave the ripped topsoil in a rough condition to reduce wind erosion potential. 16. Disc or rip disturbed soils on hay and tame pasture lands where the sod layer has been broken or badly compacted and reseeding is warranted.
Stony Topsoils	17. Pick stones on agricultural and grass lands so that the disturbed area outside of the development zone is equivalent (*i.e.,* stone size and density) to that of adjacent lands. Dispose of stones at locations approved by the Environmental Inspector, the landowner or appropriate regulatory authority.
Woody Debris	18. Avoid overpicking of small diameter slash in wooded areas with erodible soils.
Erosion Control	19. Install temporary erosion control on exposed moderately to highly erodible soils where there is potential for water or wind erosion prior to re-establishment of vegetation.
Reclamation	20. Limit construction equipment or vehicle travel once final clean-up and reclamation are completed. 21. Implement appropriate reclamation measures as indicated on the Environmental Facility Drawings and as described in the Facilities EPP to address resource-specific conditions that may result in revegetation problems. 22. Adhere to guidelines provided in the Reclamation Management Plan (see Appendix C).
Seeding Plans/Procedures	23. Prepare a seeding plan for approval by the Environmental Inspector that identifies the seeding equipment to be used at the facility site, calibration procedures for the seeding equipment to be used and the seeding schedule.
Seed Procurement	24. Use only Canada Certified No. 1 or the best available agronomic seed. For native seed, the highest seed grade available will be obtained. Do not accept seed that contains any Prohibited Noxious or Noxious weeds. Retain the Certificates of Analysis obtained for both agronomic and native seed for future documentation. The Certificates of Analysis will be provided to the land authority upon request. 25. Ensure that legume (*e.g.,* alfalfa) components of the seed mix have been treated with inoculants specific to the seed to be sown.
Seed Species Selection Alberta/BC	26. Seed disturbed lands in Alberta and BC with native and non-native seed mixes developed for the Project that are based on vegetation field survey data, consultation with landowners/lessees or appropriate regulatory authorities.
Seed Mix Requirements Alberta/BC	27. Seed disturbed soils Alberta, Interior BC and Lower Mainland BC at: • level and gently sloping non-cultivated terrain (tame pasture, hay, shrub/treed and forest land); and • road ditches. 28. Seed mixes and application rates are provided in the Seed Installation and Seed Mix Detail (see Appendix S).

Activity/Concern	Potential Mitigation Measures
Fertilization Requirements Alberta/BC	29. Fertilize disturbed soils Alberta, Interior BC and Lower Mainland BC where woody debris has been added to root zone material during construction to adjust the Carbon: Nitrogen ratio or to encourage vegetation establishment on nutrient deficient soils to be seeded by the Contractor with an agronomic or native grass mix (see Reclamation Management Plan [Appendix C] for fertilizer blends and application rates).
Tackifier	30. Apply tackifier at a rate recommended by the supplier on disturbed soils where wind erosion may be problematic.
Hydromulch/ Hydroseed	31. Apply hydromulch/hydroseed at a rate recommended by the supplier on steep slopes and/or where wind erosion may be problematic.
Visual Barriers	32. Install tree and shrub plantings at access points no longer required and at viewscapes to provide a visual screen to the facility site as directed by the Environmental Inspector (see Drawing [Visual Screen – Facility Site] provided in Appendix R). 33. Use nursery stock seedlings grown from seed sources from the same natural subregion/biogeoclimatic zone, latitude and elevation for vegetation screens. Seedlings and/or larger trees can also be transplanted from acceptable donor sites. Avoid using forage species that will attract ungulates.
Fences	34. Repair fences and temporary gates replaced with permanent fences and gates of equal or better quality.
Weed Control	35. Maintain weed control during clean-up and reclamation activities.

EXAMPLE ABOVE GROUND FACILITIES PLANNING SHEET

The following is an example of the site information that will be included prior to construction at each of the above ground facilities including pump stations, terminals, pressure control stations, block valves, and launcher/receiver sites.

ABOVE GROUND FACILITIES OVERVIEW

Facility No. and Name/Land Reservation: _____ _____ **RK :** _____

Site Status (new/previously disturbed): _____

Access Road Status (new/existing): _____

Environmental/Socio-Economic Issue(s): _____

APPLICABLE KEY MITIGATION MEASURES

Equipment Siting: _____

Water Crossing: **Yes: ____ No: ____**
Vehicle Crossing Type: _____
Instream Period of Least Risk: _____
RAP:

Clearing: _____

Soil Salvage and Grading : _____

Above Ground Facility: _____

Fuel Storage: _____

9.0 ACCESS ROADS FOR FACILITIES

Introduction

The following potential mitigation measures may be implemented, as appropriate, by Trans Mountain, its Contractor and/or subcontractors on all access roads during the construction of facilities. An Access Road Planning Sheet (see example at the end of Section 9.0) will be prepared prior to construction to address resource-specific key issues and mitigation measures to be implemented for each facility site. A summary of temporary access points is also included at the end of Section 9.0.

Objective

The objective of these potential mitigation measures is to ensure that new access roads and upgrades to existing facility roads are selected, designed, constructed, used and, where warranted, reclaimed in a manner that reduces or avoids adverse environmental effects.

Company Measures

The following measures are the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Access Road Selection	1. Use existing access roads and trails, where feasible and safe to do so, rather than develop new access roads and trails.
	2. Align new access roads, where needed, to avoid watercourse crossings, steep slopes and sidehill terrain, to the extent practical. Where avoidance cannot be achieved design crossings to occur as close to perpendicular as possible to the watercourse.
	3. Align new access roads or extensions to existing access roads a minimum of 100 m from watercourses/wetlands/lakes, and a minimum of 30 m back from the edge of terraces, ridges or other elevated landforms, if feasible.
	4. Align new access roads or extensions of existing roads to avoid wetlands and peatlands, to the extent feasible.
	5. Refer to environmental resource-specific mitigation tables for terrain and wetland environmental features provided in Appendices E and K, respectively.
Approvals	6. Ensure all approvals and permits required for the development of new access roads or upgrades to existing roads/trails are in place prior to commencing access road development activities. Note that approvals may be necessary for the overall access road and for associated issues or activities (*e.g.,* heritage resources, clearing, vehicle crossings, blasting and water withdrawal).
	7. Notify the appropriate regulatory authority a minimum of 10 days prior to the use of a ford, installation of a clear-span bridge, construction of an ice bridge or snow fill vehicle crossing, or maintenance of a culvert or bridge in accordance with applicable provincial and and federal requirements.
	8. Ensure applicable approvals/permits are in place prior to the withdrawal of water to control dust on access roads. Follow measures provided in the Water Withdrawal and Discharge Procedures Management Plan (see Appendix C).
Road Grade	9. Develop/upgrade each access road only to the extent necessary to accommodate the intended construction traffic during the period of planned use.
	10. Maintain a maximum slope of 10% at all roads.

Activity/Concern	Potential Mitigation Measures
Resource-Specific Environmental and Socio-Economic Features	11. Align new and potential access roads and complete upgrades to existing access roads during access road development (*e.g.,* clearing, topsoil/root zone material salvage, grading, fill and gravel hauling/placement), in a manner to avoid environmental resources, and noise-related disturbances during sensitive periods within the applicable setback distances and associated timing constraints established by the appropriate regulatory authority, to the extent feasible. 12. Refer to environmental resource-specific mitigation tables for rare plant and plant communities, wildlife species at risk/sensitive species, heritage resources and traditional land use environmental features provide in Appendices J, L, M and Q, respectively.
Staking/Flagging/ Fencing	13. Stake/re-stake the access road right-of-way and TWS boundaries, resource-specific features (*e.g.,* rare plant species, wildlife habitat features, archaeological sites and traditional land use), all confirmed locations of sensitive environmental resources identified within the resource-specific mitigation tables within the immediate vicinity prior to clearing, where warranted. 14. Post signs in the vicinity of sensitive environmental features, where warranted, to alert workers of their presence and ensure their protection adjacent to the access road.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Workspace	15. Obtain approval from the Construction Manager, landowner or appropriate regulatory authority prior to taking additional workspace in the field, where warranted.
Access Road Development Schedule	16. Conduct pre-clearing of timber and/or pre-mowing of native tame pasture/hay where directed by the Environmental Inspector prior to the onset of the migratory bird nesting season (see Appendix L for listing of dates). 17. Reduce the amount of clearing, to the extent feasible, to accommodate road width on side slopes. 18. Schedule hauling of timber potentially infected by a forest parasite (*e.g.,* mountain pine beetle) for the period either before or after the beetle flight period, to the extent feasible, unless otherwise approved by provincial forestry authorities.
Wildlife	19. Report all wildlife incidents to the Environmental Inspector who will take the necessary action, in consultation with the applicable regulatory authority. Adhere to the measures outlined in the Wildlife Encounter Contingency Plan (see Appendix B).
Vegetation Disturbance	20. Reduce clearing of native vegetation, where disturbance to native vegetation cannot be avoided.
Snow Management	21. Ensure snow bladed off roads is not to be windrowed greater than 1 m high and preferably not higher than 0.5 m to allow proper visibility for drivers. If banks must be higher, gaps will be placed to provide for wildlife passage, if practical.

Activity/Concern	Potential Mitigation Measures
Topsoil or Root Zone Material Salvage	22. Do not salvage topsoil/root zone material from areas of the access road where construction activities will not result in extensive mixing of surface and subsoils or excessive damage to the upper soils, as determined by the Environmental Inspector. 23. Salvage all topsoil or the upper 15 cm of root zone material, where present, for use during clean-up and closure of new and upgraded access roads as directed by the Environmental Inspector. 24. Salvage topsoil/root zone material at new permanent and temporary access roads where grading, bar ditches, fill or other materials are necessary. 25. Store all salvaged topsoil and root zone material from the new permanent or temporary access road bed area in windrows along one or both edges of the access road in a manner that does not alter natural drainage patterns. 26. Implement appropriate weed control and erosion and sediment control measures on topsoil/root zone material windrows (see Weed and Vegetation Management Plan in Appendix C). 27. Seed the topsoil/root zone material immediately with a cereal grass cover crop species (see Section 8.0), unless otherwise directed by the Lead Activity Inspector and the Environmental Inspector, to reduce the risk of erosion or creation of weed habitat.
Access Development	28. Apply appropriate measures (*e.g.,* signs, boundary markers, gates, fences, etc.) to ensure that facility construction vehicles remain on the designated access road right-of-way. Adhere to measures provided in the Traffic and Access Control Management Plan (see Appendix C). 29. Ensure approaches to highway and secondary roads are constructed and signed in accordance with the requirements/codes of the local road authority. 30. Source borrow material for access roads from nearby approved sites, to the extent feasible. 31. Install borrow material to a minimum cover depth of 0.1 m or as authorized by appropriate regulatory authorities. Dependent on the size of the loads and whether the road will be constructed over mineral or organic soils, the thickness of material used to construct the road may have to be increased. Consider the use of geotextiles to conserve borrow materials during access road development.
Drainage and Erosion Control	32. Ensure adequate drainage by maintaining the proper grade and installing culverts to allow for cross drainage. Outslope the crown of the road so that it is a minimum of 15 cm higher than the shoulders to allow the road surface to drain and dry. 33. Top the road with clean gravel, where warranted. Consider using underlay felt liners, geotextiles, filter mats or matting if the soil conditions and drainage are poor and there is potential for rutting and erosion. 34. Install/implement drainage and erosion control measures (*e.g.,* check dams, sediment traps, culverts), as warranted, during the development of new access roads and upgrading of existing roads/trails. 35. Monitor and, if warranted, repair erosion control measures and/or implement supplemental erosion control measures, when the risk of erosion and sedimentation of a watercourse exists.

Activity/Concern	Potential Mitigation Measures
Drainage and Erosion Control (cont'd)	36. Seed disturbed side slopes and bar ditches (if present) on new and upgraded roads with an approved seed mix as provided in the Reclamation Management Plan (see Appendix C). 37. Notify local road authority, if required, of any planting activity.
Culvert Installation	38. Adhere to the conditions listed in the *Forest Road Engineering Guidebook* in BC (BC MOF 2002) and the *Code of Practice for Watercourse Crossings* (Alberta Environment 2000) and the *Design Guidelines for Bridge Size Culverts* (Alberta Transportation 2004) in Alberta, as appropriate. 39. Install culverts, where warranted, to prevent accumulation of run-off water and allow surface water drainage to cross built-up access roads. 40. Place armouring and marker flags at both inflow and outflow ends of culverts, if warranted, to prevent erosion. 41. Ensure that culverts of proper size, number and alignment are in place to handle peak run-off events for the period/duration the culverts will be in place and to reduce water movement along ditches and road surface. 42. Reduce alteration of natural drainage patterns by aligning culverts with the drainage and at angles other than right angles to the road. 43. Provide adequate spillways for culverts in unstable areas or where road-fill materials are unprotected. 44. Provide sediment catch basins at the entrance to major culverts as deemed necessary by appropriate regulatory authorities. 45. Install downspouts, where warranted, to transport water down the slope into prepared ditches where the outflow ends of culverts are located near the top of fill slopes. 46. Do not obtain rock to be used in the construction of aprons to be installed or repaired at culvert inlets or outlets from the high watermark of a watercourse/wetland/lake. Place rocks at a slope similar to the culvert and channel in a manner that will not interfere with fish passage or constrict the channel width. 47. Remove accumulated debris in a controlled and incremental manner to reduce the risk of flow surges, erosion and/or sedimentation of downstream areas. Remove or otherwise stabilize removed debris to prevent the debris from re-entering the watercourse/wetland/lake.
Ditches	48. Ensure ditches do not drain directly into a watercourse/wetland/lake, unless limited by topography and approved by the appropriate regulatory authority. Install ditch blocks where required. 49. Rock-line "V" ditches where required on steep slopes, and on scraper or rounded ditches, to reduce erosion and gullying. 50. Adhere to the *Environmental Operating Practices for the Upstream Petroleum Industry for British Columbia – Geophysics* (CAPP 2001) and the *Field Guide for Erosion and Sediment Control* (Government of Alberta 2011) for recommended spacing gaps in berm installation to direct water to ditches.
Access Road Use and Maintenance	51. Do not use de-icer or salt for access road maintenance. Prevent sand used for maintenance purposes from entering watercourses by restricting sand application to access roads located within 10 m of watercourses/wetlands/lakes. 52. Apply only water or non-toxic and non-persistent chemical products as approved by the Environmental Inspector to access roads for dust control.

Activity/Concern	Potential Mitigation Measures
Access Road Use and Maintenance (cont'd)	53. Apply water, when warranted, to control nuisance dust arising from use of access roads in proximity to residences or in proximity to sensitive wildlife or vegetation habitat. 54. Do not apply dust control suppressants to roads during windy conditions or within 300 m of a watercourse/wetland/lake. 55. Maintain all side cuts in roads in a stabilized and revegetated condition, to the extent feasible. Apply geotechnical or bioengineering techniques, where warranted, to control chronic slumping problems that have the potential to contribute sediment to nearby watercourses. Remove access impediments (*e.g.,* posts, large boulders) installed on existing roads which have been approved for facility construction access. Allow impediment removal for the purpose of facilitating access during active construction in the area. Install temporary blockades after work hours to contr*ol p*ublic access until the permanent barrier is re-established. Control access during the work day where requested. 56. Conduct grading frequently enough to prevent creation of large potholes. Do not blade the gravel onto the shoulders of the road when reworking gravel during maintenance operations. Ensure maintenance personnel eliminate ridges along the edges of the roadway to prevent run-off water from being retained. 57. Decommission temporary access roads not required for operational activities. Use approved seed mixes for the reclamation of decommissioned access roads (refer to the Reclamation Management Plan in Appendix C).
Speed Limits	58. Ensure all construction traffic adheres to posted speed limits on all construction access roads and does not exceed the maximum speed limit of 30 km/hr where speed limits have not been posted in order to reduce the potential for injury to the public and wildlife.
Culvert Maintenance	59. Ensure culvert maintenance (*i.e.,* removing debris blockages, controlling erosion at a culvert inlet or outlet) is conducted in accordance with DFO's *Operational Statement for Culvert Maintenance* (DFO 2008) and adhere to the conditions listed in the *Design Guidelines for Bridge Size Culverts* in Alberta (Alberta Transportation 2004) and the *Forest Road Engineering Guidebook* in BC (BC MOF 2002), as appropriate. 60. Schedule culvert maintenance to commence within the least risk window, timing window or outside of the applicable RAP (see Appendices I and L) unless otherwise approved by the appropriate regulatory authority. 61. Remove accumulated debris, in a controlled and incremental manner to reduce the risk of flow surges, erosion and/or sedimentation of downstream areas. Remove or otherwise stabilize removed debris to prevent the debris from re-entering the watercourse/wetland/lake. 62. Ensure the Environmental Inspector is present during culvert blockage removal/modification activities and prepare a monitoring report of the activities. 63. Consider the use of culvert screening, polyvinyl chloride piping, fencing or other beaver deterrents at culvert locations prone to damming by beavers. 64. Monitor the effectiveness of culverts in handling surface drainage across temporary access roads following installation to ensure that surface drainage is not disrupted; implement remedial measures (*e.g.,* steaming of culverts), when warranted, to ensure that icings do not result in flooding or damage to vegetation in proximity to a culvert.

EXAMPLE ACCESS ROAD PLANNING SHEET

The following is an example of the information that will be included on access road planning sheets to be prepared for each site.

ACCESS ROAD OVERVIEW

Access Road: **Name:** _____ **Nearest RK or Landmark:** _____

Land Reservation: _____ **Use Period:** _____

UTMs: _____ **to** _____

Access Road Status (new/existing): _____

_____

Environmental/Socio-economic Issue(s): _____

_____

_____

_____

_____

APPLICABLE KEY MITIGATION MEASURES

Access Road Siting (*e.g.,* pump station, etc.) _____

_____

Water Crossing: **Yes: ____ No: ____**

Vehicle Crossing Type: _____

Instream Period of Least Risk: _____

Clearing: _____

_____

Blasting: **Timing Constraint:** _____

Soil Salvage and Grading: _____

_____

Source Material: _____

_____

Washing Requirements (*e.g.,* weeds) _____

_____

Reclamation: _____

10.0 BORROW SITES

Introduction

Borrow material will be required for facility site pads and access roads. Sand and gravel may also be used to produce cement. In some cases, borrow material will be processed to meet a specific demand (*e.g.,* production of cement). The following measures will be considered by Trans Mountain, the Contractor and subcontractors:

- quantities and locations where borrow material is required may change;
- borrow sources may not have sufficient quantity or quality of material once they are explored prior to development and additional sources may be required; or
- environmental, ownership and permitting concerns may arise over specific borrow sources.

The potential environmental mitigation measures provided are applicable to all work areas throughout the development, operation and, when warranted, reclamation of borrow sites. A borrow site planning sheet will be prepared prior to construction to address resource-specific key issues and mitigation measures to be implemented for each site (see example at the end of Section 10.0).

Objective

The objective of the following potential mitigation measures is to ensure that potential adverse environmental effects associated with development, operation and, when warranted, reclamation of borrow sites for the Project are reduced or avoided.

Company Measures

The following measures will be the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Approvals and Permits	1. Ensure all approvals and permits required for the development of new or upgrades to existing borrow sites are in place prior to commencing borrow site development activities. Note that approvals may be necessary for the overall borrow site as well as the associated issues or activities (*e.g.,* heritage resources, traditional land use, and clearing).
Resource-Specific Environmental and Socio-Economic Features	2. Identify locations where resource-specific environmental features are present on or adjacent to the borrow site that may influence soil handling or grading as well as the schedule for the construction and/or use of the borrow site. 3. Select new borrow sites and complete upgrades to existing borrow sites in a manner to avoid environmental resources, noise-related disturbances during sensitive periods within the applicable setback distances and associated timing constraints established by the appropriate regulatory authority, to the extent feasible. 4. Refer to environmental resource-specific mitigation tables for rare plant communities, wildlife and wildlife habitat, palaeontological resources and traditional land use provided in Appendices J, L, M and Q, respectively.
Air and Noise Emissions	5. Ensure that borrow site activities adhere to local air and noise bylaws unless otherwise approved by municipal authorities.
Pit Development Plan	6. Review the Pit Development Plan (to be developed by the pit operator and provided under separate cover prior to construction) and ensure all conditions and approvals are in place prior to the commencement of pit development.

Contractor Measures

The following measures will be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Access Roads	7. Adhere to the measures related to access road construction provided in Section 9.0.
Pit Development Plan	8. Follow the Pit Development Plan to be developed and provided under separate cover for each new borrow site and each existing borrow site where expansion of the site is planned.
Site Fencing	9. Install temporary fences around borrow sites to reduce the attraction of wildlife and provide security for the site.
Lighting	10. Direct lighting for borrow sites, downward and, where feasible, positioned to avoid or reduce annoyance of nearby residents and land users.
Visual Screen	11. Maintain an undisturbed vegetation screen between a new borrow site and an adjacent road.
Clearing and Disposal	12. Extend clearing a minimum of 15 m beyond the perimeter of the excavation area.
Timber Salvage	13. Salvage merchantable timber, if present, at new borrow sites and existing borrow sites to be expanded unless timber salvage is otherwise waived by the appropriate regulatory authority.
Grubbing, Non-Merchantable Timber and Slash Disposal	14. Refer to Section 8.0 for protection measures associated with grubbing, non-merchantable timber and slash disposal.
Topsoil/Root Zone Material Salvage	15. Salvage topsoil/root zone material, subsoils (*e.g.,* B & C soil horizons) in separate lifts to a maximum depth of 1.2 m, prior to removing overburden, where present, from new borrow sites and portions of existing borrow sites where the excavation is to be expanded, from material stockpile sites and material processing or other equipment sites. Extend soil salvage a minimum of 5 m beyond the planned rim of the excavation, material stockpile site or other equipment site. 16. Store salvaged topsoil/root zone material, subsoils and overburden separately, to avoid admixing, in low berms along the upslope boundaries of the borrow pit or elsewhere that will avoid disruption of natural drainage and subsequent disturbance during operation of the site. 17. Seed the topsoil/root zone material immediately with a cereal grass cover crop species (see Section 8.0), unless otherwise directed by the Environmental Inspector, to reduce the risk of erosion or creation of weed habitat.
Fuel Storage	18. Store above ground fuel storage tanks exceeding 4,600 L capacity, in accordance with applicable *National Fire Code of Canada* (Government of Canada 2010) requirements, as outlined in the Spill Contingency Plan (see Appendix B). Furthermore, adhere to conditions for *Petroleum Storage Tanks* (AESRD 2013) in Alberta and conditions listed in *A Field Guide to Fuel Handling, Transportation and Storage* (BC Ministry of Water, Land and Air Protection 2002). 19. Do not use underground fuel storage.
Waste Disposal	20. Adhere to the waste disposal measures outlined in the Waste Management Standard (see Appendix C).

Activity/Concern	Potential Mitigation Measures
Dust Control	21. Spray water, when warranted, on access roads, material storage piles and work areas within borrow sites to reduce dust emissions. Adhere to the measures provided in Section 9.0 for access roads. Install dust skirts on stockpiling and loading equipment to limit dust emissions where the potential for generation of large quantities of fugitive dust exists. 22. Reduce the backhoe bucket drop height during stockpiling and loading of soils and aggregate to limit the potential for noise and dust emissions.
Excavation Depth	23. Ensure the excavation of borrow material does not extend within 1 m minimum of a water table.
Drainage	24. Grade borrow sites, where feasible, to maintain natural surface drainage or drainage structures. Install/construct ditches or berms to direct stormwater surface drainage around the borrow site.
Retention/Settling Ponds	25. Create retention ponds, where warranted, using the *BC Dam Safety Review Guidelines* (BC MFLNRO 2012), *Canadian Dam Safety Guidelines* (Canadian Dam Association 2007), *Stormwater Management Guidelines for the Province of Alberta* (Alberta Environmental Protection 1999), and *Aggregate Operators Best Management Practices Handbook for British Columbia* (BC Ministry of Energy and Mines 2002) as a guide to hold sediment laden stormwater run-off until the sediment has settled. 26. Conduct discharge of water from retention ponds as outlined in the Water Withdrawal and Discharge Procedures Management Plan (see Appendix C). Size settling ponds created, where warranted, to hold wash water and allow sediment to settle to allow a capacity of 110% minimum of the volume of the wash water.
Water Withdrawal and Discharge	27. Ensure applicable approvals are in place prior to the withdrawal or discharge of water used for washing or arising from other operations at borrow sites. 28. Follow all approval conditions related to the withdrawal or discharge of water associated with the operation of borrow sites. 29. Ensure that withdrawal rates do not exceed 10% of the natural flow rate of the source watercourse unless otherwise approved by the appropriate regulatory authority. 30. Suspend or reduce the rate of water withdrawal in the event that the approved minimum flow or depth of water in the watercourse/wetland/lake is reached during a water withdrawal. Maintain suspended or reduced withdrawal rates until the water flows or depths exceed the approved levels. Discharge water from a settling pond, retention pond or other stormwater site onto the borrow site, if feasible. Avoid discharging this water into a watercourse/wetland/lake without the approval of the Lead Activity Inspector and the Environmental Inspector and acquisition of applicable approvals. 31. Do not exceed the provincial or federal water quality limits (*e.g.,* CCME 2007) of wash or other water discharged from a borrow site directly into a watercourse/wetland/lake that supports fish or provides fish habitat.

Activity/Concern	Potential Mitigation Measures
Water Withdrawal and Discharge (cont'd)	32. Discharge locations will be preferentially selected to dewater onto stable terrain areas rather than directly into a watercourse/wetland/lake where the water will be filtered through vegetation and soils prior to returning to a watercourse/wetland/lake. Locations for dewatering will be into bar ditches, if feasible, or onto nonarable lands. Sediment reduction methods will be implemented on the bed, banks and approaches to the water source or discharge site, if warranted, to protect downstream fish, fish habitat and water users from increased sedimentation or reduced water quality. Discharge locations will be monitored to ensure that no erosion, flooding or icing occurs. 33. Reduce water energy with the use of a dissipater and protective rock riprap, sheeting, tarpaulins or other equivalent materials to reduce or avoid the potential for erosion of soils during water discharge activities. The rate of discharge will also be reduced if downstream or terrestrial flooding appears to be imminent, particularly when discharge occurs during frozen conditions.
Flood Plain Sites	34. Avoid developing new borrow pits in flood plains to the extent feasible. If feasible, existing and new borrow pits in upland environments will be selected for use before a new pit is developed in a flood plain. Avoid stockpiling materials excavated from a borrow site on ice, in a wetland or on a flood plain that shows evidence of active lateral migration as determined by the appropriate regulatory authority. 35. Maintain 100 m minimum buffer zone between the channel zone and the active portion of the borrow site on a flood plain. 36. Ensure that the depth of excavation within an active flood plain does not extend into the water table. 37. Remove borrow equipment and/or construct dikes prior to a flooding event to avoid flows through a borrow site. 38. Prohibit the storage of fuels, lubricants and other materials hazardous to fish and wildlife at borrow sites located on flood plains. 39. Ensure that borrow sites located on an active flood plain are not located on the outside of watercourse bends or adjacent to actively eroding banks.
Noise Emissions	40. Consider the placement and orientation of equipment to be used at a borrow site during the preparation of the Pit Development Plan by the pit operator (to be developed and provided under separate cover prior to construction) for each borrow site in order to reduce the noise disturbance of residents in the vicinity of the borrow site and sensitive wildlife. 41. Ensure that borrow site activities adhere to local noise bylaws, unless otherwise approved by municipal authorities.
Reclamation	42. Reclaim all borrow sites unless otherwise directed by the appropriate regulatory authority issuing approvals/permits for the borrow site and in accordance with the Pit Development Plan (to be developed by the pit operator and provided under separate cover prior to construction). 43. Conduct reclamation progressively where feasible. Once a borrow site is exhausted, reclaim the site immediately before moving onto the next site. 44. Grade slopes created during the development or operation of borrow sites to stable angles (approximately 1:3; rise over run) or as specified in the applicable Pit Development Plan (to be developed by the pit operator and provided under separate cover prior to construction) or borrow site approval conditions.

Activity/Concern	Potential Mitigation Measures
Reclamation (cont'd)	45. Remove the dikes of settling and retention ponds, if present, and recontour the area. Remove or rip clay liners to re-establish natural drainage. 46. Conduct grading and recontouring of any borrow sites located on a flood plain in a manner that does not accelerate channel relocation. 47. Replace salvaged overburden, if present, and then subsoil and then any salvaged topsoil/root zone material, and evenly spread over portions of the borrow pit where salvage occurred for each borrow site. 48. Backfill overburden and subsoils in 15 cm lifts during reclamation of each site and compact after each lift. 49. Seed and revegetate borrow sites to be reclaimed in accordance with the respective Pit Development Plan (to be developed by the pit operator and provided under separate cover prior to construction) and Reclamation Management Plan (see Appendix C). 50. Re-establish vegetation similar to that present at borrow sites prior to development, at borrow sites to be reclaimed. 51. Recontour and re-establish temporary access roads used or constructed to borrow sites following use in conjunction with closure of the borrow sites. 52. Remove approaches to the borrow site access road from applicable highways or secondary roads (see Section 9.0).

EXAMPLE BORROW SITE PLANNING SHEET

The following is an example of the information that will be included on borrow site planning sheets to be prepared for each borrow site.

BORROW SITE OVERVIEW

Borrow Site: **Site No.:** _____ **Reservation No.:** _____ **UTM:** Northing: _____ Easting: _____ **Nearest RK :** _____

Borrow Site Development Period: _____ to _____

Extraction/Hauling Period(s): _____ to _____

Site Status (new/previously disturbed): _____

Access Road Status (new/existing): _____

Environmental/Socio-economic Issue(s): _____

APPLICABLE KEY MITIGATION MEASURES

Equipment Siting (*e.g.,* crusher, settling pond, lighting): _____

Water Crossing: **Yes:** ____ **No:** ____
Vehicle Crossing Type: _____
Instream Period of Least Risk: _____
RAP:

Clearing: _____

Flood Plain: _____

Blasting: **Timing Constraint:** _____

Soil Salvage: _____

Fuel Storage: _____

Washing Requirements and Source Water: _____

Settling Pond: _____

Reclamation: _____

11.0 POWER LINE CONSTRUCTION

Introduction

The potential mitigation measures provided are applicable to power lines throughout all phases of construction, as warranted. These general measures are followed by detailed specifications for each phase of power line construction. The following mitigation measures will be implemented, as warranted, by Trans Mountain, its Contractor and subcontractors prior to initiation of power line construction activities.

Objective

The objective of these potential mitigation measures is to avoid or reduce potential adverse environmental effects associated with general power line construction activities.

11.1 General Measures

The following general mitigation measures are applicable to power line construction activities. Further detail is provided for mitigation measures related to pole installation, conductor stringing and site clean-up in the subsections that follow.

Company Measures

The following measures will be the responsibility of Trans Mountain.

Activity/Concern	Potential Mitigation Measures
Approvals and Permits	1. Ensure that all required approvals, licenses and permits are in place prior to commencing construction activities. Note that approvals may be necessary for the overall power line and associated issues or activities (*e.g.,* heritage resources, clearing and vehicle crossings).
Resource-Specific Environmental and Socio-Economic Features	2. Confirm that flagging, staking and/or fencing installed during survey activities (see Section 7.0) to identify resource-specific features (*e.g.,* Noxious or Prohibited Noxious weed infestations, rare plant locations, archaeological sites) are in place and are maintained throughout construction. 3. Refer to environmental resource-specific mitigation tables for rare plant communities, wildlife and wildlife habitat, palaeontological resources and traditional land use provided in Appendices J, L, M and Q, respectively.
Scheduling	4. Direct that a breeding bird nest survey be conducted by a qualified avian biologist prior to commencing activities in areas where pre-clearing or clearing activities have not been completed prior to the start of the migratory bird nesting period. In the event that an active nest is discovered, it will be subject to site-specific mitigation measures (*e.g.*, protective buffer or nonintrusive monitoring). The appropriate mitigation strategy will be selected by the Environmental Inspector or Wildlife Resource Specialist from the Wildlife Species of Concern Discovery Contingency Plan (see Appendix B).
Staking/Flagging/ Fencing	5. Re-stake/flag the power line right-of-way and TWS boundaries, resource-specific features (*e.g.,* rare plant species, wildlife habitat features, archaeological sites and traditional land use), all confirmed locations of sensitive environmental resources identified within the resource-specific mitigation tables within the immediate vicinity prior to clearing, where warranted. 6. Post signs in the vicinity of sensitive environmental features, where warranted, to alert workers of their presence and ensure their protection adjacent to the access road.

Activity/Concern	Potential Mitigation Measures
Geotechnical Investigations	7. Conduct geotechnical investigations at pole sites prior to the commencement of construction. The information obtained during the geotechnical investigations will be used to determine: • areas where shallow water tables are present; • type of substrate material that is present; • the type of foundation, if applicable, will be used at the pole sites; and • depth of foundation. 8. Reduce ground disturbance during geotechnical investigations by using appropriate equipment (*e.g.,* low-ground-pressure vehicles, wide pad tracks, when conducting the investigations). 9. Ensure subsoil materials brought to the surface during investigations are returned back to the drill hole upon completion of the investigation. Backfill drill holes to an elevation slightly in excess of the surrounding ground elevation in order to compensate for subsidence of the backfilled material. 10. Ensure that any flow resulting from artesian conditions encountered during geotechnical activities is plugged following the recommendations of a qualified hydrogeologist, where practical.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Workspace	11. Obtain approval from the Construction Manager, landowner and the appropriate regulatory authority prior to taking additional workspace in the field, where warranted.
Scheduling	12. Pre-clear or pre-mow areas of native vegetation outside the restricted migratory bird activity period (RAP) to reduce the risk of birds nesting on the construction right-of-way where construction is scheduled to occur during the spring/summer period (see Appendix L, Table L-2). 13. Follow instream least risk windows as provided in Appendix I, if applicable, if there is the need to install a vehicle/equipment crossing structure at a watercourse crossing. 14. Schedule construction activities to avoid spring break-up if topsoil/root zone material has not been salvaged from the travel lane and required workspace at each pole site. 15. Schedule construction on native grasslands to occur when ground conditions are dry or frozen, where feasible. 16. Schedule hauling of timber potentially infected by a forest parasite (*e.g.,* mountain pine beetle) for the period either before or after the beetle flight period, to the extent feasible, unless otherwise approved by provincial forestry authorities.
Noise	17. Notify residents living within 500 m of the power line right-of-way a minimum of 72 hours in advance of splice implosions, if applicable. 18. Provide sufficient notice to landowners/occupants that have cattle grazing on or adjacent to the power line right-of-way during pole installation and splice implosions, if applicable, to allow them to move their cattle to another pasture.

Activity/Concern	Potential Mitigation Measures
Noise (cont'd)	19. Adhere to applicable setback distances (see Appendix L) and associated timing constraints when conducting splice implosions in the vicinity of identified important wildlife areas. In situations where the noise effect created by implosive splicing is deemed unacceptable, through consultation with landowners/occupants or in discussion with the Lead Activity Inspector and the Environmental Inspector, Wildlife Resource Specialists and the appropriate regulatory authorities, use compression splicing.
Wildlife	20. Consider installing bird flight diverters (*e.g.,* Firefly) along shield wires at locations identified by Wildlife Resource Specialists and the appropriate regulatory authorities. 21. Ensure power line poles or towers are sited outside of the channel width and/or riparian buffer areas of watercourses/wetlands/lakes.
Snowbanks	22. Ensure snowbanks along power line right-of-ways are not greater than 1 m high and preferably not higher than 0.5 m. If banks must be higher, place openings to allow for wildlife passage.
Vegetation Disturbance	23. Reduce clearing of native vegetation, where disturbance to native vegetation cannot be avoided.
Snow Management	24. Store mixtures of snow and soil in a manner that prevents sedimentation of watercourses/wetlands/lakes when the snow melts.
Timber Salvage	25. Salvage merchantable timber, if present, on the power line right-of-way unless timber salvage is otherwise waived by the appropriate regulatory authority.
Grubbing, Non-Merchantable Timber and Slash Disposal	26. Refer to Section 8.0 for protection measures associated with grubbing, non-merchantable timber and slash disposal.
Topsoil or Root Zone Material Salvage	27. Do not salvage topsoil/root zone material from areas of the power line right-of-way where construction activities will not result in extensive mixing of surface and subsoils or excessive damage to the upper soils, as determined by the Lead Activity Inspector and the Environmental Inspector. 28. Salvage all topsoil or the upper 15-20 cm of root zone material, where present and as required, for use during clean-up as directed by the Lead Activity Inspector and the Environmental Inspector. 29. Store all salvaged topsoil and root zone material in windrows along one or both edges of the power line right-of-way in a manner that does not alter natural drainage patterns. 30. Seed the topsoil/root zone material immediately with a cereal grass cover crop species (see Section 8.0), unless otherwise directed by the Lead Activity Inspector and the Environmental Inspector, to reduce the risk of erosion or creation of weed habitat.
Access	31. Use existing access roads and trails, where feasible and safe to do so, rather than develop new access. 32. Adhere to the measures related to access road construction provided in Section 9.0.

11.2 Pole Installation

Introduction

The potential mitigation measures provided are applicable to pole installation during power line construction. The following mitigation measures will be implemented, as warranted, by Trans Mountain, its Contractor and subcontractors.

Objective

The objective of these potential mitigation measures is to avoid or reduce potential adverse environmental effects associated with pole installation during power line construction activities.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Pole Footings	1. Ensure that augur pole holes to the depth provided in the construction specifications are based on the geotechnical investigations.
	2. Provide casing, as required, to prevent the walls from sloughing. Where soil or water control is warranted, a cement form (*i.e.,* Sonotube) may be utilized.
	3. Ensure all loose material is removed from the bottom of the augured hole prior to the installation of the poles.
Lattice Tower Footings	4. This is a place holder should the design show a need for lattice tower structures, which will be determined following preliminary line design.
Subsoil Storage	5. Ensure enough workspace is available (approximately 0.5 m) to allow for the storage of augured subsoil material onto subsoil to reduce the risk of subsoil material sloughing into the hole on cultivated and poorly-sodded tame pasture and hay lands during nonfrozen soil conditions.
	6. Ensure enough workspace is available (approximately 0.5 m) to allow for the storage of augured subsoil material onto unsalvaged topsoil/root zone material to reduce the risk of subsoil material sloughing into the hole on well-sodded tame pasture and hay lands, native grasslands and forested areas during nonfrozen soil conditions.
	7. During frozen soil conditions, ensure enough workspace is available (approximately 0.5 m) to allow for the storage of augured subsoil on a 10 cm buffer of snow, if available, or onto unsalvaged topsoil/root zone material to reduce the risk of subsoil material sloughing into the hole.
Fencing (Lattice Tower Installation)	8. Fence-off open excavations and augured lattice tower footings, if applicable, to protect wildlife and livestock from entering the work area if excavations at lattice tower footings will be left open and unattended for over 24 hours.
Dewatering	9. Dewater the augured hole if warranted, prior to the installation of the pole.
	10. Pump water onto stable and well-vegetated areas, tarpaulins or sheeting in a manner that does not cause erosion or any unfiltered or sediment-laden water to directly re-enter a watercourse/wetland/lake. Place pumps on polyethylene sheeting above the ordinary high water mark of the watercourse/wetland/lake.
	11. Ensure that dewatering points are not located within 50 m of a watercourse/wetland/lake. Dewatering locations must be approved by the Lead Activity Inspector and the Environmental Inspector.

Activity/Concern	Potential Mitigation Measures
Cement Management (Lattice Tower Installation)	12. Isolate work areas in the vicinity of watercourses/wetlands/lakes to ensure water does not experience an increase in alkalinity beyond ambient conditions during construction. 13. Ensure that any concrete, cement, mortars or other lime-containing construction materials are not deposited, directly or indirectly, into or near any watercourse/wetland/lake. All forms, if applicable, shall be examined by a qualified Inspector prior to pour to ensure they are tight. 14. Provide containment facilities for the wash-down water from cement delivery trucks, concrete pumping equipment and other tools and equipment. 15. Report spills of sediments, fines, cement or concrete residue, wash or contact water to the Environmental Compliance Manager to allow Trans Mountain to notify appropriate regulatory authorities. 16. Frequently monitor pH in watercourses immediately downstream of the isolated work site until completion of the cement or concrete residue work if located within 30 m of a watercourse/wetland/lake. 17. Prevent water that contacts uncured or partly cured concrete during activities such as exposed aggregate wash-off, wet curing or equipment washing from directly or indirectly entering a watercourse, watercourse/wetland/lake. 18. Maintain complete isolation of cast-in-place cement and grouting from fish-bearing watercourses for a minimum of 48 hours if the ambient air temperature is above 0°C and for a minimum of 72 hours if the ambient air temperature is below 0°C. 19. Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0, and the turbidity is less than 25 NTU measured to an accuracy of +/- 2 NTU.
Backfilling (Lattice Tower Installation)	20. Use excavated material to backfill the augured tower footings, wherever practical. 21. Ensure sources of imported backfill have been approved by Trans Mountain, landowners/occupants and/or applicable appropriate regulatory authorities prior to hauling to the power line right-of-way. Attempt to schedule delivery of imported fill so it can be directly installed upon arrival at the tower assembly site rather than being temporarily stored on the power line right-of-way prior to being backfilled. 22. Do not backfill within the first 24 hours of cement being poured. 23. Backfill, as directed, by the Lead Activity Inspector and the Environmental Inspector, in consultation with Project engineers, where applicable. 24. Backfill to the surface and mound to allow for drainage away from the tower structure and settlement of soils. Mounding will not exceed 30 cm above grade, where feasible. 25. Avoid scalping sod and/or topsoil/root zone material during backfilling. Use suitable equipment (*e.g.,* clean-up bucket on an excavator) to reduce the potential for scalping. 26. Avoid mixing snow into backfill material.

Activity/Concern	Potential Mitigation Measures
Backfilling (Lattice Tower Installation) (cont'd)	27. Feather-out excess subsoil material across the area where topsoil/root zone material has been salvaged. Avoid mixing topsoil/root zone material and feathered subsoil material. Blend feathered material into the natural grade of the area so as to not change local surface drainage patterns.
Excess Subsoil	28. Dispose of excess subsoil material at locations approved by the Lead Activity Inspector and the Environmental Inspector and the appropriate regulatory authority.
Materials Hauling	29. Confine traffic to the designated power line right-of-way travel lane and the access trails. 30. Refer to Section 8.0 for protection measures associated with topsoil/root zone material salvage and grading if grading of access roads/trails is required or if topsoil/root zone material salvage is warranted due to an anticipated high volume of traffic.
Tower Assembly and Erection	31. Confine lattice tower assembly and erection activities to the allotted facility site or power line right-of-way areas and TWS. Ensure that approval is obtained from the Lead Activity Inspector, the Environmental Inspector and the appropriate regulatory authority before taking additional TWS. 32. Refer to Section 8.0 for protection measures associated with topsoil/root zone material salvage and grading if grading of crane sites is required or if topsoil/root zone material salvage is warranted due to an anticipated high volume of traffic.

11.3 Conductor Stringing

Introduction

The potential mitigation measures provided are applicable to conductor stringing during power line construction. The following mitigation measures will be implemented, as warranted, by Trans Mountain, its Contractor and subcontractors.

Objective

The objective of these potential mitigation measures is to avoid or reduce potential adverse environmental effects associated with conductor stringing during power line construction activities.

Company Measures

The following measure will be the responsibility of Trans Mountain.

Activity/Concern		Potential Mitigation Measures
Sensitive Terrain/Wildlife Habitat	1.	Consider using helicopters to support stringing of conductors over large watercourses/wetlands/lakes (*e.g.* North Thompson River), sensitive terrain and/or wildlife habitat.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern		Potential Mitigation Measures
Surface Conditions	2.	Ensure ground surface is sufficiently dry or frozen to ensure work can continue without causing rutting, compaction, soil pulverization or any other detrimental effects to soils and/or vegetation.
Anchor Pits (Lattice Tower Installation)	3.	Salvage topsoil/root zone material from areas where anchor pits will be excavated and store the topsoil/root zone material separately from material removed to excavate the pit, if applicable.
	4.	Place soil material removed to accommodate plate anchors utilized to secure the conductor during stringing activities adjacent to the site for use during backfilling.
	5.	Remove both screw and plate anchors, where practical, from the power line right-of-way once stringing is completed, if applicable.
	6.	Backfill excavated material into the anchor pit following stringing. Level backfilled material to grade and compact backfilled material to equivalent of adjacent lands off the power line right-of-way areas. Evenly replace topsoil/root zone material upon completion of backfilling.
Sensitive Terrain/Wildlife Habitat	7.	Abide by applicable timing constraints when using helicopters to string conductors through areas with wildlife timing constraints.
Wetlands and Riparian Areas	8.	Consider installing bird deterrents (*e.g.,* avian reflectors, marker balls, swinging markers, flappers) on shield wires (where applicable) in the vicinity of select wetlands and riparian areas to deter birds away from the infrastructure.

11.4 Site Clean-Up

Introduction

The potential mitigation measures provided are applicable to site clean-up following power line construction. The following mitigation measures will be implemented, as warranted, by Trans Mountain, its Contractor and subcontractors.

Objective

The objective of these potential mitigation measures is to avoid or reduce potential adverse environmental effects associated with site clean-up following power line construction activities.

Contractor Measures

The following measures are to be implemented by the Contractor.

Activity/Concern	Potential Mitigation Measures
Scheduling	1. Conduct a rough clean-up of the power line right-of-way if construction activities will cease for an extended period of time following pole installation and before stringing operations will commence.
	2. Commence initial site clean-up immediately following conductor stringing where construction occurred during frozen conditions.
	3. Postpone clean-up work on excessively wet soils until conditions are dry.
	4. Review timing constraints (see Appendix L) applicable to construction related activities prior to scheduling clean-up activities.
Subsoil Compaction	5. Determine locations where subsoil compaction has occurred by comparing compaction levels on and off the power line right-of-way. Sites compared will be in close proximity and have similar drainage, soil moisture, and aspect. Rip compacted subsoils with a multi-shank ripper or breaking disc to a depth of 30 cm or the depth of compaction, whichever is deeper. If soils are moist, postpone ripping of subsoils until soils dry to ensure that the soils fracture when ripped.
Topsoil/Root Zone Material Replacement	6. Replace topsoil/root zone material evenly over all portions of power line right-of-way that have been stripped.
Reclamation	7. Follow the measures provided in the Reclamation Management Plan (see Appendix C).

12.0 REFERENCES

12.1 Personal Communications

TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated into this report.

Dembicki-Lep, C. Plant Programs Specialist Inspector, Canadian Food Inspection Agency. Alberta North Region. Edmonton, AB.

Gregoire, P. Wildlife Biologist, Canadian Wildlife Service, Environment Canada. Edmonton, AB.

Joshi, V. BC Diagnostic Plant Pathologist, Plant and Animal Health Branch, Ministry of Agriculture. Abbotsford, BC.

Kneteman, J. Senior Wildlife Biologist, Alberta Environment and Sustainable Resource Development. Hinton, AB.

Leskiw, J. Supervisor, Agricultural Agronomics, Parkland County. Stony Plain, AB.

Pichette, S. Agricultural Services Co-ordinator, Yellowhead County. Edson, AB.

Surgenor, J. Wildlife Biologist, BC Ministry of Forests, Lands and Natural Resource Operations. Kamloops, BC.

Wilkinson, L. Species at Risk Biologist, Alberta Environment and Sustainable Resource Development. Edson, AB.

Wilson, J. Special Projects Officer, Canadian Wildlife Service, Environment Canada. Delta, BC.

Wind, E. Wildlife Biologist, E. Wind Consulting. Nanaimo, BC.

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APPENDIX A

CHECKLIST

(PLACE HOLDER – To be developed prior to construction)

APPENDIX B

CONTINGENCY PLANS

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1.0 CONTAMINATION DISCOVERY CONTINGENCY PLAN

Recognition and Response

Identification of Contamination

Soil, surface water and groundwater contamination can be recognized by one or more of the following:

- hydrocarbon odor;
- visual sheen;
- visual free product (oil or other product); and/or
- visual staining.

Work will be stopped immediately if contamination is identified during the construction phase of the facilities and/or associated components.

Notification Framework

Upon the identification of contamination, work will cease immediately and the onsite supervisor and the Lead Activity Inspector will be notified. The Lead Activity Inspector or will notify the Environmental Compliance Manager, without delay, of the discovery. The Environmental Compliance Manager will ensure the timely notification to the appropriate federal/provincial regulatory authority and the NEB.

Health and Safety

The health and safety of personnel and public is the first priority upon discovery of previously unknown contamination. Contractors and personnel onsite will suspend all work in the immediate area, shut equipment down and immediately notify the onsite supervisor, the Lead Activity Inspector and Environmental Compliance Manager. Appropriate personal protective equipment, including respiratory protection, will be worn and all reasonable measures will be taken to ensure that health and safety of anyone in the immediate area is preserved. Personnel and Contractors will employ all measures and requirements outlined in KMC's Environment, Health and Safety Policy as well as any measures or requirements outlined by Trans Mountain.

Interim Mitigation

The Lead Activity Inspector and the Environmental Compliance Manager must be consulted when determining what mitigation measures may be required and employed. In all instances, the migration of the contamination will be reduced. Mitigation measures may include:

- segregating contaminated soil for later sampling/analysis and disposal;
- placing any contaminated soil onto an impermeable surface;
- in cases where precipitation may cause runoff, contaminated soil will be covered with an impermeable cover;
- in cases where runoff is imminent, berms can be constructed to control runoff;
- stopping contaminated water discharge; and
- storing contaminated water in tanks for later sampling/analysis and disposal.

Contamination Management Requirements

Excavations in which contaminated soil or groundwater has been discovered must not be backfilled until authorization has been given by the Construction Manager and the Lead Activity Inspector or by the Environmental Compliance Manager.

Contaminated soil and water must not be transported off-site or disposed of until analytical results have been received as per federal and provincial regulations and legislation. The Construction Manager and the Lead Activity Inspector or the Environmental Compliance Manager will provide notification as to when excavations can be backfilled.

2.0 FIRE CONTINGENCY PLAN

Fire Prevention Measures

The Contractor will develop a Fire Contingency Plan (Volume 4C, Section 5.2.7) and a Fire Prevention Plan (Volume 4C, Section 5.2.8) with minimum guidelines in the TMEP Health and Safety Management Plan. This plan will be used in conjunction with the Fire Contingency Plan and the Fire Prevention Plan during all phases of construction.

The following standard measures will be adhered to during construction of facilities and associated components (*i.e.*, borrow sites, temporary access roads and TWS).

- Prior to commencement of construction, the Contractor will designate one of his staff as Fire Boss. The Fire Boss will be familiar with fire suppression techniques, equipment and procedures.
- The Lead Activity Inspector and Contractors' vehicles will carry firefighting equipment such as pulaskis, shovels, backpack pumps or components of a water delivery system (pump and hose) in sufficient quantities so that each worker has access to at minimum, one hand tool with which to carry out fire suppression work. 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.
- The Fire Boss will ensure that equipment is cleaned periodically to reduce the build-up of debris in areas which could pose a fire hazard such as the belly pans of crawler tractors.

In the Event of a Wildfire

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

- Commence fire suppression measures immediately upon detection of a fire provided that current fire behaviour allows personnel to safely proceed.
- Report location of fire as well as size, wind direction, fuels burning and immediate values at risk to the Fire Boss.
- The Fire Boss will report all wildfires immediately and relay general fire information to the appropriate provincial or municipal responding authority.
- All equipment and personnel shall be made available to control the fire. Suppression efforts will take into consideration fire behaviour, safety, training, and fitness of personnel as well as equipment availability.
- The Fire Boss will inspect the fire as soon as possible and take charge of directing suppression measures until relieved by a responding authority official.
- 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.
- Fire suppression efforts shall continue until the fire is extinguished or until otherwise notified by the appropriate jurisdictional authority (*i.e.*, applicable municipality, AESRD, or British Columbia Forest Service [BCFS]).
- The Fire Boss will ensure that all burning embers are extinguished and will monitor burn area for smouldering material. If available, employ infrared scanning equipment to detect any residual hot spots.

To Report a Wildfire:

Alberta	310-FIRE (3473)
British Columbia	800-663-5555 (or *5555 on most cellular networks)

General Fire Information

When a fire is encountered adjacent to or within the vicinity of the facility footprint, make note of the following fire and site conditions prior to reporting the fire:

- crew contact information;
- location of the fire;
- fuel the fire is burning in (trees, grass, etc.);
- approximate size of the fire;
- how quickly the fire is spreading;
- colour of the smoke;
- values at risk (lives, structures, etc.); and
- local weather (temperature, local wind speed and direction, etc.).

3.0 HERITAGE RESOURCES DISCOVERY CONTINGENCY PLAN

Note: Personnel are NOT permitted to collect and/or keep any artifacts. All heritage resources identified must be catalogued, collected by Trans Mountain and submitted to the appropriate regulatory authority.

The following procedures provide contingency measures for the discovery of heritage resources prior to and during construction of facilities and associated components (*i.e.*, borrow sites, temporary access roads and TWS).

Heritage Resources Discovery Prior to Construction

In the event that heritage resources are discovered during the Archeological Impact Assessment (AIA)/Historical Resource Impact Assessment (HRIA), implement the measures listed below.

- Assess the potential effects of the operation or activity on the identified heritage resource.
- Prepare and submit a report containing the assessment of the effects of the operation or activity described above to the NEB and/or the appropriate regulatory authority in accordance with the permit.
- Conduct all salvage, preservation or mitigation measures or any other action deemed appropriate by BC Archaeology Branch or Alberta Culture and/or appropriate regulatory authority.

Prior to construction of the Project, the AIA/HRIA will specify mitigation measures to be implemented at each identified heritage resource site. Mitigation measures to be implemented will be provided in Appendix M (Heritage Resources [Resource-Specific Mitigation]), on the Environmental Facility Drawings or will otherwise be communicated to the Contractor to ensure their implementation.

The mitigation measures that may be implemented include the following.

- Avoid the site by amending the development footprint, clearly mark these sites using fencing or flagging.
- Mitigate the site; collect the artifacts, map, photograph, document and complete an Archaeological Site Inventory Form.
- Have a qualified Heritage Resource Specialist present to monitor topsoil/root zone material salvage and grading operations.
- Install matting to protect the site.
- Conduct an excavation to retrieve scientific information and establish an adequate record of the site according to applicable heritage resources guidelines.

Heritage Resource Discovery During Construction

In the event that heritage resource sites are discovered during construction of the facilities or associated components, implement the measures listed below.

- Suspend work immediately in the vicinity (*i.e.*, within 30 m) of any newly identified archaeological, palaeontological or historical resource sites (*e.g.*, modified bone, pottery fragments, fossils, etc). Work at that location may not resume until the measures below are implemented. Clearly mark the site using fencing and flagging.
- Notify the Environmental Inspector, who will notify the Construction Manager and a qualified Heritage Resource Specialist and, if warranted, the appropriate regulatory authority. If an organic specimen is discovered in frozen ground, the Environmental Inspector will attempt to preserve the frozen state until the Heritage Resource Specialist is onsite or has been contacted.

- A qualified Heritage Resource Specialist will develop, if warranted, an appropriate mitigation plan in consultation with the Environmental Inspector, the Construction Manager, and/or appropriate regulatory authority, as well as the applicable Aboriginal representatives. The mitigation measures available include those listed below:

  - Site avoidance - may include amending the development footprint or temporarily covering the site using matting or subsoil ramps.

  - Systematic data recovery - scope of work may range from artifact collection, mapping and site documentation, to salvage excavations.

  - Surveillance/monitoring - assign a qualified Heritage Resource Specialist to monitor the remainder of the topsoil/root zone material salvage and grading operations in the vicinity of the discovery.

Human Remains Discovered During Construction

In the event that human remains are discovered during construction of facilities and/or associated components, implement the measures listed below.

- Suspend work immediately in the vicinity of any newly identified human remains. Work at that location may not resume until the measures below are implemented.

- Notify the Lead Activity Inspector, who will notify the Construction Manager and a qualified Heritage Resource Specialist as well as the local police and appropriate regulatory authority.

- If there is potential for disturbance to the site due to trafficability or high public visibility, assign employees to stand watch until a qualified Heritage Resource Specialist arrives.

- Stake or flag off the location to prevent further disturbance.

- Cover any exposed bones with clean plastic sheeting, tarpaulin, blanket or other covering until a qualified Heritage Resource Specialist is present.

- Do not backfill. If excavated fill has been loaded into a truck, empty the excavated fill at a nearby secure location for a qualified Heritage Resource Specialist to inspect.

- The Contractor will only resume work in that area once the archaeological and forensic studies are complete, clearance has been granted by the appropriate regulatory authority, and Trans Mountain has been advised that work can continue.

4.0 RARE ECOLOGICAL COMMUNITIES OR RARE PLANT SPECIES DISCOVERY CONTINGENCY PLAN

In the event that potential ecological communities or rare plants (vascular plant or bryophyte [moss or liverwort]), or lichens are discovered on or within 30 m of the facility construction and/or associated components (*i.e.*, borrow sites, temporary access roads and TWS footprint, follow the measures outlined below:

- Notify the Environmental Inspector.
- Note the location of the potential rare plant, lichen or ecological community relative to the facility.
- Send a photograph of the potential rare element and any additional details regarding the element and the site to a qualified Vegetation Resource Specialist.
- If feasible, avoid further disturbance to the location or within 30 m of the location until a qualified Vegetation Resource Specialist has been consulted.
- A qualified Vegetation Resource Specialist may deem it necessary to visit the site and will, regardless of whether a site visit is warranted, determine if site-specific mitigation is required. The Vegetation Resource Specialist will then develop an appropriate site-specific mitigation plan in consultation with Trans Mountain following the Rare Ecological Community and Rare Plant Population Management Plan (see Appendix C).

5.0 SOIL EROSION AND SEDIMENT CONTROL CONTINGENCY PLAN

Where soil erosion by wind or water is evident during construction of facilities and/or associated components (*i.e.*, borrow sites, temporary access roads and TWS, all necessary Contractor equipment and personnel will be made available to control the erosion. During the construction phase, the Lead Activity Inspector in consultation with the Environmental Manager, Environmental Compliance Manager and, if required, the NEB, will determine appropriate procedures to be implemented to control soil erosion and other soil handling problems encountered. The Lead Activity Inspector will notify the NEB as soon as practical that contingency measures have been implemented. A record will be made of the location, timing, reason for implementation and measures implemented.

One or more of the following erosion control options listed below will be implemented, if warranted, where soil erosion is observed. Similar procedures to control erosion will be followed during the operational phase.

Water Erosion

- Shut-down construction until the risk of erosion has been reduced or conditions improve.
- Install sediment fences near the base of slopes.
- Construct/install temporary berms of subsoil, logs, coir logs, sandbags, or straw bales during construction activities.
- Salvage topsoil/root zone material and store away from the area to be regraded.
- Construct temporary cross ditches if approved by landowner and is practical for the area.
- Construct temporary and/or permanent diversion berms if approved by landowner and is practical for the area.
- Re-grade rills and gullies.
- Replace salvaged topsoil/root zone material.
- Implement one or a combination of the following long-term mitigation techniques, as warranted:
  - Construct cross ditches and berms decreasing the spacing on steeper slopes or on more erodible soils.
  - Armour the upslope face of berms with coir matting or erosion control blanket, logs or sandbags.
  - Import small diameter slash then roll back and walk down.
  - Apply erosion control blanket, mulch or tackifier to hold soil.
  - Reseed and hand rake an annual cover crop, hydroseed or apply seed and install erosion control blankets.
  - Transplant native shrubs, install willow stakes (or use other bioengineering techniques) or rooted stock plants.

Wind Erosion

Topsoil/Root Zone Material

- Shut-down or relocate construction activities until winds dissipate and conditions improve.
- Consider using the following techniques if wind erosion of the topsoil/root zone material windrow is of concern:
  - Apply water to the topsoil/root zone material windrow.

  - Windrow snow over the topsoil/root zone material windrow.
  - Tackify (at rate recommended by the distributor) the topsoil/root zone material windrow.
  - Cover the topsoil/root zone material with a geotextile material and anchor the fabric.
  - Pack the topsoil/root zone material windrow with suitable equipment.

- Consider using the following techniques if wind erosion is of concern after topsoil/root zone material replacement:
  - Seed with cereal or short-lived perennial grass cover crop species.
  - Conduct straw crimping (contact Agricultural Fieldman or Crop Specialist [Alberta] or the BC Ministry of Agriculture Representative [BC] for local, high quality straw suppliers).
  - Apply hydromulch or tackifier.
  - Use a packing roller (*e.g.,* Accuroller) to lightly compact sandy or pulverized soils.
  - Import small diameter slash for use as rollback.
  - Walk down slash.
  - Apply locally available manure and cultivate.
  - Install wind fences.

6.0 SOIL HANDLING CONTINGENCY PLAN

During construction of facilities and associated components (*i.e.*, borrow sites, temporary access roads and TWS), the following problems may arise which may result in loss of soil productivity if not addressed. Mitigation measures are suggested below, which may lessen the effects of the identified conditions/concerns associated with construction.

Little or no Topsoil on Cultivated Lands

- Salvage surface soils to colour change or to 10-15 cm, whichever is greatest.

Little or no Topsoil on Native Grassland, Tame Pasture or Hay Lands

- Salvage surface soils to colour change or to 10-15 cm, whichever is greatest.

Stony Subsoils or Topsoil/Root Zone Material

- Attempt to use conventional equipment to salvage topsoil/root zone material.
- Employ excavator if above measures are ineffective.

Shallow Bedrock

- Import additional or replacement backfill if warranted from locations approved by the appropriate regulatory authority.

Soil Handling Measures

- Salvage extra width of topsoil/root zone material if storage of extra subsoil is required.

Uneven Boundary Between Topsoil/Root Zone Material and Subsoil

- Utilize equipment capable of fine depth adjustments when salvaging topsoil/root zone material.

Uneven Surface on Native Grassland, Hay or Tame Pasture Lands

- Consider salvaging topsoil on an area for the subsoil storage pile on hay and tame pasture.
- Use equipment with fine depth control to backfill subsoil that is in contact with sod layer.
- Consider use of prairie protector on clean up bucket or grader blade.
- Minimize scalping of sod layer.

7.0 SPILL CONTINGENCY PLAN

The Construction Manager or designate, and the Lead Activity Inspector and the Environmental Inspector will immediately notify Trans Mountain via the 24-hour Emergency Line, which is operated by KMC, and the Environmental Compliance Manager will notify the appropriate federal/provincial regulatory authority as required by law when a reportable event occurs during the construction of any component of the TMEP. If this is not possible, notification will be made as soon as practical.

Spills may need to be reported to provincial regulatory authorities, when applicable. The timeline in which the reporting is to take place is dependent on the size of the spill. An immediately reportable spill (major spill) is defined as a release of a substance that is likely to be an imminent environmental or human health hazard and/or meets or exceeds reportable volumes. Major spills will be immediately reported to the appropriate federal/provincial regulatory authority by the Environmental Compliance Manager. Any spills with volumes that are not immediately reportable (minor spills) are not required to be immediately reported to the applicable federal/provincial regulatory authority. Rather, these spills will be tracked and documented by the Environmental Inspectors and submitted to Trans Mountain for inclusion in their spill-tracking databases.

If there is any doubt that the quantity spilled exceeds reportable levels, the spill will be reported to Trans Mountain via the 24-hour Control Centre Emergency Line who will determine if the spill should be reported to the appropriate federal/provincial regulatory authority. Crucial information that will be provided to the 24-hour Control Centre Emergency Line, if feasible, includes: name and telephone number of the caller, date and time of the call, material(s) spilled, location of the spill, estimated quantity spilled, cause of spill, actions taken to-date, assistance required, injuries, and weather conditions (KMC 2012a,b).

In Alberta, a reportable spill is defined by the Alberta *Environmental Protection and Enhancement Act* as:

- the release has caused, is causing or may cause impairment of or damage to the environment, human health or safety, or property;
- the amount exceeds the quantities or emission levels set out for the substance (see MSDS);
- the release is into a watercourse or into the groundwater or surface water in any quantity; and/or
- the release is 200 L or more (Transport Canada 1992 immediate reporting quantity for flammable liquids [class 3]).

In BC, a reportable spill is defined by the BC *Environmental Management Act* as:

- a release of 100 L or more (BC MOE).

Any sites contaminated by a spill will be assessed, remediation will be designed and disposal sites will be identified in accordance with the NEB Remediation Process Guide (2011). This document will be provided to the Construction Manager or designate, and the Lead Activity Inspector and the Environmental Inspector as part of the Environmental Education Program. Emergency contacts are presented in Appendix D.

7.1 Introduction

Guidelines for the safe handling, storage, use and disposal of potentially hazardous materials as well as spill prevention measures and guidelines for the refuelling and servicing of equipment are provided in Trans Mountain's Waste Management Standard provided in Appendix C.

7.2 General Measures

The following are general measures to be adhered to during construction of the TMEP:

- Appropriate spill equipment will be maintained at all work sites. The risk potential for site-specific spills will be used to determine the appropriate type of response equipment to be stored onsite and suitable location for storage.

- Specific instructions regarding applicable contacts and appropriate response actions to be taken in the event of a spill will be posted in the field construction offices.

7.3 Initial Response

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

- Ensure personal safety and the safety of others onsite and don appropriate personal protective equipment. In the event of a spill of a hazardous material, the first person on the scene will execute the actions presented in the Spill Scene Checklist (Attachment B2).

- When notified of a spill, the Construction Manager, or designate, or the Environmental Inspector will immediately ensure that:

  - Action is taken to control danger to human life;

  - An onsite Emergency Response Coordinator is designated;

  - The appropriate provincial disaster services, local police and/or RCMP, and emergency services have been notified through KMC's call down system.

  - The necessary equipment and personnel are mobilized, and measures are being implemented to stop the source of the spill, if safe to do so, and commence clean-up.

  - Trans Mountain is immediately notified of the spill via the 24-hour Control Centre Emergency Line; and the Environmental Compliance Manager will immediately notify applicable provincial and federal regulatory authorities, and the NEB of the spill.

- The Contractor will make all resources available to contain and clean-up the spill.

- Once the emergency contacts are made and the initial efforts to contain and clean-up the spill are underway, Trans Mountain will notify the Project's Environment Compliance Manager.

7.4 General Spill Containment Procedures

The successful containment of a spill on land or water depends on a variety of factors including: ground cover and 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 spills for hazardous materials.

- Ensure personal safety and safety of others onsite. The first person on the scene will execute the actions listed in the Spill Scene Checklist.

- Assess the safety hazards of the situation and don appropriate personal protective equipment.

- Remove sources of ignition, if safe to do so.

- Identify the product, stop source and physically contain spill as soon as safe to do so.

- Avoid use of water or fire extinguishing chemicals on non-petroleum product spills 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.

- Minimize traffic on contaminated soils.

- 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 will be necessary on water.

- Clean-up will not be attempted without advice from the Environment Manager.

7.4.1 Spills Occurring During Transportation

The general guidelines listed below will be followed for the containment of materials spilled during transportation.

- Contain spilled product.

- Pump tanker truck or transportation vessel dry (into appropriate containers).

- Remove tanker truck or transportation vessel from site.

- Recover spilled product.

- Clean up contaminated area.

- 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. Repeat as required.

7.4.2 Spills Adjacent to or into a Watercourse or Wetland

The general guidelines listed below will be followed for spills adjacent to or into a watercourse or wetland.

- Construct berms and/or trenches to contain spilled product prior to entry into a watercourse or wetland.

- Deploy booms, skimmers, sorbents, etc., if feasible, to contain and recover spilled material from a watercourse or wetland.

- Pick up spilled product.

- Clean up contaminated area including downstream shorelines.

- Dispose of heavily contaminated soil and vegetation at an approved facility. On lightly contaminated soil areas consider in situ restoration where feasible; fertilize and then cultivate beyond depth of contamination. Repeat as required.

7.4.3 Spot Spills

Effects from small spot spills can generally be reduced and will not result in the suspension of activities if appropriate actions are implemented, All small spills of fuels or hazardous materials must be reported immediately to an Environmental Inspector.

- An Environmental Inspector, in consultation with the Environment Lead, will determine appropriate methods to remove or reclaim contaminated soils. Soil and vegetation heavily contaminated with petroleum products will be disposed of at an approved facility.

- Locations where spot spills occur are to be recorded to ensure that post-construction environmental monitoring of the site can be conducted, if warranted.

- In lightly contaminated soil areas where in situ restoration is feasible; soil will be fertilized, incorporated by hand or cultivated to a depth below the depth of contamination, then repeated as required.

8.0 TRADITIONAL LAND USE SITES DISCOVERY CONTINGENCY PLAN

8.1 Traditional Land Use Sites Identified Prior to Construction

In the event that Traditional Land Use (TLU) sites are identified during supplemental studies with Aboriginal representatives prior to facility construction or associated components (*i.e.*, borrow sites, temporary access roads and TWS), the sites will be assessed and appropriate mitigation measures will be determined. The TLU site will be assessed based on the criteria as follows:

- the location of the TLU site with respect to the area of development;
- the relative importance of the TLU site to the community; and
- the potential for an alteration of construction activities to reduce or avoid sensory disturbance.

The types of accepted mitigation listed below have been successful in mitigating effects on TLU sites. Alternative site-specific mitigation strategies may also be recommended by communities. The mitigation measures that may be implemented will be dependent on the type of site identified.

Hunting

Hunting and wildlife sites are areas where large mammals such as elk, moose, deer, caribou and bear are commonly harvested. Key wildlife species 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:

- adhering to species-specific timing constraints, to the extent feasible; and
- limiting the use of chemical applications.

Trapping

Aboriginal communities continue the practice of trapping and snaring for food and pelts. These traps and snares may or may not be located within registered trap lines.

To avoid accidental damage where the pipeline transects a trap line, mitigation measures may include:

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

Fishing

The practice of traditional fisheries relate to the species harvested, fishing techniques, and the nature of specific reaches of watercourses/wetlands/lakes. Fishing methods may include but are not be limited to: angling, gigging, spear-fishing, dip netting, gill netting, and the construction and use of fish traps and weirs. While fishing activities vary with changes in seasonal water flow and variation in fish stocks, fisheries often exhibit habitual repeated use. Fishing areas include watercourses/wetlands/lakes often in proximity to staging areas and/or access points to the waters. Secondary fishing activities relate to the processing of harvests, and may include processing yards, smokehouses, drying racks, and fish-grease rendering features.

Standard and effective mitigation measures for fishing areas may include:

- recording and mapping of fishing locales; and

- strict adherence to the regulations, standards and guidelines set by provincial and federal regulatory authorities for watercourse crossings.

Plant Gathering

Many Aboriginal communities harvest medicinal, ceremonial and food source plants. Plants are gathered in a variety of environments, which include old 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.

Standard and effective mitigation measures for areas where traditional plants are identified may include:

- limiting the use of chemical applications;
- replacement of plant species during reclamation; and
- avoidance of the site.

Trails and Travelways

Travel corridors are essential for conducting traditional activities and accessing cultural landscape features. Trails include well-defined all-terrain vehicle and snowmobile corridors, navigable waterways, river portages and historic foot, dog sled and pack horse pathways.

Successful and proven mitigation measures available to trails transecting the facilities and/or associated components construction footprint include:

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

Habitation Sites

Habitation sites 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 structures, 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 mitigation measures for habitation sites include:

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

Gathering Places

Aboriginal communities often gather to share in ceremonial activities, exchange items of trade, arrange and celebrate marriages and for other activities as well. In addition, 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 effect will be assessed in the field and mitigation measures will be refined and optimised, if warranted.

Sacred Areas

Sacred 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.

Mitigation measures for sacred areas may include detailed recording, mapping and avoidance however, additional mitigation measures, if warranted, will be refined and optimised in the field and through community discussions.

8.2 Traditional Land Use Sites Discovered During Construction

In the event that sacred TLU sites are identified during the construction of facilities and/or associated components, the following measures will be implemented.

- Suspend work immediately in the vicinity of any newly discovered sacred site. Work at that location may not resume until the measures below are conducted.
- Notify the Lead Activity Inspector, who will notify the Construction Manager, the Environmental Manager, the Aboriginal Manager and a qualified Heritage Resource Specialist.
- A qualified Heritage Resource Specialist will assess the site and develop an appropriate mitigation plan using the information listed above.
- Any potentially-affected Aboriginal community will be informed of the discovery and the mitigation to be implemented.

9.0 WET/THAWED SOILS CONTINGENCY PLAN

Trans Mountain will assign an Environmental Inspector with sufficient training and soils-related experience to identify soils that are too wet for a particular activity, and when the soils are sufficiently dry to allow the activity to resume. The decision to continue or suspend particular facility construction activities on lands with excessively wet/thawed soils will be made by the Construction Manager in consultation with the Lead Activity Inspector. A record of the location, timing and reason for implementation of the Wet/Thawed Soils Contingency Plan will be maintained by the Lead Activity Inspector.

The Lead Activity Inspector and the Environmental Inspector will be responsible for monitoring and ensuring that all procedures are implemented, and will liaise with the NEB to obtain input. Therefore, if necessary, a meeting will be held in the field to ensure that all parties involved mutually understand the concerns.

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

Contingency measures will be implemented, if warranted, if one of the following indicators occurs:

- rutting of topsoil/root zone material to the extent that admixing may occur;
- excessive wheelslip;
- excessive build-up of mud on tires and cleats;
- formation of puddles; and/or
- tracking of mud as vehicles leave the facility.

Where construction activities have the potential to, or are causing the aforementioned issues, the Lead Activity Inspector will suspend that phase of the construction activity until soil conditions dry out/freeze, or effective mitigation procedures have been implemented.

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

Wet Soil Contingency Measures

- Salvage topsoil/root zone material from the facility footprint to prevent mixing and rutting (note that topsoil/root zone material salvage cannot be conducted when soils are excessively wet).
- Delay construction until soils dry out.
- Restrict construction traffic, where feasible, to equipment with low ground-pressure tires or wide pad tracks.
- Prevent rubber-tired traffic from driving on the facility and associated components construction footprint.
- Postpone work in highly sensitive areas and shift effort to low sensitivity areas.
- Restrict work to non-problem areas, such as well-drained soils, until conditions improve.
- Salvage an additional width of topsoil/root zone material in potential problem areas; note that topsoil/root zone material salvage will not be permitted during wet soil conditions.

- Install geotextiles or matting in problem areas.

- Suspend construction activities and traffic in areas (outside of the development zone) with wet soil conditions until the soils dry out. Suspension of construction activities on the facility and/or associated components construction footprint will be based on discussions between the Construction Manager and the Lead Activity Inspector and the Environmental Inspector, the Contractor, and, if warranted, the NEB. Recommencement of work once soils dry out or freeze must be authorized by the Construction Manager, in consultation with the Lead Activity Inspector.

Thawed Soil Contingency Measures

- Restrict construction traffic, where feasible, to equipment with low ground-pressure tires or wide pad tracks.

- Prevent rubber-tired traffic from driving on the facility and associated components construction footprint.

- Restrict work to non-problem areas, such as frozen or well-drained soils, until conditions improve.

- Limit construction activities and traffic, if thawed ground conditions are encountered, to the evening or early morning when the ground is frozen.

- Install geotextiles or matting in problem areas.

- Employ frost inducement measures such as snow packing or plowing to increase the load-bearing capacity of thawed ground.

- Salvage topsoil/root zone material from the facility footprint and associated components to prevent mixing and rutting (note that topsoil/root zone material salvage cannot be conducted when soils are excessively wet).

- Suspend construction activities and traffic in areas with thawed soils until the soils dry out or refreeze.

If the indicators of excessively wet/thawed soil conditions previously noted above are not evident, soils will be considered dry enough to resume activity.

Partial Suspension of Construction Activities and Traffic

The primary concern during wet/thawed soil conditions is the potential for rutting, compaction and loss of soil structure in the topsoil/root zone material. Depending upon the land use and width of topsoil/root zone material salvage conducted, some construction activities and traffic may be conducted during wet/thawed soil conditions while others are suspended. Criteria to be used in determining whether activities will be suspended during wet or thawed soil conditions or thawed soil conditions, respectively are provided in Tables B.9-1 and B.9-2.

TABLE B.9-1

CRITERIA FOR THE SUSPENSION OF ACTIVITIES DUE TO EXCESSIVELY WET OR THAWED SOIL CONDITIONS

Land Use	Topsoil/Root Zone Material Salvage Status	Construction Activity	Suspend Activity for Environmental Issue?
All Agricultural and Forested	No salvage conducted	Various	Yes
	Full development zone salvage conducted at facility site	Various	No
	Full right-of-way or travel lane and work area salvage conducted on power line right-of-way	Various	No
	Topsoil/root zone material replaced	Various	Yes, limited to ATV and foot traffic

10.0 WILDLIFE ENCOUNTER CONTINGENCY PLAN

Follow the measures provided below in the event of an encounter with wildlife during construction of facilities and/or associated components (*i.e.*, borrow sites, temporary access roads and TWS) either at the construction site or on the commute to and from the construction site.

- Report any incidents (*e.g.*, aggressive behaviour, nuisance behaviour, obtained food or garbage) with wildlife to the Environmental Inspector who will immediately notify the appropriate regulatory authority and, if warranted the local police detachment (see Appendix D for applicable contacts).

- Report any trapped, injured or dead animals onsite to the Environmental Inspector who will notify the appropriate regulatory authority to consult on appropriate action.

- Report the location and details of collisions with wildlife to the Environmental Inspector, who will notify the appropriate regulatory authority and, if warranted, the local police detachment (see Appendix D).

- Once the preceding contacts have been made, the Lead Activity Inspector will also contact the Safety Manager, who will in turn communicate the information to the Construction Manager.

- The Environmental Inspector will document all wildlife encounters during construction in a detailed record. This record will include, at a minimum: date; weather conditions; location; wildlife species encountered; the type of encounter (*e.g.*, passive, aggressive, etc.); and, if applicable, any actions taken by Project staff to address the situation. Wildlife encounter records will be kept on file by Trans Mountain and provided to the appropriate regulatory authority and Aboriginal communities upon request.

11.0 WILDLIFE SPECIES OF CONCERN DISCOVERY CONTINGENCY PLAN

The following procedures provide contingency measures for the discovery of wildlife species of concern prior to and during construction of facilities and associated components (*i.e.*, borrow sites, temporary access roads and TWS). Wildlife species of concern can include provincial or federally-listed species.

Wildlife Species of Concern Discovery Prior to Construction

In the event that wildlife species of concern or their site-specific habitat is discovered during wildlife or other studies on the facility footprint and/or associated components, the discovery will be assessed and appropriate mitigation measures will be determined by a qualified Wildlife Resource Specialist as identified in Appendix L. The wildlife or habitat will be assessed based on the following criteria:

- the location of the wildlife or habitat features with respect to the area of development;
- the presence of topographic features or vegetation to effectively screen the wildlife or habitat from construction activities;
- the timing of construction versus the critical timing restraints for the species; and
- the potential for an alteration of construction activities to reduce or avoid sensory disturbance.

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

- abide by seasonal timing constraints and the recommended setback distances;
- abide by daily timing restrictions for construction activities;
- narrow down the area of disturbance and protect the site using fencing or clearly mark the site using flagging (see Drawing [Narrow Down Fencing] provided in Appendix R);
- inform all users of access restrictions in the vicinity of flagged or fenced sites;
- realign the route (*i.e.*, access roads) or shift the development (*i.e.*, ancillary site) within the facility footprint, to avoid the site;
- install nest boxes or platforms or otherwise replace or enhance habitat during reclamation; and
- with the appropriate permit and/or regulatory consent, relocate individuals (*i.e.*, amphibians) or features (*i.e.*, unoccupied stick nests), if practical, and monitor the post-construction response.

The locations of important wildlife and wildlife habitat encountered on the facility footprint and/or associated components and appropriate mitigation to be implemented at each known site will be identified in Appendix L and the Environmental Facility Drawings. Appendix L and the Environmental Facility Drawings will be amended to reflect important wildlife environmental features on or in the vicinity of the facility and/or associated components of the construction footprint and will incorporate any new discoveries prior to construction.

Wildlife Species of Concern Discovery during Construction

The discovery of wildlife species of concern or their site-specific habitat is discovered during construction of the facility and/or associated components will be assessed and appropriate mitigation measures from the list provided above will be determined.

Wildlife species of concern and their habitat characteristics that have the potential to occur within the facility and/or associated components footprint will be identified to the Contractor and Inspection staff through the Environmental Education Program. The Environmental Inspector will be provided with detailed information on identifying wildlife species of concern and their site-specific habitat.

The measures outlined below will be followed in the event that wildlife species of concern or their site-specific habitat are discovered during the construction of facility and/or associated components.

- Suspend work immediately in the vicinity of any newly discovered wildlife species of concern. Do not resume work at that location until the measures below are implemented.
- Notify the Environmental Inspector who will notify the Construction Manager.
- The Lead Activity Inspector will assess the discovery and either allow construction to resume or, in the event of a confirmed or potential discovery, proceed by notifying:
  - The appropriate regulatory authority.
  - A qualified Wildlife Resource Specialist.

A qualified Wildlife Resource Specialist will assess the discovery and determine the appropriate mitigation measures to be implemented in consultation with the Environmental Manager and the appropriate regulatory authority. The Wildlife Resource Specialist will visit the site, if warranted.

ATTACHMENT B1

NATIONAL ENERGY BOARD DETAILED INCIDENT REPORT

National Energy Board
Calgary, Alberta

Appendix 1
DETAILED INCIDENT REPORT

Type or print in black pen

Board Use Only

NEB Incident No. _____ Date Received _____ NEB Investigator _____

Investigator's Comments _____

_____

_____

Secretary
National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta T2P 0X8 • Fax: (403) 292-5503

PART A - OPERATOR INFORMATION

Name of Company _____

Address of Company _____

_____

Pipeline Name _____

PART B - TIME, WEATHER AND LOCATION OF INCIDENT

Date *(month)* _____ *(day)* _____ *(year)* _____

Hour *(24 hour system & time zone)* _____

Weather *temperature*: *^{0}C precipitation*: _____ *windspeed & direction*: _____

CSA Class Location ☐1 ☐2 ☐3 ☐4

Location (provide specific location using a chainage description (MLV, kmP), land survey description or prominent landmarks)

_____

_____

_____

_____

PART C - ORIGIN OF SPILL/RELEASE

Facility Involved:

☐ Line Pipe ☐ Tank Farm ☐ Pump Station ☐ Compressor Station ☐ Regulator/Meter Station ☐ Gas Plant

☐ Other Related Facility *(specify)* _____

Equipment Involved:

☐ Pipe ☐ Valve ☐ Pressure relief device ☐ Fitting ☐ Compressor ☐ Pump ☐ Pressure vessel ☐ Tank

☐ Instrumentation

☐ Other *(specify)* _____

PART D - SPILLS AND RELEASES *(Report LVP and HVP spills only if in excess of 1.5 m^3)*

☐ Gas ☐ LVP ☐ HVP ☐ Toxic Substance

Name of product/substance _____

Volume spilled/released _____ m^3 Volume recovered _____ m^3

Was there a fire? ☐ Yes ☐ No Was there an explosion? ☐ Yes ☐ No

PART E - IMMEDIATE CAUSE FOR INCIDENTS ON OPERATING PIPELINES (*Immediate Cause: means unsafe acts or unsafe conditions*)

☐ Failed pipe ☐ Operator personnel error ☐ Other *(specify)* _____

☐ Failed weld ☐ External loading or natural forces Refer to Part H

☐ Corrosion Refer to Part G ☐ Equipment malfunction/failure Refer to Part I

PART F - LINE PIPE DATA

Type of Failure _____

Nominal Diameter (mm) _____ Wall Thickness (mm) _____ Date of Manufacture _____

Weld Process _____ SMYS (MPa) _____

Pipe Specification ☐ Z 245 ☐ Other *(specify)* _____ Pipe Location: ☐ Below Ground ☐ Above Ground

Maximum Operating Pressure (kPa) _____ Pressure at Time of Incident (kPa) _____

Latest Presure Test Date _____ Maximum Test Pressure (kPa) _____ Test Duration (hrs) _____

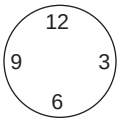
PART G - CORROSION FAILURES

Corrosion location: ☐ Internal ☐ External

Type of Corrosion *(specify)* _____

Type of Coating _____

Circumferential Position Looking Downstream (mark an X)



PART H - FAILURES DUE TO EXTERNAL LOAD OR NATURAL FORCES

☐ Damage by operator or its contractor ☐ Damage by other parties ☐ Earth movement ☐ Lightning/Fire

☐ Other (*specify*) _____

Name or Contractor/Other Party _____

Address _____

Telephone ( ) _____ Name of Representative _____

PART I - EQUIPMENT MALFUNCTION/FAILURE

Equipment _____ Manufacturer _____ Model# _____

Year Equipment Installed _____ Year Equipment Manufactured _____

PART J - ESTIMATE OF TOTAL INCIDENT COST *(Including repair, cleanup and restoration)*

$

PART K - REPAIR DESCRIPTION *(Description of all repairs to the pipeline made necessary by the incident and date of return to service of the pipeline)*

PART L - INJURY AND FATALITY DESCRIPTIONS

☐ Number of Fatalities ☐ Number of Serious Injuries

Serious Injury - includes an injury that results in: fracture of a major bone, amputation of a body part, loss of sight - one or both eyes, internal haemorrhage, third degree burns, unconsciousness, or loss of a body part or function of a body part

NAME	AFFILIATION	FATALITY OR INJURY DESCRIPTION AND CURRENT PATIENT CONDITION
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	

PART M - IMMEDIATE INCIDENT CAUSE OF SERIOUS INJURY/FATALITY *(Immediate Cause - means unsafe acts and conditions)*

☐ Defective/inadequate safety devices, tools or equipment

☐ Improper operation of safety devices, tools or equipment

☐ Improper loading or placement

☐ Hazardous environment (gases, dust, smoke, fumes or vapours)

☐ Congested work area/disorderly workplace

☐ Other *(specify)*

PART N - NARRATIVE OF INCIDENT

Provide a complete description of the incident, including events leading up to, and following the incident. Also include additional information as specified in the guidelines to section 52 of the Onshore Pipeline Regulations. Attach any additional information that may supplement the narrative such as 1) drawing of the incident site 2) photographs 3) schematics 4) maps 5) reports (metallurgical, NDT, inspection, pressure test, etc.)

Attach additional sheets of narrative as required.

PART O - WITNESS INFORMATION

NAME _____ TELEPHONE NO. ( ) _____

_____ ( ) _____

_____ ( ) _____

_____ ( ) _____

_____ ( ) _____

PART P - BASIC CAUSES OF INCIDENT ***(Identify all basic causes contributing to the incident. Basic Cause - means the real or root causes of why the unsafe acts and unsafe conditions as described in the immediate cause occurred. Several Basic Causes may be assigned for one incident.)***

☐ Inadequate training ☐ Inadequate work standards or procedures ☐ Inadequate materials, tools or equipment

☐ Inadequate design/maintenance ☐ Non-compliance with work standards or procedures

☐ Other *(specify)* _____

Additional comments on selected basic cause: _____

_____

_____

_____

PART Q - CORRECTIVE ACTIONS TAKEN TO PREVENT SIMILAR INCIDENTS ***(If no corrective action taken, state reasons why)***

_____

_____

_____

_____

_____

_____

_____

_____

PART R - NAME OF PERSON CONDUCTING A COMPANY INCIDENT INVESTIGATION

Name _____

Title _____

Telephone ( ) _____ Fax ( ) _____

PART S - NAMES OF OTHER AGENCIES INVESTIGATING INCIDENT

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

PART T - NAME AND TITLE OF COMPANY REPRESENTATIVE FILING REPORT

Name _____ Signature _____

Title _____

Telephone ( ) _____ Fax ( ) _____ Date *(time)* _____ *(month)* _____ *(day)* _____ *(year)* _____

ATTACHMENT B2

SPILL SCENE CHECKLIST

Note: The following activities will be taken by the first person on the scene of a hazardous material spill or release or a spill of other potentially deleterious material into a watercourse or wetland or environmentally sensitive area, if feasible.

(a) Ensure personal safety and safety of others onsite and don appropriate personal protective equipment. _____

(b) 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 via the MSDS sheets that are available for each controlled substance. _____

(c) 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). While efforts have been initiated to contain the spill, immediately notify the Trans Mountain Construction Manager, or designate and Environmental Inspector. If the Environmental Compliance Manager, or designate, cannot be immediately contacted, notify Trans Mountain's 24-hour Emergency Line. These people will, as required, contact the appropriate authority as well as applicable federal and provincial regulatory authority and the NEB. _____

(d) Once the source has been cut off, attempt to contain the spilled material. _____

(f) If any of the above actions are beyond the capabilities at hand, do not hesitate to ask for qualified assistance. _____

(e) Take not of details such as time, location, material, volume, corrective actions, etc., for reporting criteria. _____

(f) In Alberta, a written report must be submitted directly to the Monitoring Division of the Alberta Energy Regulator within 7 days of verbally reporting an unrefined or refined product release, if the release has caused, is causing, or may cause adverse effect on the environment. If the release is fully contained onsite, or there are no adverse effects, then a written report is not required. In Alberta, a spill of 200 L or greater must be reported for all Class 3 (Flammable Liquids) spills. _____

(g) In British Columbia, an immediate verbal report is required to the BC MOE 1-800-663-3456 (24-hour emergency line). Where requested to do so by an environment officer, a written report shall also be filed with the department. In BC, a spill of 100 L or greater must be reported for all Class 3 (Flammable Liquids) spills. _____

APPENDIX C

MANAGEMENT PLANS

TABLE OF CONTENTS

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1.0 AGRICULTURE MANAGEMENT PLAN

Trans Mountain acknowledges and understands the potential effects associated with the introduction and/or spread of clubroot disease on cultivated lands as well as the health and biosecurity considerations of animal and nursery farms during facility construction activities. As such, Trans Mountain will implement appropriate mitigation measures to prevent the introduction and/or spread of clubroot disease as well as health hazards associated with farming operations that are in line with prevention strategies being implemented by regulatory authorities, the counties/municipalities and the landowner.

1.1 Clubroot Disease

Clubroot is a soil-borne disease caused by the plant pathogen *Plasmodiophora brassicae,* which affects canola, mustard and cole crops in the cabbage (*Brassicaceae*) family. Potato cyst nematode has been removed from Facilities. It is considered a pest under the *Agricultural Pest and Nuisance Control Regulation* of the *Agricultural Pests Act* (*APA*) and was first detected in Alberta in canola near Edmonton in 2003 and is known to sporadically affect cole crops in lower mainland British Columbia (BC). Clubroot disease is spread through resting spores in the soil, which can survive for up to 20 years. Symptoms will vary depending on the growth stage of the crop and when infection occurs. Infection at the seedling stage can result in wilting, stunting and yellowing of plants. In later stages, infected plants will ripen prematurely and seeds will shrivel, reducing yield and quality of crop. A common physical feature and identifier of clubroot is gall formation on the roots of affected plants (Alberta Agriculture and Rural Development 2010).

There are two key publicly available documents that guide the approach for construction and/or equipment sanitation in Alberta and BC with regard to clubroot disease spread prevention: 1) Best Management Practices for Clubroot Disease Management, Canadian Association of Petroleum Producers, July 2008; and 2) Alberta Clubroot Management Plan, Alberta Clubroot Management Committee, February 2008 (revised in 2010).

Known Occurrences

TERA Environmental Consultants (TERA), on behalf of Trans Mountain, contacted Parkland and Yellowhead counties in Alberta and Fraser-Fort George, Thompson-Nicola, Fraser Valley and the Greater Vancouver Regional Districts in BC, where facilities and/or associated components (*i.e.,* borrow sites, temporary access roads and TWS) are located, in order to gather information on clubroot occurrences, in particular, as well as to discuss any concerns or information regulatory authority representatives may have with regard to clubroot disease.

The results of consultation regarding clubroot disease in the counties and regional districts where facilities and/or associated components are located are summarised in Table C.1.1-1.

TABLE C.1.1-1

SUMMARY OF COUNTY AND REGIONAL DISTRICT AREAS WITH KNOWN CLUBROOT OCCURRENCES

County/Regional District	Information Source	Method of Engagement	Date of Consultation Activity	Consultation Outcomes
Parkland County, Alberta	James Leskiw, Supervisor, Agricultural Agronomics	Email/Phone	April 17 to 22, 2013	Clubroot disease has been identified at 149 locations in Parkland County. Follow the Alberta Clubroot Management Plan (Alberta Agriculture and Rural Development 2010).
Yellowhead County, Alberta	Sonja Pichette, Agricultural Services Coordinator	Email	April 17 to 23, 2013	Yellowhead County has three fields with confirmed clubroot disease in the Evansburg North area. Once a detailed route with specific locations is confirmed, contact Ms. Pichette for exact clubroot locations. The County strongly recommends communicating with landowners for specific clubroot cleaning protocols. Follow the Alberta Clubroot Management Plan.
Fraser Valley, BC	Vippen Joshi, Diagnostic Plant Pathologist	Email	March 5, 2013	Clubroot found in cole crops. No regulations or standard practices in place for clubroot. Follow the Alberta Clubroot Management Plan.

1.1.1 Risk of Contamination

Cultivated fields that are (or have been) planted to canola are at a higher risk for clubroot disease than forested or undisturbed pasture land. Activities conducted on subsoil, or frozen, snow-covered lands are at lower risk than activities conducted on nonfrozen topsoil. Field approaches, headlands and low wet areas possess a higher potential for clubroot disease, however, occurrences are not limited to these locations. Generally, the risk of clubroot disease is higher along the eastern (Parkland County, Alberta) extent of the Project footprint, where there are many confirmed cases of clubroot and lower mainland BC (Greater/Metro Vancouver Regional District, BC).

The level of risk for the potential spread of clubroot disease as a result of Project activities are listed below.

- The highest risk activities occur during construction on a facility or associated component and involve topsoil disturbance and work on recently disturbed topsoil (*e.g.*, topsoil salvage and replacement, harrowing or seeding).

- Activities that occur on the surface of topsoil (*e.g.*, pre-construction surveys) also involve some risk, however, at a lesser scale.

- Activities that occur on subsoil, where topsoil has been salvaged (*e.g.*, trenching, backfilling, etc.), are considered to be very low risk. Similarly, activities on gravel or road surfaces are very low risk.

1.1.2 Prevention Strategy

The philosophy behind preventing the spread of clubroot disease is to ensure that topsoil from one field that may be contaminated with a soil-borne disease is not transported to any other cultivated fields. The best available mitigation is to clean equipment involved in topsoil handling, such that topsoil is not carried from land to adjacent land, and/or from county/regional district to county/regional district.

Cleaning Stations

As presented in the Alberta Clubroot Management Plan (Alberta Agriculture and Rural Development 2010) and the Canadian Association of Petroleum Producers Best Management Practices for Clubroot Disease (2008), clubroot disease prevention involves a phased sanitation approach. Rough cleaning, fine cleaning and disinfection are all part of the clubroot management program.

- Rough Cleaning – Scrape off any soil or crop debris from openings, tires and wheels (*i.e.,* manually with a shovel, brush or broom). Air compressors are another form of rough cleaning that further assists in the removal of soil.

- Fine Cleaning – Pressure wash vehicles, paying extra attention to areas where soil can accumulate (*i.e.,* tires or undercarriage). Turbo nozzles and the addition of an industrial detergent may enhance the degree of soil removal.

- Disinfection – Mist equipment and/or vehicles with 1-2% bleach solution. Where practical, allow contact with bleach solution for approximately 15-20 minutes (keep areas wet by re-applying).

Cleaning Station Site Selection

Cleaning stations, including the type and location, will be identified prior to construction. Equipment cleaning is important not only for the prevention of the spread of soil-borne diseases, but also for the prevention of the spread of Noxious weeds. As a result, cleaning station locations will be influenced by the results of the pre-construction weed survey. County/regional district consultation and landowner requests will also influence the cleaning station types and location. At minimum, it is anticipated that fine cleaning and disinfection will be required at county/regional district boundaries.

The Environmental Facility Drawings and Environmental Alignment Sheets (power lines) will identify preliminary cleaning station locations based on pre-construction weed survey findings and preliminary consultation results. However, stations may be moved, added or removed by the Environmental Inspector

to reflect the most up-to-date and appropriate mitigation measures for Project activities. In the event that clubroot disease is identified during the course of construction on or adjacent to the facility footprint, the situation will be reassessed and appropriate mitigation measures will be taken (*i.e.,* additional cleaning stations).

General Clubroot Mitigation

- Work and traffic on topsoil will be reduced between quarter-sections and during wet conditions, to the extent practical. Extra caution will be taken regarding topsoil transfer on slightly wet soil, and working in very wet soil conditions will be avoided, where possible.
- Avoid the use of topsoil imported from infested or suspicious areas.

Foot Traffic

- When travelling on foot, remove excess topsoil from footwear and any equipment (*e.g.*, shovels) before moving between cultivated quarter-sections. When working in high risk areas or when requested by the landowner, this may include wearing disposable booties.

Vehicles and Equipment

- All equipment will be fine cleaned and disinfected prior to mobilization to the Project.
- Ensure all vehicles, all-terrain vehicles and equipment driving on topsoil (*i.e.,* before topsoil has been salvaged or after topsoil has been replaced) or involved in topsoil handling activities arrive on site in a clean condition.
- During construction activities, equipment involved in clearing/brushing and topsoil handling will be cleaned at designated cleaning stations, either with compressed air or with a power wash plus disinfectant misting. Cleaning station locations and type will be identified prior to construction.
- If work is conducted in a high risk clubroot area/county and then equipment is mobilized to start work in a different area/county, a thorough cleaning will be performed prior to the commencement of construction in the new location.
- Rough cleaning using shovel and sweep cleaning to remove obvious clumps of soil between cultivated fields and quarter-sections (*e.g.,* at changes in land use and/or at road crossings) as a minimum measure in high risk locations such as Parkland County, Alberta, to prevent movement of topsoil from one landowner to the next.

Communication/Documentation

- The above clubroot prevention strategy, including expectations and cleaning station locations, will be communicated to the Contractors via the Environmental Education Program, Environmental Protection Plan and associated Environmental Facility Drawings.
- Trans Mountain will document process changes and updates that arise during construction (*i.e.,* landowner requests and updates to consultation with respect to clubroot disease) such that any revisions to the cleaning protocol will be communicated to the Contractor.
- The Contractor will develop a documentation process to track compliance with the cleaning protocols in terms of what equipment/vehicles were cleaned, how and where.

2.0 HYDROVAC CUTTING AND HANDLING DISPOSAL MANAGEMENT PLAN

Background

Hydrovac excavation will be used prior to construction where soil excavation activities of facilities and associated components (*i.e.,* facility sites, access roads, power lines, TWS) will occur, as described in Section 8.0 of the Facilities EPP. This method of excavation will be used prior to ground disturbance activities to expose hotlines and underground utilities to prevent potential line strikes. The process of hydrovac excavation uses pressurized water to safely expose underground infrastructure while a vacuum system simultaneously extracts the resulting hydrovac slurry into an onboard tank. This method of excavation produces a waste liquid, which is a combination of water and subsoil (*i.e.,* hydrovac slurry or hydrovac tailings) that must be properly contained and disposed of.

Objectives

The objective of the Hydrovac Cutting and Handling Disposal Management Plan is to avoid or reduce potential adverse environmental effects due to the handling, storage or disposal of hydrovac slurry in accordance with the applicable provincial and federal legislation, regulations and guidelines, and Trans Mountain's policy and reclamation objectives for the Project.

Management Approach

Prior to initiating the hydrovac operation, the hydrovac Contractor will ensure that the Environmental Inspector has reviewed and approved a disposal site. If the disposal site is determined to be off-site, the maximum weight of the loaded hydrovac truck will be determined to ensure compliance with applicable road weight restrictions. The hydrovac Contractor will also provide copies of their operating procedures and emergency response plans for approval to the Environmental Inspector prior to initiation of hydrovac operations. The hydrovac Contractor will ensure that all tanks are clean and free of contaminants prior to arriving onsite.

Refer to Water Withdrawal and Discharge Procedures Management Plan for water withdrawal procedures to be employed during hydrovac activities.

Hydrovac Operations

Salvage topsoil prior to hydrovac use. Topsoil salvage is not necessary if the topsoil and subsoil will be removed using a hydrovac during frozen soil conditions or where the area to be exposed will be subsequently subject to topsoil salvage as part of facility site and associated components preparation activities.

Non-Contaminated Hydrovac Slurry Disposal

Non-contaminated tailings will be released into the hydrovac excavation if future subsidence of the site is not a concern and the area will be fenced until the tailings are dry. Onsite disposal is the preferred method for hydrovac slurry from new disturbances as is not likely to be contaminated and generally consists of mineral soil. The disposal location will be in an area where topsoil/root zone material salvage has occurred. If a dike is warranted to contain the hydrovac slurry, the dike material will be composed of subsoil material and will be able to prevent any surface water runoff from contacting the hydrovac slurry. The hydrovac Contractor will ensure that at no time during the hydrovac slurry disposal will the hydrovac slurry be allowed to be pumped into or flow into a watercourse/wetland/lake.

If temporary onsite storage is constructed (*e.g.*, sump or bermed area), topsoil/root zone material will be salvaged from the area to be used for storage. The storage area will be sized to be able to contain the hydrovac slurry by preventing off-site migration of the stored hydrovac slurry. If a dike is necessary for containment, it will be composed of impermeable clay. Salvaged topsoil/root zone material will be stored on one or two sides of the sump/dike area to provide access for equipment and potential sump/dike expansion, where warranted.

Hydrovac slurry may be temporarily stored on the Project footprint at a site designed to safely store hydrovac slurry in the hydrovac truck, in clean oilfield storage tanks, or in a metal slop bin if other more practical storage options (*i.e.*, temporary pits) are not feasible for the site.

Wet hydrovac slurry may also be disposed of at an approved licensed treatment plant or disposal facility, if necessary. Appropriate documentation will be provided to Trans Mountain to confirm the hydrovac slurry was disposed of in accordance with regulatory requirements and to the satisfaction of Trans Mountain.

Contaminated Hydrovac Slurry Disposal

Trans Mountain will ensure any hydrovac slurry suspected of contamination receives special handling storage and disposal. Contaminated hydrovac slurry will not be allowed to mix with non-contaminated hydrovac slurry. If contaminants are suspected, hydrovac slurry will not be removed from the site, instead, arrangements will be made to temporarily store the hydrovac slurry onsite until analysis is complete and appropriate disposal requirements are made. Potential indicators of contamination include soils with a sudden change to a darker or blacker appearance in colouration and/or have a hydrocarbon odour. Refer to the Contamination Discovery Contingency Plan (see Appendix B) for additional information.

Trans Mountain will require the hydrovac Contractor to follow the guidelines set out in the Waste Management Standard (see Section 7.0 of this Appendix), as well as to provide appropriate documentation to verify the contaminated hydrovac slurry disposal is in accordance with regulatory requirements and to the satisfaction of Trans Mountain.

Ultimately, all hydrovac holes will be backfilled with mineral soil and compacted to ensure settling of material does not pose a hazard for wildlife, livestock or the general public. If hydrovac slurry necessitates off-site disposal, clean replacement backfill will be sourced.

3.0 NOISE MANAGEMENT PLAN

(PLACE HOLDER – To be developed prior to construction)

4.0 RARE ECOLOGICAL COMMUNITY AND RARE PLANT POPULATION MANAGEMENT PLAN

4.1 Purpose and Scope

The purpose of this Rare Ecological Community and Rare Plant Population Management Plan is to provide recommended mitigation measures when rare ecological communities, rare plants (vascular plant or bryophyte [moss or liverwort]) or rare lichens are discovered.

4.2 Rare Ecological Communities

Supplemental rare ecological community surveys will be conducted where a need is identified. Protection measures and environmental management techniques for rare ecological communities will be determined following an assessment of the community, which will take into account the following site-specific conditions and community sensitivity criteria.

- Community extent and abundance in the local area.
- The relative rarity of the community (*i.e.*, as indicated by its provincial [S] rank or BC *Identified Wildlife Management Strategy*).
- The growth form, primary mode of species reproduction and mode as well as magnitude of seed/spore dispersal of the component plant species.
- Construction activity timing.
- The location of the community with respect to the construction disturbance.
- The proportion of the community expected to be affected.
- The site preferences of the community and/or its component plant species.
- Expected or known sensitivity or resilience to disturbance of the community and/or its component plant species.
- Past mitigation success of the community or similar communities.

Assessment and mitigation for rare ecological communities will include the following steps:

- Consult with either the Alberta Conservation Information Management System (ACIMS) or the British Columbia Conservation Data Centre (BC CDC) to verify the community's ranking and known distribution within the province, if required.
- Consult with a qualified Vegetation Resource Specialist regarding preferred or recommended mitigation measures for the community.
- Stake, flag or otherwise delineate rare ecological communities to avoid accidental encroachment.
- Restrict general application of herbicide near all rare ecological communities.
- Post-Construction Environmental Monitoring (PCEM) of rare ecological community occurrences may be recommended to monitor the effectiveness of mitigation efforts.

4.2.1 Mitigation Measures for Rare Ecological Communities

Mitigation measures for rare ecological communities located within the facility footprint will focus on the transfer of identified plants and plant material into suitable habitat located outside of the development zone where topsoil removal or disturbance is not anticipated or immediately adjacent to the facility footprint. The recommended mitigation strategy for rare ecological community occurrences may include the following suite of mitigation measures and options, in order of preference. One or more options may

be used within the facility footprint and outside of the development zone or immediately adjacent to the facility footprint.

- Adjust workspace locations (*e.g.,* temporary workspace [TWS] and additional temporary workspace [ATWS]), log decks, transmission towers or poles, access roads or realign the facility infrastructure to avoid the rare ecological community.
- Narrow down or realign the proposed area of disturbance and protect the site using fencing or clearly mark the site using flagging and inform all users of access restrictions in the vicinity of flagged or fenced sites.
- Avoid or reduce clearing of trees/shrubs or grubbing of deciduous roots, where feasible.
- Mow or walk down shrubs and small trees rather than wholly remove vegetation, where feasible.
- Leave gaps in the topsoil/root zone material piles or subsoil piles to avoid the shrubby community.
- Use protective matting and/or snow during the winter to mat over the community where it occurs and other areas where surface disturbance is not required to protect communities from scraping and compacting.
- Conduct native seed collection for use in revegetation efforts.
- Consider employing appropriate salvage, propagation and transplant techniques for component species.
- Final decisions regarding mitigation measures will be made by Trans Mountain in consultation with a qualified Vegetation Resource Specialist and, where appropriate, other stakeholders (*i.e.,* Aboriginal representatives).

4.3 Rare Plant Species

Supplemental rare plant surveys will be conducted where a need is identified. Protection measures and environmental management techniques for rare plant subpopulations will be determined following an assessment of the occurrence, which will take into account the following site-specific conditions and species sensitivity criteria.

- Occurrence, size and abundance of the species in the Local Study Area.
- The number of known subpopulations within the occurrence.
- The relative rarity of the species (*i.e*., as indicated by its provincial [S] rank, *SARA*, COSEWIC, the Alberta *Wildlife Act* or the BC *Identified Wildlife Management Strategy*).
- The growth form/type of the species (*e.g.*, annual, biennial, perennial, aquatic, moss, liverwort, epiphyte, tree, shrub).
- Construction activity timing.
- The location of the subpopulation or individual with respect to the proposed disturbance.
- The primary mode of species reproduction (*e.g.*, spores, seeds, rhizomes, suckering/spreading, vegetative propagules).
- The mode and magnitude of seed/spore dispersal.
- The proportion of the occurrence expected to be affected.
- The habitat/substrate preferences of the species.

- The proximity of available habitat/substrate (based on similarity of habitats to the habitat of the species occurrence).
- Expected or known sensitivity or resilience to disturbance of the species.
- Past mitigation success of the species or similar species.
- Expected or known occurrence viability/sustainability (both pre-construction and post-construction).

The assessment and mitigation for rare plant occurrences may include the following steps.

- Consult with either the ACIMS or BC CDC to verify the species' ranking and known distribution within the province, if required.
- Consult with a qualified Vegetation Resource Specialist regarding preferred or recommended mitigation measures for the species.
- Stake, flag or otherwise delineate rare plant subpopulations prior to construction to avoid accidental encroachment.
- Restrict general application of herbicide near all rare plant subpopulations.
- PCEM of rare plant occurrences may be recommended to monitor the effectiveness of mitigation efforts.

4.3.1 Mitigation Measures for Rare Plant Occurrences

Mitigation measures for rare plant occurrences located with the facilities footprint will focus on the transfer of identified rare plants and plant material (*i.e.,* seeds or rhizomes from rare plants) into suitable habitat outside of the development zone where topsoil removal or disturbance is not anticipated or immediately adjacent to the facility footprint.

- Where the facility (development zone) encounters rare species ranked S1 or S1S2, or S2, S2S3, S1S3, S3, SNR, SH or SU, or species that are protected under provincial or federal legislation/regulations the transfer or protection of identified plants, and plant material is preferred within the facility footprint and outside of the development zone or immediately adjacent to the facility site to avoid the subpopulation(s). The recommended mitigation strategy may include the following options, in order of preference. One or more options may be used onsite:
  - Adjust workspace locations (*e.g.,* TWS and ATWS), log decks, transmission towers or poles or realign the facility infrastructure to avoid the rare plant.
  - Leave gaps in the topsoil/root zone material piles or subsoil piles to avoid the site.
  - Use protective matting and/or snow during the winter to mat over the subpopulation outside of the development zone where topsoil removal or disturbance is not required to protect vegetation from scraping and compacting.
  - Propagate rare plants via vegetative or reproductive means (*e.g.,* harvesting of seed, salvaging and transplanting or collecting of cuttings) and transplant at suitable receiving sites.
- Additional site-specific mitigation measures for non-vascular plants where complete avoidance is not feasible or where the facility footprint encounters rare non-vascular plants ranked S2, S2S3, S1S3, S3, SNR, SH or SU, may include the following options:
  - Relocation of woody and soil debris (*e.g.,* decayed logs, portions of logs, individual branches, bark disk transplants, soil crusts).
  - Relocation of portions of the non-vascular plants/lichens (*e.g.,* lichen pendants, moss peds, liverwort thalii).

  - Inoculation using vegetative fragments.

  - Where transplanting is utilized, the location (*e.g.,* aspect and vertical position) and habitat (*e.g.,* substrate, light and humidity conditions) of the receiving sites will emulate conditions at the transplant source location, to the extent feasible.

- Final decisions regarding mitigation measures will be made by Trans Mountain in consultation with botanical experts and, where appropriate, other stakeholders (*i.e.,* Aboriginal representatives).

5.0 RECLAMATION MANAGEMENT PLAN

Construction reclamation activities are measures conducted as part of the main construction program. The primary goal of reclamation measures is to reduce adverse effects of facilities construction and return the affected lands to a stable, non-erosive condition that will promote the re-establishment of land productivity. This process involves measures such as: topsoil and root zone material salvage; subsoil conditioning and grade and drainage re-establishment; topsoil and root zone material replacement; installation and maintenance of temporary and permanent erosion and sediment control measures; and revegetation on areas outside of the development zone (area containing infrastructure [pump stations, valves, towers, poles, etc.]). This Reclamation Management Plan includes construction reclamation measures that will be implemented prior-to, during and following construction of the facility footprint (outside of the development zone), in order to assist in successfully reclaiming land.

Construction affected lands will be stabilized and revegetated in a manner that will in time achieve land productivity along the right-of-way that is equivalent to the adjacent land use, ensuring the ability of the land to support various land uses. Successfully achieving this goal typically includes implementing the construction reclamation measures as follows.

- Topsoil/root zone material salvage, subsoil conditioning and grade and drainage feature re-establishment.
- Topsoil/root zone material replacement.
- Installation and maintenance of temporary and permanent erosion and sediment control measures.
- Establishment of vegetative cover to stabilize surface soils and to re-establish an early successional trajectory will facilitate the development of plant communities that are compatible with those maintained during the operational phase of the Project in temporary workspace areas (*e.g.*, deactivated borrow sites and access roads) that are allowed to re-establish the surrounding vegetation and land uses.
- Establishment of access control and re-installation of existing fencing.

5.1 Scope of the Reclamation Management Plan

This Reclamation Management Plan has been developed to provide details of the reclamation measures that may be used to mitigate temporarily disturbed lands on the TMEP facility footprint and/or associated components. The following activities represent standard and special reclamation measures that may be implemented during construction of facility sites and/or associated components as outlined in the EPP. Resource features such as rare plants, wetlands and associated riparian areas and wildlife habitat enhancement features are also described below. Implementation of some of the measures included in the Reclamation Management Plan may commence prior to the construction phase, where deemed appropriate. A PCEM Program will be developed as per regulatory requirements.

5.2 Construction Reclamation

The goal of the proposed construction reclamation measures is to re-establish site stability to all disturbed lands located within the facility footprint and outside of the development zone. The drawings (see Appendix R) identify the construction reclamation measures to be implemented prior to, during and following construction in order to ensure that land productivity is returned to affected lands. The drawings outline instructions for the mitigation and reclamation of valued environmental resources and will be used by Contractors and the Environmental Inspector and Construction Managers as specifications and instructions for environmental protection and reclamation.

5.3 Construction Reclamation Measures

The following activities represent measures designed to mitigate potential environmental effects and facilitate reclamation during facility construction. These construction reclamation measures have been

chosen to address the environmental resources expected to be encountered within the facility footprint and/or associated components (*e.g.,* borrow sites, temporary access roads and TWS).

5.3.1 Clearing and Disposal

5.3.1.1 Background Information

Woody vegetation clearing/brushing and disposal measures are implemented to prepare the facility footprint and/or associated components for construction activities. Small woody vegetation will be walked down in TWS areas where the topsoil/root zone material does not require disturbance. Where merchantable timber is present on the facility footprint and/or associated components, it will be salvaged and managed as per the Timber Management Plan (see Appendix C). The objectives of these mitigation measures are to restrict the construction footprint to approved workspace, limit the disturbance to adjacent vegetation (*i.e.,* merchantable timber and native vegetation) and reduce the effects of construction on vegetation re-establishment, to the extent practical.

5.3.1.2 Reclamation Strategy

Reclamation measures to address the extent of vegetation clearing and management of woody debris (mulch production and slash salvage) on the disturbance footprint and to support vegetation re-establishment, have been developed for use during construction. These may include the following.

- Clear woody vegetation outside of the development zone only to the extent warranted to reduce the loss of forest values and reduce the potential for terrain instability and erosion.

- Monitor the amount of mulch (wood chips) produced during mulching of un-grubbed tree stumps where minimum disturbance construction techniques are used so as to maintain soil nutrients at levels (*i.e.,* maintain a suitable Carbon:Nitrogen ratio) that can support vegetation re-establishment following construction activities.

- Salvage sufficient woody slash and non-merchantable timber for soil erosion control in areas where disturbed erodible soils (*e.g.*, erodible soils on cuts) are identified and for habitat re-establishment at riparian areas to provide microsites to aid in the establishment of woody plants.

- Reduce grubbing of plant roots and stumps at non-graded areas outside of the development zone, to the extent feasible, to promote re-sprouting of cleared/brushed deciduous vegetation and germination of the undisturbed soil seed bank to optimize the potential for the natural regeneration of vegetation and reduce the potential for terrain instability or soil erosion by wind or water at these sites.

5.3.2 Topsoil/Root Zone Material Salvage, Grading and Replacement

5.3.2.1 Background Information

Protection of topsoil/root zone material during construction and while being stored for facility decommissioning, and addressing vegetation re-establishment of graded areas is a key component of the Reclamation Management Plan. The protection and reclamation on agricultural lands (see the Agriculture Management Plan in Appendix C), grasslands and forested/wooded areas is the objective of the following measures.

5.3.2.2 Reclamation Strategy

Reclamation procedures will be implemented during construction to salvage, store (temporary and long-term storage) and replace topsoil/root zone material in a manner that prevents soil structure degradation and soil erosion. Measures to facilitate topsoil/root zone material salvage, grading and revegetation are as follows.

- Topsoil/root zone material will be salvaged to preserve plant propagules (*i.e.,* root pieces, seed and spores) to assist natural regeneration on non-agricultural lands and to preserve soil productivity on agricultural lands.

- For temporary storage, store topsoil/root zone material in a manner that: does not alter soil structure or soil chemistry; provides protection from soil erosion by wind and water; and avoids mixing of stored surface soils with stored subsoil/ or woody debris (*i.e.,* woody slash or mulch). For the long-term storage of topsoil/root zone material, establish berms to a height that does not exceed 1 m, locate storage berms away from operational activities and seed with a suitable perennial ground cover that is resistant to soil erosion and is competitive to invasion by weeds.

- Recontour subsoil, relieve compaction in work areas and do not over work replaced topsoil/root zone material.

- Re-establish contours and relieve compaction at riparian areas, where required, by replacing root zone material in a manner that leaves the surface in a rough condition (*i.e.,* textured) to reduce surface water runoff.

- Distribute salvaged (or supplemental) woody slash to provide microsites for plant establishment.

5.3.3 Soil Erosion Control

Some areas of the facility footprint and/or associated components may be susceptible to wind and/or water erosion. Where erosion potential is identified (*i.e.,* exposed moderately to highly erodible soils) install temporary erosion control prior to re-establishment of vegetation. Erosion control measures may be one or a combination of the following:

- erosion matting;
- cover crop;
- wind fencing;
- tackifier and mulch;
- brush wind barrier;
- staked logs; and/or
- woody debris.

The Wind Erosion Drawing (see Appendix R) describes, in greater detail, erosion control and monitoring measures to be applied during and following construction.

5.3.4 Temporary Access Road Watercourse Crossings and Riparian Areas

5.3.4.1 Background Information

The objective of watercourse streambed, bank and riparian area reclamation is to stabilize the disturbed channel and riparian areas. This allows for the re-establishment of fish habitat and to match the morphology and integrity of the watercourse on the right-of-way to off the right-of-way.

5.3.4.2 Reclamation Strategy

The measures outlined below are designed to ensure the stabilization of the streambed banks and approach slopes of watercourses and revegetation within riparian areas immediately following construction and to re-establish important fish habitat at these watercourses. General channel reclamation measures that may be implemented include the following.

- Prior to channel work (where the bed and banks may be disturbed during temporary culvert or bridge installation), identify any bed or bank site-specific features at the crossing and record their location (*e.g.,* root wad, large woody debris, large boulders) to allow for feature reestablishment following culvert and bridge removal, and streambed and bank reestablishment (see Drawings [Vehicle Crossing – Temporary Bridge] and [Access Roads – Culvert] provided in Appendix R).

- At the completion of instream work (*i.e.,* removal of temporary culverts or bridges), return the watercourse bed and banks to their pre-construction configuration and alignment. Cap the disturbed streambed with salvaged substrate, extending replacement of cobbles and boulders to the ordinary high water level if adequate material is available and re-establish of bank configuration; and replace any site-specific features within the streambed or banks that are important for fishes or other aquatic organisms (*i.e.*, as initially salvaged or as part of compensation directed by the Environmental Inspector).

Additional measures that may be implemented to address bank stability and riparian reclamation include:

- Log crib structures (see Drawing [Streambank Protection – Cribwalls] provided in Appendix R) are used to retain bank material and protect against stream scour;

- Dormant brush layer in cross cut slope (see Drawing [Shrub Staking and Transplanting] provided in Appendix R) provides an opportunity for woody plant establishment;

- Sediment fences (see Drawing [Sediment Fence] provided in Appendix R) and sediment-stop logs (coir logs) provide protection against watercourse sedimentation;

- Erosion control berms (see Drawing [Cross Ditches and Diversion Berms] provided in Appendix R) may be used to divert overland water flow into areas with stable vegetation;

- Erosion control blanket or coir matting (see Drawing [Erosion Control Matting] provided in Appendix R) is used to protect slopes from low to moderate overland water flow velocities and provide suitable habitat for grass vegetation reestablishment;

- Coniferous tree revetments (see Drawing [Streambank Protection – Typical Coniferous Tree Revetment] provided in Appendix R) may be used for aquatic habitat reestablishment;

- Woody slash placement in the riparian area may be used to promote woody vegetation establishment or soil erosion protection where appropriate (see Drawing [Rollback] provided in Appendix R);

- Subsoil/surface soil texturing (micro-berms and swales) within the riparian area to create micro-sites that protect riparian vegetation from wind erosion form desiccating winds and provide water catchments; and

- Seeding of an annual/biannual grass cereal (*e.g.,* fall rye, oats, etc.) or short-lived perennial grass (*e.g.,* slender/awned wheatgrass or Canada wild rye) cover crop species where woody vegetation establishment is the revegetation goal, or a native grass seed mix where a grass plant community is the revegetation goal. The cover crop species will be chosen to germinate and establish quickly to stabilize soils and reduce competition to: naturally regenerating and installed woody plant material; installed dormant stakes/brush during bank reconstruction; woody transplants or rooted woody stock plants within the riparian area, where warranted (see Drawings [Shrub Staking and Transplanting] and [Streambank Protection – Hedge/Brush Layering] provided in Appendix R).

5.3.5 Wetlands

5.3.5.1 Background Information

Wetlands are sensitive ecosystems. However, if mitigation measures are planned and implemented effectively, wetlands demonstrate a unique resiliency and quickly re-establish wetland function and resume ecological function similar to that observed prior to construction.

5.3.5.2 Reclamation Strategy

Disturbance to wetlands from facility construction outside of the development zone will be avoided, to the extent feasible. Mitigation measures to be used to reduce effects to wetlands are as follows.

- Transfer identified rare plants off the area of the development zone within the facility footprint and/or associated components) prior to construction (see Section 2.1.6).

- Recontour and decompact subsoil or fill material and replace organic soil, avoiding admixing of soils and uneven contour.

- Re-establish wetland water connectivity where the wetland was not filled by constructing channels through the wetland, where required.

- Compensation would only be considered where additional mitigation to re-establish habitat and/or function was considered to not be an appropriate course of action, and following consultation with appropriate regulatory authorities.

5.3.6 Rare Plants and Plant Communities

5.3.6.1 Background Information

Protection of rare vascular and nonvascular plants and plant communities is important for the maintenance of ecological integrity. Prior to construction, a survey will be conducted to identify if any vegetation species that require special consideration before, during and after construction are present on the facility footprint and/or associated components. Mitigation measures have been developed for use during facility construction with the goal of accomplishing effective protection of the rare plants and/or plant communities, if they are discovered within the disturbed footprint.

5.3.6.2 Reclamation Strategy

Where the facility footprint encounters a rare plant or rare plant community, it is recommended that the travel lane be re-aligned on the construction right-of-way. Where this is not feasible and a rare plant or rare plant community cannot be avoided, measures to be implemented prior to, during and following construction will include one or a combination of the following.

- Plant material will be collected prior to construction, transplanted to suitable habitat outside of the development zone or immediately adjacent to the facility footprint and monitored one year following construction (see Drawing [Live Plant Salvage and Transplant] provided in Appendix R).

- Fence off the area where the rare plant or rare plant community is encountered outside of the development zone (see Drawing [Narrow Down Fencing] provided in Appendix R).

- Placing protective structures or snow and ice work pads over the plants of concern where site-specific conditions, plant species characteristics and timing of construction allow for effective protection outside of the development zone (Rare Plant Ramp Protection [Appendix R]).

- Placing a span bridge or ramp over the plants of concern where site-specific conditions allow for effective protection from construction traffic where construction activities will interact with rare plants (see Drawing [Temporary Bridge/Rare Plants] provided in Appendix R).

- Within the vicinity of all of the subpopulations, salvage the upper 15 cm of topsoil/root zone material separately (where feasible) from the remaining A horizon, then redistribute on top of the replaced topsoil at a location outside of the development zone and within suitable habitat following final clean-up.

- Recontour the land to pre-construction conditions, where a level surface is not required during operations.

5.3.7 Wildlife

5.3.7.1 Background Information

The protection of wildlife and re-establishment of wildlife habitat is an important element in Project reclamation. Measures to re-establish effective wildlife movement corridors and maintain biodiversity include preserving existing vegetation and using native plant species during reclamation.

5.3.7.2 Reclamation Strategy

Disturbances to wildlife habitat will be mitigated through the implementation of various measures including one or a combination of the following.

- Grub stumps and roots of deciduous vegetation following clearing activities only within the development zone where grading or filling is required (to encourage re-sprouting following construction), where grubbing will not be implemented, mulch stumps to create a smooth work surface.
- Reseed disturbed areas following construction with native vegetation conducive to the development of wildlife habitat and/or food and fence of seeded areas, if warranted.
- Utilise native vegetation that has a reduced attractiveness to wildlife (*e.g.,* forage) in areas where the facility footprint is in close proximity to railway or roadway rights-of-way to avoid attracting ungulates and carnivores, and reduce their exposure to collisions.

5.3.8 Revegetation

5.3.8.1 Background Information

Several methods are proposed for the revegetation of the facility footprint and/or associated components outside of the development zone (*e.g.*, native grass seed mixes and localized shrub transplants, rooted stock plants, etc.). The criteria considered when selecting suitable seed mixes includes: vegetation types, soil moisture regimes, soil chemistry, salvage and planting season and exposure to wind and sun.

5.3.8.2 Reclamation Strategy

A number of special measures will be implemented within construction disturbances outside of the development zone where the topsoil/root zone material has been replaced or stored. These measures could include a combination of the following.

- Salvaging and storing dormant native vegetation and rare plants prior to construction for future transplanting onto or adjacent to the disturbance.
- Seeding with a native grass seed mix (see Detail [Seed Mixes] provided in Appendix S).
- Placing erosion control blanket or coir matting (see Drawing [Erosion Control Matting] provided in Appendix R), woody slash or log diversions (see Drawing [Rollback] provided in Appendix R) on erodible soils or wind exposed sites to provide micro-habitat and support plant establishment (see Drawings [Brush Wind Barrier] and [Staked Logs/Log Cribwall for Erosion Control] provided in Appendix R).

Natural regeneration of native plant species (with the addition of a short-lived cover crop) will be considered for implementation in areas that are well suited to this reclamation technique; construction disturbances in riparian areas where minimum disturbance techniques were used and grubbing of riparian vegetation was avoided, are suitable areas for the implementation of this measure.

5.3.8.3 Salvage, Storage and Installation of Native Plant Material and Plants, Tree/Shrub Transplants and Native Seed Procurement

Background Information

Disturbances to vegetation outside of the development zone will be mitigated through the facilitation of natural regeneration processes or implementation of revegetation reclamation measures. Prior to clearing/brushing activities, dormant native woody plant material (brush and stakes) and plants may be salvaged and stored. Alternatively, dormant native woody plant material and plants may be collected immediately prior to their installation. Native grass seed will be obtained from a commercial seed retailer.

Reclamation Strategy

The primary objective of salvaged, transplant or purchased native plants or plant material and/or facilitating the natural regeneration of native plants (woody, forb and grass species) on construction disturbances outside of the development zone, is to re-establish equivalent land productivity. Reclamation measures that may be implemented include the following.

- Salvage, store and install dormant native woody plant material and plants in a manner that maximizes the establishment potential of the plant material and plants following installation.
- Within the vicinity of the facility footprint, collect dormant woody plant material (deciduous stakes/brush) and select suitably sized transplants (small conifer/deciduous trees/shrubs) from a suitable donor site following approval from the applicable land manager(s).
- A grass cover crop will be used at riparian areas to support the establishment of installed and naturally regenerating native woody plant material and plants and to provide erosion protection in the short-term.
- Implement plant protection measures (*e.g.*, soil mounds and berms, wind fencing and rollback) that work to reduce environmental stresses (*i.e.,* wind exposure, low soil moisture stress [desiccation]), to the extent feasible.
- Monitor plant establishment.

5.3.9 Problem Soils Reclamation

5.3.9.1 Background Information

The topography and types of soils encountered on the facility footprint and/or associated components) outside of the development zone may provide special challenges for reclamation. Soil related reclamation issues occur due to high susceptibility to wind and water erosion, low soil moisture and soil chemical and physical properties.

5.3.9.2 Reclamation Strategy

The following mitigation measures may be implemented to deal with the reclamation of problem soils.

- Silt and sand textured soils are more susceptible to wind and water erosion after disturbance due to a general lack of cohesiveness and low water holding capacity. It may be necessary during construction to apply tackifier to topsoil/root zone material storage berms, pack with a goosefoot packer or cover with erosion control blanket prior to vegetation establishment, especially in open wind prone areas;
- To re-establish vegetation on dry sandy soils, native or the selective use of non-native, locally adapted drought tolerant plant species will be seeded along with a native or non-native short-lived cover crop. Prior to the seeding activity, the seedbed will be lightly compacted (i.e., track packed or other method) to improve moisture holding capacity in the surface seedbed layer and localized woody slash placement may be installed to control wind erosion and promote germination and seedling establishment.
- Short and long-term measures will be implemented as required to reduce the risk of soil erosion by water or wind (see Sections 7 to 9 of the EPP).

5.3.10 Weed and Problem Species Control

The management of weed and problem species is essential for the successful reclamation of disturbed areas outside of the development zone. The Project will use an integrated management approach that could include mechanical and chemical methods to control Noxious weeds and reduce the spread of problem vegetation (see the Weed and Vegetation Management Plan in Appendix C). The mechanical or chemical treatment methods used will vary with life-form and mode of reproduction of the species targeted and the location and extent of the infestation. Mechanical treatments include hand-pulling and

mowing. Promotion of active revegetation of native plant communities through native grass, for or woody plant installations represents the effective use of a cultural method (see Detail [Weed Control] provided in Appendix R). Chemical treatments include either selective herbicides (*i.e.*, target specific plant species) or non-selective herbicides (*i.e.,* target all vegetation).

5.3.11 Temporary Construction Access and Existing Operations Access Routes

Construction access routes used during construction are of two types: existing roads and trails (operational access and other); or access specifically built for temporary use during construction of the facility. Following completion of construction, temporary access routes located outside of the development zone will be deactivated and reclaimed and will include one or a combination of the following methods.

- Regrading subsoil to match surrounding contours and drainage patterns.
- Alleviating compacted subsoil, where warranted.
- Replacing salvaged topsoil/root zone material and woody debris and seed with the appropriate native grass seed mix to establish a native cover suitable for site conditions and land use, and is compatible with weed management and wildlife management objectives.
- Block access using large boulders, fencing or install rollback for access control (see Drawing [Rollback] provided in Appendix R) across the access road to the edge of the forest.

6.0 TIMBER MANAGEMENT PLAN

(PLACE HOLDER - To be developed prior to construction)

7.0 TRAFFIC AND ACCESS CONTROL MANAGEMENT PLAN

The Traffic and Access Control Management Plan addresses the management of construction traffic and access to the facility footprint and/or associated components (borrow sites, and TWS) and temporary access routes (see also Volume 4C). This Plan addresses activities during pre-construction, construction and post-construction phases of the Project and provides guidelines for vehicular use to the construction facility footprint and associated components, as well as blocking and/or controlling access following construction and throughout the operation phase of the Project. The intent of the mitigation is to reduce disturbances caused by access, construction equipment and vehicle traffic, during and following facility construction and, in particular, on lands with sensitive wildlife areas, riparian areas and in areas of high soil erosion hazard. All vehicle and equipment operators will adhere to the contingency measures for wet or thawed conditions that are outlined in the Wet/Thawed Soils Contingency Plan (see Appendix B).

The Traffic and Access Control Management Plan is a supplement to and not a replacement for, the Traffic Control Plan that is to be prepared by the Prime Contractor.

The objectives of the Traffic and Access Control Management Plan will be accomplished by minimizing the development of access routes, controlling public access to the facility footprint and/or associated components, selecting appropriate access routes that cause the least disturbance to high quality, sensitive wildlife habitat, managing traffic on these routes, and determining appropriate construction reclamation. Trans Mountain will work with applicable resource managers, traditional land and resource users, as well as other affected stakeholders (*e.g.*, non-traditional trappers) to define locations where access control is necessary, and what type(s) of access control is to be implemented.

Access will be managed, where required, on the facility footprint where new temporary and permanent access is created for the construction and/or operation of the facility. To mitigate environmental effects associated with increased access, which could further lead to increased concentrations of hunting and fishing activities at previously unattainable locations, increased predation of wildlife, disturb reclamation efforts on sensitive terrain, etc., Trans Mountain will manage access to the facility footprint and/or associated components where new access is created by implementing one or more of the mitigation measures to manage access during the pre-construction, construction and post-construction phases of the Project.

7.1 Pre-Construction

Pre-construction activities will be scheduled for dry or frozen conditions. Access roads will be developed prior to clearing of the facility footprint and/or associated components.

The applicable regulatory authority will be notified of all access road upgrading requirements and Trans Mountain will accommodate continued public access during facility construction, whenever feasible.

The Project may implement and adhere to the following guidelines and mitigation measures, as applicable.

- All necessary permits will be obtained prior to the initiation of pre-construction work.
- Trans Mountain will work with applicable regulatory authorities, traditional land and resource users and other potentially affected stakeholders when completing the final design for managing access to the facility footprint and/or associated components. Final access management measures to be implemented will be determined during the detailed design phase of the Project prior to construction. The applicable measure(s) to be implemented during construction will be mapped on the Environmental Facility Drawings that will be revised and issued prior to construction.
- For existing access routes, Trans Mountain will adapt road access management procedures of the current road operators, where required.
- All motorized vehicles, including all-terrain vehicles (ATVs), will be confined to the facility footprint and approved access roads, shoo-flies or trails, except where specifically authorized by the landowner and/or occupant. This restriction also applies to all biophysical inventory and land surveying activities.

- Travel through areas of high sensitivity (*e.g.,* native grassland) will be primarily on foot; however, ATVs may be used for increased efficiency if minimal terrain effect is anticipated. Vehicle travel through native grassland and riparian areas will be restricted to one pass, where practical.

- Soil testing activities will only take place during dry or frozen ground conditions in areas where soil testing with a truck mounted auger is required, so that surface disturbance is reduced.

- Prior to the commencement of construction activities, site-specific features of concern (*e.g.,* rare plant communities or heritage resource sites) identified during biophysical surveys will be flagged sufficiently (if approved by landowner and/or occupant) so that these features could be removed or relocated outside of the development zone where construction and operational traffic can avoid these features.

- All pre-construction vehicle traffic will use existing vehicle crossings (*e.g.,* existing bridge) to cross flowing watercourses. Fording of flowing streams by vehicles will not be permitted.

- Pre-construction vehicle traffic will be limited to ATV traffic and, in severe cases, suspended if excessively wet soil conditions and the potential for topsoil/subsoil mixing due to rutting exists. Traffic will be confined to well-sodded, well-drained or frozen lands during excessively wet soil conditions.

- Pre-construction access through wetlands and riparian areas will be primarily by Argo for increased efficiency and minimal effects on terrain. Vehicle travel through wetlands and riparian areas will be restricted to one pass, where feasible.

7.2 Construction

The Project may implement and adhere to the following guidelines and mitigation measures during construction, as applicable.

- All Project personnel and Trans Mountain visitors to the facility footprint and/or associated components will receive a pre-job orientation which will include a discussion of the purpose and requirements of the Traffic and Access Control Management Plan. All project roads and access points to the facility footprint and/or associated components will be controlled using signage, gates, barricades or security personnel, where necessary, to prohibit unauthorized public use. Single lane roads and certain forestry haul roads may require radio control of traffic for safety purposes. Trans Mountain and their Contractor will develop a communication protocol prior to construction.

- Existing roads will be utilized as access, wherever possible. Existing access will not be upgraded or widened unless approved by the appropriate authorities.

- All vehicular traffic will be restricted to the approved workspace and access roads. Any newly developed access must be approved by Trans Mountain.

- Fences and signs will be erected to protect features of concern as specified in the EPP (Sections 6.0 to 11.0). The boundaries of shoo-flies will be clearly marked with signs and/or staking and flagging.

- Construction and inspection personnel and visitors to the facility footprint and/or associated components and other work sites will receive instruction regarding locations suitable for parking vehicles and equipment.

- Trans Mountain, the Contractor and all subcontractor personnel will avoid areas that are fenced or staked and abide by any restrictions regarding in/out privileges that are implemented in areas requiring special protection.

- 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/Thawed Soils Contingency Plan provided in Appendix B).

- Construction personnel will be transported between the construction camps, hotel accommodations, construction yards and muster areas by multi-passenger vehicles to the extent practical, in order to reduce vehicle traffic between lodging, staging and work site locations.

- Two-way travel, along temporary access roads to facilities, may be prohibited in areas where special restrictions are in effect (*e.g.,* narrowing of workspace to limit effect on a feature of concern).

- It may be necessary to designate turn-around areas for trucks transporting facility infrastructure. These areas will only be used for that purpose and not used for general construction traffic.

- The speed limit on the facility footprint will be 30 km/h and may be lower under specific conditions such as areas of high erosion hazard, low visibility, steep terrain or areas where specific wildlife or vegetation concerns have been identified; speed limits will be posted on the facility footprint and access created for the Project.

- All Project-related vehicles will follow applicable traffic, road-use and safety laws.

- Speed limits will be obeyed in order to reduce the potential for collisions with wildlife and for public safety.

- All personnel will avoid unnecessary wheel spin.

- Surface grading will be reduced on native vegetation (*i.e.,* rough micro-topography tolerated) unless a safety concern is identified.

- Use of cellular telephones and other hand-held communication devices by Trans Mountain staff, Contractor and subcontractors is prohibited while operating a motor vehicle. Drivers must pull over, when safe to do so and in a safe location, prior to using all hand-held communication devices.

- Vehicles will be limited to travel on the access roads and facility footprint for which they are designed. Trucks transporting facility infrastructure will require extra turning radius. Consequently, approaches to the facility footprint and/or associated components or existing public roads will be at least 15 m wide when used for trucks transporting facility infrastructure. Previously disturbed areas will be used for this purpose, if feasible. Trucks transporting facility infrastructure will be limited to access roads developed for their use, and other vehicles will not park in turnarounds developed for infrastructure truck use. New turn around areas require approval by applicable regulatory authorities.

7.3 Construction Clean-up and Reclamation

After construction is complete, all temporary construction access roads and shoo-flies will be reclaimed. Newly created access points will be blocked unless otherwise directed by Trans Mountain or the landowner/occupant or stakeholder (*i.e.,* Aboriginal representatives). Reclamation efforts will be initiated and traffic will adhere to the following principles to ensure there is minimal disturbance.

- Final clean-up and reclamation will be completed, including the implementation of access control along portions of facility footprint and/or associated components adjacent to environmentally sensitive features such as wetlands.

- Efforts to control off-road vehicle use will be coordinated with the appropriate regulatory authority or land occupant and will be conducted until the facility footprint and/or associated components have been satisfactorily reclaimed.

- Foot traffic will be reduced on newly seeded areas until grass establishment has taken place. Vehicle traffic will be avoided on seeded areas until the sod is re-established.

- All temporary construction access roads and shoo-flies will be reclaimed as per the EPP. Newly created access points will be blocked unless otherwise directed by Trans Mountain or the appropriate regulatory authority. Temporary construction gates and any fences removed during construction will be replaced with permanent fences.

- Routine access to the facility footprint and/or associated components for operations, maintenance and monitoring activities will be by way of pre-existing roads and trails wherever feasible. Where travel in the vicinity of sensitive vegetation is required (*e.g.,* during reclamation monitoring), foot travel will be used whenever feasible. ATVs / Argos will be used if necessary

- Off-road vehicle use and travel by predatory wildlife will be deterred by rolling back timber and slash across the width of the facility footprint, where feasible (*e.g.*, access trails, rights-of-way, seismic lines).

- Ditch ramps will be removed following construction where they were installed to facilitate access from existing roads to the facility footprint.

- Trans Mountain's emergency response measures will include instructions regarding preferred access routes to the facility footprint in areas of sensitive vegetation or habitats. These instructions will be followed during both emergency response training exercises and real emergencies providing that response times and safety are not compromised.

8.0 WASTE MANAGEMENT STANDARD

The Waste Management Standard (The Standard) has been prepared to provide guidelines for dealing with the generation of project waste. The plan is submitted in accordance with the filing requirements outlined in the NEB *Filing Manual* (NEB 2013).

This Standard outlines specific measures to be followed by all Trans Mountain employees and Contractors involved with the construction of the Project. The Standard is designed to ensure wastes generated by the Project are handled, stored and disposed of in an environmentally responsible manner, thereby maintaining ecological and cultural integrity. The proper implementation of the measures provide in the Waste Management Standard will reduce the likelihood of an accidental release of potentially hazardous waste products into the environment during facility construction.

The Standard applies to all employees, Contractors and consultants who conduct work on behalf of Trans Mountain during all phases 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 waste materials that are potentially hazardous to the environment.

The Environmental Inspector is responsible for ensuring compliance with KMC's Environmental Guidelines or the most recent KMC environmental manual or environmental management plans available at the time of construction for waste management. Where a discrepancy occurs, the most stringent requirements apply. In the event of a spill, the Spill Contingency Plan (see Appendix B) will be implemented. The Spill Contingency Plan (see Appendix B) sets forth the lines of communication and procedures to follow in order to facilitate containment and clean up should a spill occur.

Trans Mountain's Waste Management Standard will be provided in the Contractor's Construction Field Office for each spread.

1.0 INTRODUCTION

1.1 Scope

1.1.1 This Environmental Standard establishes the requirements that must be met while performing all work activities at Kinder Morgan Canada (KMC) in accordance with the Waste Management Program. This includes the requirements for handling, labelling, storing, and transporting wastes generated by work on or at KMC operated systems and facilities.

1.1.2 Any deviation from this Standard requires approval through the Facilities Modification Request (FMR) process.

1.2 Applicability

1.2.1 This document is applicable to all KMC employees and contractors with respect to any activity associated with waste management on the following (checked) KMC operated systems and facilities:

- ☑ Trans Mountain System
- ☑ Puget Sound System
- ☑ Jet Fuel System
- ☑ North 40 Terminal

1.3 Definitions

None

1.4 Background

1.4.1 Protection of the environment is a key priority of the public, industry, and government. One of the initiatives that KMC has implemented to accomplish this expectation is the environmentally responsible management of all waste generated by the company.

1.4.2 All types of waste, no matter how benign, can impact the environment and require responsible management to minimize and mitigate this impact. The Waste Management Program provides all employees and contractors with the tools to incorporate responsible waste management practices into their daily work routine and to

ensure that wastes are managed in accordance with applicable laws and regulations.

1.4.3 KMC operates facilities located in Canada and the United States. There are notable differences in how states and provinces regulate waste disposal. All employees involved in disposal activities must ensure that any waste intended for disposal or recycling is done so in accordance with the appropriate regulations for the province or state in which the waste is generated.

1.4.4 Both employees and contractors are responsible for preventing pollution by incorporating responsible waste management practices into work-related tasks on a daily basis. The results will lead to a cleaner environment, more efficient operations, and a safer workplace.

1.4.5 The Waste Management Program has been implemented to ensure compliance with regulatory requirements, protect human health and the environment, minimize costs and liabilities associated with managing wastes, and improve resource use and recovery in a managed and responsible manner.

1.4.6 This Standard is part of the Waste Management Program and states the requirements that must be met during all work activities.

2.0 ROLES AND RESPONSIBILITIES

2.1 Waste Program Coordinator

- Coordinates program management with third-party waste contractor
- Manages and coordinates third-party revisions to Waste Management Program
- Develops and implements waste training programs
- Participates in audits (as necessary) and corrective actions associated with waste documentation and processes
- Manages waste contractor selection for external auditing
- Acquires provincial waste generation numbers

2.2 Third-Party Waste Contractor

- Provides bin rental and pickup services
- Transports and disposes of routine and non-routine operational and project waste
- Provides technical waste support for field personnel
- Issues quarterly and annual waste tracking summaries to KMC for internal and external reporting
- Screens regulations/legislative requirements and provides updates to Waste Program Coordinator
- Reviews and updates KMC waste management documents as necessary
- Provides emergency waste services for petroleum releases i.e. onsite manifest completion, waste disposal coordination, etc.

2.3 Environment Manager

- Responsible for the overall Waste Management Program.
- Ensures the Environment Department has personnel and services in place to support the program.
- Designates a Waste Program Coordinator who will coordinate waste management activities associated with company facilities and operations.

2.4 EHS Coordinators

- Ensures applicable regulatory commitments are satisfied, including the acquisition of required permits and completion of government requested reports.
- Provides support and guidance to Operations and other departments on waste management issues.
- Assists in the acquisition of any required approvals for regional and project waste disposals.
- Responsible for record keeping and maintaining waste tracking documentation.
- Responsible for audit participation and corrective actions associated with facility audits.

2.5 Operations

- Coordinates day to day waste activities for their particular region, facility or activity.
- Ensures that only company approved waste contractors are used for generated waste transport and disposal.
- Ensures that all applicable waste training is received before conducting tasks associated with waste management.
- Responsible for completing station inspections which include Waste Storage Building Inspections.

2.6 Engineering

- Coordinates waste services for company projects.
- Ensures that only company approved waste contractors are used for generated waste transport and disposal.

2.7 Procurement Department

- Issues Master Service Agreement contracts with approved waste contractors.
- Provides support when surplus or used pipe, valves or fittings are sold or donated.

3.0 REQUIREMENTS

3.1 Waste Characterization and Classification

3.1.1 All wastes produced at KMC facilities and job sites shall be characterized and classified before long-term storage and disposal.

3.1.2  Characterization and classification shall be done by following Procedure *3.2.6.1 Classifying and Characterizing Waste*.

3.2 Waste Handling

3.2.1 All KMC employees who manage or handle waste must:

- Review and understand the applicable sections of the Waste Management Program.

- Be properly trained in the waste practices and procedures relevant to their work duties and have taken the KMC Waste Management Awareness training course.
- Ensure that all wastes are identified, handled, stored, transported, documented and disposed of or recycled in an environmentally acceptable manner and in compliance with federal, provincial/state, and municipal regulations.
- Report all spills or incidents in a timely manner according to KMC's incident reporting procedure (entry into STARS, emergency response line (ERL) notification, etc.).
- In Canada, review and understand Workplace Hazardous Materials Information System (WHMIS) and Transportation of Dangerous Goods (TDG) requirements before handling and disposing of wastes.
- In the United States, review and understand Hazardous Communication (HAZCOM), Department of Transportation (DOT) requirements for shipping dangerous goods, and Environmental Protection Agency (EPA) and state requirements for waste management.

3.3 Transportation of Wastes

3.3.1 All wastes produced at KMC facilities and job sites shall be transported in accordance with the applicable federal transportation requirements.

3.3.2 Transportation requirements are dependant on the properties of a substance, not whether it is waste or non-waste (unused); therefore, wastes must be transported with the same caution and compliance with transportation regulations as non-waste substances.

3.3.3  Transporting wastes shall be performed by following Procedure *3.2.7.3 Transporting Regulated Wastes – Documentation Guide*.

4.0 INSPECTIONS AND AUDITING

4.1 Inspections

4.1.1 All waste storage areas, including hazardous waste storage areas, shall be routinely inspected at least once every three months or as specified by the applicable regulations.

4.1.2 The inspections must document evidence of spills and leaks, corroded or damaged drums or tanks, missing labels, inadequate spill containment or weather protection, and current contents of wastes stored. A checklist shall be used for conducting routine inspections.

4.1.3  Inspections shall be carried out by following Procedure *3.2.6.2 Waste Storage and Inspections*.

4.2 Auditing

4.2.1 KMC shall undertake regular audits of waste contractors and internal operations where wastes are generated, handled, stored, transported, and disposed of or recycled.

4.2.2 Detailed information on waste auditing protocols and audit systems and schedules are developed and implemented by the Waste Program Coordinator.

4.2.3  Selecting waste contractors for waste disposal and ensuring they are approved for use by KMC shall be done by following Procedure *3.2.7.1 Selecting and Using Waste Contractors*.

5.0 QUALIFICATION AND TRAINING

5.1 KMC Employees who Manage or Handle Waste

5.1.1 All employees who handle, store, transport and dispose of waste must be qualified and have received waste management training. Waste training for KMC Technicians is a component of, and administered within, the KEEP Canada Program.

5.1.2 The type of training shall reflect the type (i.e. character and classification) of waste the employee is working with.

5.2 Contracting Companies that Transport or Dispose of Waste

5.2.1 Prior to handling, shipping, or disposing of any waste generated by KMC, contractors must review the Contractor Environmental/Safety Manual and understand the waste regulations that apply to KMC.

6.0 REFERENCES

6.1 Environmental Manual

- *3.2.6.1 Classifying and Characterizing Waste*
- *3.2.6.2 Waste Storage and Inspections*
- *3.2.7.1 Selecting and Using Waste Contractors*
- *3.2.7.3 Transporting Regulated Wastes – Documentation Guide*

6.2 Regulations

- National Energy Board, Onshore Pipeline Regulations, 1999
- Transport Canada, Transportation of Dangerous Goods Regulations
- Environment Canada, Interprovincial Movement of Hazardous Waste Regulations
- Alberta Environment and Sustainable Resource Development, Waste Control Regulation
- Alberta Environment and Sustainable Resource Development, Alberta Users Guide for Waste Managers
- Alberta Energy Resources Conservation Board (ERCB), Directive 55: Storage Requirements for the Upstream Petroleum Industry, Directive 58: Oilfield Waste Management Requirements for the Upstream Petroleum Industry, and Directive 66: Requirements and Procedures for Pipelines
- British Columbia Ministry of Environment, Hazardous Waste Regulation
- British Columbia Ministry of Environment, Hazardous Waste Legislation Guide
- Environmental Protection Agency, Resource Recovery and Conservation Act, 40 CFR §260-282
- Environmental Protection Agency, Hazardous Materials Regulations 40 CFR §273
- Department of Transportation, Pipeline and Hazardous Material Safety Administration (PHMSA) 49 CFR §171-185

- Washington State Department of Ecology, Dangerous Waste Regulations WAC 173-303
- Washington State, Chapter 70.105 RCW Hazardous Waste Management

9.0 WATER WITHDRAWAL AND DISCHARGE PROCEDURES MANAGEMENT PLAN

Background

Water withdrawal and discharge can affect surface and groundwater flow as well as transport sediment into watercourses, wetlands and lakes. During construction, withdrawal and discharge of water may be necessary at work camps, borrow sites and for construction, reclamation and maintenance of access roads as well as testing of the pump station facility piping or discharge from trucks for road/access maintenance/construction. Water withdrawal and discharge for these activities have the potential to adversely affect water quality and aquatic resources, due to disturbance to the land surface, disturbance to the bed and banks of watercourses, disruption of water flow, alteration of water temperature and flooding or erosion during disposal of waste water. The Water Withdrawal and Discharge Procedures Management Plan will provide steps to ensure that water use and discharge related to Project activities are properly managed. Refer to Section 8.3 of the EPP for potential mitigation applicable to the withdrawal and discharge of water for hydrostatic testing.

Objective

The objective of the Water Withdrawal and Discharge Procedures Management Plan is to ensure that withdrawal and discharge of water for the Project is conducted in a manner that:

- maintains water quality;
- avoids soil erosion;
- reduces or avoids adverse effects on aquatic resources and habitat, wildlife, recreational land use and downstream water users; and
- is conducted in accordance with applicable approvals and permit conditions.

Management Approach

In determining the potential water sources required for water usage (*i.e.,* hydrostatic testing) and the volumes and rates of withdrawal, many key environmental factors will be considered, which include.

- Fish presence, species and potential habitat near the intake site, RAP and least-risk timing windows.
- Baseline source water quality parameters prior to withdrawal, including conductivity, salinity absorption and total suspended solids.
- Estimated flow rates in the watercourse at the anticipated times of withdrawal, with particular consideration to periods of low flow.
- Duration, rates and total volumes of withdrawal from each respective watercourse/wetland/lake.
- Characteristics of the watercourse/wetland/lake at the intake site (*e.g.,* channel width and depth, velocity, sediment transport processes).
- Location and position of the intake within the watercourse/wetland/lake, including dimensions, alignment, depth and wetted area.
- Whether the excavation of a sump is necessary (preference will be given where no sump is warranted).
- Site access.
- Location of the source and discharge sites to the point of use of the water.
- Areas with unstable banks or approaches.

- Physical screen intake design and requirements.

Trans Mountain will prepare and provide to the National Energy Board (NEB) a summary of the details of all planned water withdrawals and discharges for the Project prior to hydrostatic testing of pump station piping. An example of a Water Withdrawal and Discharge Form is provided at the end of this plan.

Water Withdrawal

During water withdrawals, the Contractor, under the supervision of the Environmental Inspector, will set intakes in the watercourses/wetlands/lakes in such a way as to avoid sedimentation, maintain adequate flow rates (no more than a 10% withdrawal rate [Canadian Association of Petroleum Producers {CAPP} 1996]) and restrict fish impingement on screen intakes, in compliance with regulatory requirements and conditions of the TDL in Alberta or a Section 8 Short-Term Water Withdrawal *Water Act* Approval or Basin Section 8 Approval from BC OGC in BC. In the event that primary test water sources do not contain adequate flow rates to support the water withdrawal without affecting downstream uses and resources, the withdrawal rate will be reduced or alternative water sources will be used.

Fuel driven pumps and generators associated with the withdrawal of water will be isolated by an impermeable lined dike or depression to prevent spills of fuels or lubricants from contaminating soils or watercourses, wetlands or lakes. Pump and related water withdrawal equipment will be placed above the ordinary high water level of the source watercourse/wetland/lake to avoid being inundated in the event of high water levels during the period of use.

In watercourses/wetlands/lakes that support sensitive species, Trans Mountain will avoid withdrawal of water during the RAPs (in Alberta) and outside of the least-risk timing windows (in BC), unless specific approval is obtained from the appropriate regulatory authority in advance.

A Qualified Aquatic Environmental Specialist (QAES) (in Alberta) or Qualified Environmental Professional (QEP) (in BC) will collect baseline water quality parameters prior to withdrawal and monitor water withdrawal rates and suspend activity, when warranted, if low flow rates or other thresholds are encountered. The screen around the intake will be fabricated to provide an adequate surface area of fine-mesh screen to reduce the approach velocity in order to prevent impingement or entrainment of small fish, in accordance with DFO screening requirements (DFO 1995). The Environmental Inspector will regularly inspect the water intake screen for entrained fish.

Water Discharge

There will be no transfer of test water from one river sub-basin to another. All test waters used for hydrostatic testing will be discharged close to the source drainage sub-basin to prevent the inadvertent transfer of aquatic organisms or plant species from one watershed or drainage sub-basin to another, as identified on approval conditions. Where test water is clean enough for release to the environment, however, cannot be released to the original basin, the selection of the discharge site and rate of discharge will ensure that the released water does not directly flow into any adjacent surface waters. In the event it is impractical to release test water onto a terrestrial site or into a watercourse/wetland/lake, located within the source drainage sub-basin, seek approval from the appropriate federal regulatory authorities (*e.g.*, DFO, NEB) prior to discharge. Screens will be maintained and adequately cleaned between water sources. Where test water is not clean enough for release to the environment, alternate options for disposal will be considered (*i.e.,* reuse for testing elsewhere or pre-approved off-site disposal and treatment locations).

All waters to be released directly or indirectly into a watercourse/wetland/lake will be tested prior to and during release. The need and type of testing of water to be released onto land or water will be in accordance with approval, permit, and/or notification conditions as well as the testing requirement information provided on the water withdrawal/discharge planning sheets.

Water used for hydrostatic testing will be tested for total suspended solids, benzene, ethylbenzene, toluene, xylene, free chlorine residual, pH, dissolved Iron, oil/grease sheen and additives if released into receiving water. If released onto land, hydrostatic testing water will be tested for total purgeable hydrocarbons, total extractable hydrocarbons and undergo a Microtox (EC_{50}) test, as per the *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas*

Pipelines (Government of Alberta 1999b) in Alberta. If determined to be non-harmful, hydrostatic testing water will be released into the environment. Prior to the discharge of hydrostatic test water to land in BC, appropriate testing and treatment measures will be implemented in accordance with Section 7(2)(e) and Section 7(3) of the Oil and Gas Waste Regulation, BC Reg. 254/2005 of the BC *Environmental Management Act,* guidelines outlined in CAPP (1996) and Canadian Council of Ministers of the Environment (CCME) (2007) water quality requirements. Note that waters containing freeze depressants will either be reused on subsequent tests or returned to the supplier.

Preferred discharge sites for dewatering will be located on stable upland areas (rather than directly into a watercourse/wetland/lake), where feasible, to allow the discharged water to be filtered through vegetation and soils prior to returning to a watercourse/wetland/lake. Preferred locations for dewatering include bar ditches, if feasible, and non-arable lands. Sediment reduction methods will be implemented on the bed, banks and approaches to the water source or discharge site, if warranted, to protect downstream fish, fish habitat and water users from increased sedimentation or reduced water quality. Discharge locations will be monitored to ensure that no erosion, flooding or icing occurs. During discharge procedures from trucks for road/access construction and maintenance, ensure discharged water is maintained within the major drainage basin and dispersed as per the conditions located within the applicable approval/licence.

Water energy will be limited with the use of a dissipater and protective rock riprap, sheeting, tarpaulins or other equivalent materials to reduce or avoid the potential for erosion of soils during water discharge activities. The rate of discharge will also be reduced if downstream or terrestrial flooding appears to be imminent, particularly when discharge occurs during frozen conditions.

SOURCE WATER OVERVIEW

Source Water: **Name:** _____ _____ **UTM of Withdrawal Site:** Northing: _____ Easting: _____ **Nearest KP :** _____

Intended Water Use: _____

Volume to be Withdrawn (m^3) _____

Rate of Withdrawal (L/s): _____

Timing of Withdrawal(s): _____ _____

Socio-economic/Environmental Issue(s): _____

Instream Period of Least Risk or RAP: _____ to _____

Erosion Control Measure(s): _____

Spill Containment/Contingency Measures: _____

DISCHARGE SITE OVERVIEW

Receiving Land or Water: Land: ____ Water: _____ Land Area: _____ ha watercourse/wetland/lake Name: _____ **UTM of Discharge Site:** Northing: _____ Easting: _____ **Nearest KP :** _____

Water Use: _____

Volume to be Discharged (m^3) _____

Rate of Discharge (L/s): _____

Timing of Discharge(s): _____ _____

Socio-economic/Environmental Issue(s): _____

Instream Period of Least Risk or RAP: _____ to _____

Erosion Control Measure(s): _____

Spill Containment/Contingency Measures: _____

SUMMARY OF MONITORING MEASURES

Monitoring Requirements as per Regulatory Approvals:

Planned Monitoring Program (including parameter(s) to be monitored, sampling intervals and sampling location(s)):

Key EPP References:

Water Crossing Summary Tables provided in Appendix J

Hydrostatic Testing - Section 8.3.

10.0 WEED AND VEGETATION MANAGEMENT PLAN

This WVMP has been prepared to meet the NEB's filing requirements for the Project Application and to address Trans Mountain's short and long-term problem vegetation monitoring and management procedures, decision criteria, as well as accountability and responsibility for the construction and operational phases of the Project.

This WVMP has been prepared to comply with all guidelines outlined in KMC's Integrated Vegetation Management (IVM) Plan (KMC 2011) as well as weed and pesticide regulations for the provinces of Alberta and BC. This WVMP addresses designated weeds listed in the Alberta and BC *Weed Control Acts* as well as the BC *Forest and Range Practices Act* (Attachment C1). Within Alberta, all growing plants designated as 'Prohibited Noxious' and their reproductive mechanisms must be destroyed or rendered non-viable. Plants designated as 'Noxious' must be controlled (inhibit growth and spread) or destroyed. In BC, 'Provincial Noxious' plants are those that must be controlled in all regions and 'Regional Noxious' plants are those that must be controlled in the region(s) for which they are listed. Furthermore, plants listed as invasive under the BC *Forest and Range Practices Act* must be managed to prevent their introduction or spread. Problem woody vegetation identified in the IVM Plan will also be addressed in this report (Attachment C1).

Vegetation species of concern specific to municipalities and/or regional districts can be obtained from municipal representatives and invasive plant councils (refer to Table C.10.0-1). Trans Mountain may wish to contact each municipality and/or regional invasive plant council at a later date to determine additional species of concern and any specific mitigation recommended for the applicable areas.

TABLE C.10.0-1

MUNICIPALITY/REGIONAL DISTRICT INVASIVE PLANT COUNCILS

Area	Municipality/Regional District	Invasive Plant Council	Approximate Reference (KP)
Alberta	Parkland County	N/A	45 to 135
	Yellowhead County	N/A	135 to 339
BC	Fraser – Fort George	Northwest Invasive Plant Council	490 to 549
	Thompson-Nicola	Southern Interior Weed Management Committee	549 to 992
	Fraser Valley	Fraser Valley Invasive Plant Council	992 to 1138
	Greater Vancouver	Invasive Plant Council of Metro Vancouver	1138 to 1180

The WVMP will be part of Trans Mountain's general Operations Plan for the Project. The overall goal of the WVMP is to manage the spread of problem vegetation for facility identification and line of sight maintenance, to provide access to the facility footprint for maintenance and to reduce accidents, fires and system failures caused by the presence of problem vegetation, in accordance with applicable legislation.

Trans Mountain will utilize an IVM approach to carry out problem vegetation (*i.e.,* weeds, grasses, sedges, forbs, vines, ferns, brush and trees [deciduous and coniferous]) management practices for this plan and to meet the overall objectives of IVM for all Trans Mountain pipelines and facilities. Integrated Vegetation Management (IVM) is an adaptive management process involving the use of various methods in a cost-effective and responsible manner to reduce the use of herbicides, promote healthy ecosystems, provide measurable results and facilitate better management of problem vegetation. The WVMP will address non-chemical, cultural and chemical techniques for problem vegetation management along facility footprint and/or associated components (borrow sites, temporary access roads and TWS) through recommendations of vegetation management procedures, which include:

- timing considerations;
- select methods and equipment; and
- specific vegetation management procedures based on the following key considerations:
  - prevention;

- identification;
- monitoring;
- treatment thresholds;
- vegetation management options; and
- post-treatment evaluation.

The use of herbicides for problem vegetation management on the facility footprint and/or associated components within the province of Alberta will be conducted in accordance with the *Environmental Code of Practice for Pesticides* (Government of Alberta 2010) as part of the Alberta *Environmental Protection and Enhancement Act*. In BC, the use of herbicides for problem vegetation management on the facility footprint and/or associated components will be conducted in accordance with the BC *Integrated Pest Management Regulation* as part of the BC *Integrated Pest Management Act*.

The WVMP consists of vegetation management measures to be implemented in the short-term, during the pre-construction, construction and post-construction environmental monitoring phases of Project construction and the long-term, during the regular operation and maintenance phase of the Project. Vegetation management measures to be implemented during both short-term and long-term periods are described further in Section 10.9 of this WVMP.

Weed information will be provided following the completion of the Weed Survey for the Project that is scheduled prior to construction.

10.1 Plan Objectives

The objective of the WVMP is to manage problem vegetation that could otherwise affect the safe and efficient operation of the Project as well as adversely affect regulatory and environmental requirements. Specifically, the intent of the WVMP is to prevent and manage the potential spread of provincially and regionally designated weed species on the facility footprint and/or associated components as a result of construction activities. In addition, the intent is to reduce or manage provincially and regionally designated weed infestations as a result of operational activities to a level equivalent to that observed on adjacent lands with similar land use and similar land management and to manage problem vegetation, as identified in the IVM Plan, to a level that is in accordance with regulatory requirements (Table C.10.3-2) and as outlined in the IVM Plan.

The WVMP has been prepared to address Trans Mountain' objectives, as outlined below.

- Allow access to facility infrastructure for maintenance by managing problem vegetation, including the growth/spread of provincially and regionally designated weeds on the facility footprint and/or associated components.
- Comply with provisions of the BC *Wildfire Regulation* with respect to maintaining sites located within 300 m of forested lands or grassland areas in a manner that prevents any fire from spreading.
- Ensure compliance with Trans Mountain's vegetation management policies, Environment, Health and Safety policy, environmental standards and guidelines and with NEB requirements.
- Reduce the incidence of accidents, fires and system failures caused by the presence of problem vegetation.
- Ensure compliance with federal and provincial problem vegetation management legislative requirements (*i.e., Weed Control Act*).
- Respect any agreement made with the public, adjacent landowners and Aboriginal communities affected by problem vegetation management (*i.e.,* chemical suppression).

- Ensure safe working conditions and protect public health and safety, environmental resources and ecologically sensitive areas.
- Maintain facility integrity and security as well as landscape aesthetics.
- Incorporate the most effective and efficient vegetation management treatments as determined through use of IVM principles.
- Reduce the need for vegetation management treatments through the use of IVM principles.
- Reduce long-term program costs.

Measures to be implemented in the short-term (during pre-construction, construction and post-construction environmental monitoring phases) and long-term (during the regular operation and maintenance phase) as well as specific activities designed to support these measures, will be provided to address the scope of each objective.

10.1.1 Short-Term Objectives

In recognition of the time required for native woody vegetation (shrubs, and deciduous and coniferous species trees) to re-establish on disturbed areas following construction, problem vegetation (designated and non-designated weeds [forbs]) as identified in provincial legislation and the IVM Plan will be addressed under short-term objectives.

Measures implemented in the short-term (during the construction phases of the Project), will include the following.

- Conduct a pre-construction weed survey and record problem vegetation (designated weeds) infestations on and adjacent to the facility footprint and/or associated components.
- Implement problem vegetation (designated weeds) treatments during the pre-construction phase, where warranted.
- Monitor problem vegetation (all weeds) during the construction phase (primarily topsoil/root zone material storage piles/berms) and implement treatments, where warranted.
- Monitor problem vegetation (designated weeds) on the facility footprint and/or associated components during the PCEM phase and implement treatments, where warranted.
- Recommend effective mitigation measures based on species, densities, land use, land management, location and aerial extent for the pre-construction, construction and post-construction environmental monitoring phases of the Project.
- Manage problem vegetation below established threshold levels required for the safe and efficient construction of the Project.
- Ensure compliance with all pertinent government regulations, Trans Mountain policies and environmental standards and guidelines.
- Continue ongoing consultation with the public, adjacent landowners and Aboriginal communities to coordinate effective problem vegetation management strategies.
- Monitor and evaluate the success of problem vegetation management strategies during the following years of the PCEM Program.
- Utilize the most effective and efficient problem vegetation management techniques/strategies in subsequent years of the PCEM Program.

A Trans Mountain Vegetation Management Contractor trained and experienced in identifying problem vegetation, and familiar with provincially and regionally designated weeds in Alberta and BC, will conduct on-ground monitoring to record the species and density of problem vegetation.

Problem vegetation density and distribution in Alberta will be ranked according to the AESRD codes (Government of Alberta 2009) while in BC, the Ministry of Forests codes (Luttmerding *et al.* 1990) will be used to provide descriptions that encompass density and distribution as well as provide a visual schematic and verbal description of each code. The AESRD and BC Ministry of Forests problem vegetation distribution codes are provided in Attachment C2 of this appendix.

Identified problem vegetation, which requires immediate management, will be reported with recommendations for problem vegetation management to Trans Mountain's environmental designate. Depending on the species, land use, densities, aerial extent and through consultation with the public, adjacent landowners and Aboriginal communities, options will be considered by the Trans Mountain environmental designate for problem vegetation management on the facility footprint and/or associated components.

The effectiveness of problem vegetation management measures implemented during the pre-construction and construction phases, will be outlined in the as-built report, Environmental Issues List for the Project (to be included and updated in all PCEM reports) and will be evaluated by a Reclamation Specialist during initial and subsequent PCEM of vegetation and soil conditions. Monitoring will be completed by inspecting all locations previously noted within the Environmental Issues List as having problem vegetation and where treatments were implemented, to report on the degree of success of the reclamation in these areas including the identification of problem vegetation species and their densities. A PCEM report will be prepared and the Environmental Issues List updated. Where PCEM identifies that further management measures are required to manage problem vegetation, Trans Mountain will take appropriate action in a timely manner. Problem vegetation management activities will be conducted as often as the Reclamation Specialist determines is warranted, based on the effectiveness of the treatment strategies, until the problem vegetation species have been reduced to below threshold levels.

10.1.2 Long-Term Objectives

Trans Mountain is committed to regular review of all applicable problem vegetation reports (*i.e.,* Pre-Construction Weed Survey Report, final year PCEM report, Environmental Issues List and Post-Treatment Monitoring Report) prepared for the facilities. As part of this commitment, measures implemented over the long-term will be implemented (*i.e.,* ongoing management of problem vegetation) to meet objectives outlined in the WVMP and the IVM Plan during regular operation and maintenance activities for the Project. The areas of the facility footprint and/or associated components, where ongoing operation and maintenance is not required, will be managed to revert to a natural vegetative state, where feasible. To meet Trans Mountain's long-term problem vegetation management goals, applicable short-term goals and measures discussed in Section 9.1.1 of this WVMP will be used along with the following measures.

- Reducing or preventing the spread of problem vegetation on the facility footprint and/or associated components through ongoing monitoring and vegetation management, where warranted.
- Addressing regulatory notices or complaints.
- Reducing problem vegetation infestations to a level at or below the level observed in adjacent lands with equivalent or similar land use and land management.
- Considering proactive and preventative problem vegetation management designed to reduce the use of herbicides when planning and constructing new facilities or when conducting operations and maintenance activities.
- Continue ongoing consultation with the public, adjacent landowners and Aboriginal communities to actively evaluate and use new problem vegetation management techniques and practices to improve the WVMP.

- Actively using and evaluating new problem vegetation management techniques and practices to improve vegetation management programs by designing and managing more effective herbicide applications, testing alternatives to herbicides and using them where appropriate; and

- Searching for products and application methods that have lower environmental effects.

10.2 Environment, Health and Safety Policy and Environmental Standards

The WVMP will be carried out in accordance with KMC's Environment, Health and Safety policy (KMC 2012) as well as KMC's Environmental Standards for Pesticides and Herbicides (KMC 2011) or any other updated source in place at the time of pre-construction.

10.3 Legislative Requirements for Vegetation Management

The management of problem vegetation must be in compliance with federal and provincial legislation as outlined in Table C.10.3-1. Specific regulatory requirements (*i.e.,* setback distances for herbicide application near watercourses/wetlands/lakes) that Trans Mountain must adhere to are provided in the IVM Plan as well as Sections 6.0 and 7.0 of the Facilities EPP.

TABLE C.10.3-1

SUMMARY OF PRIMARY WEED AND VEGETATION MANAGEMENT LEGISLATION

Area	Regulatory Authority	Legislation	Regulations
Provincial (Alberta)	Alberta Agriculture and Rural Development	*Weed Control Act*	*Weed Control Regulation*
	Alberta Environment and Sustainable Resource Development (AESRD)	Alberta *Environmental Protection and Enhancement Act*	*Pesticide Sales, Handling, Use and Application Regulations*
			Pesticide (Ministerial) Regulation
			Environmental *Code of Practice for Pesticides*
			Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body
		Public Lands Act	*Public Lands Act Regulation*
		Forest and Prairie Protection Act	*Forest and Prairie Protection Regulation*
		Alberta *Fisheries Act*	--
		Alberta *Wildlife Act*	--
Provincial (BC)	BC Ministry of Agriculture	*Weed Control Act*	*Weed Control Regulations*
	BC Ministry of Environment	*Integrated Pest Management Act*	*Integrated Pest Management Regulation*
		Environmental Management Act (Bill 57-2003)	--
	Ministry of Forests, Lands and Natural Resource Operations	*Wildfire Act*	--
	Ministry of Forests, Lands and Natural Resource Operations	*Water Act*	*Weed Control Regulation*
		Forest and Range Practices Act	*Invasive Plants Regulation*
		Wildlife Act	--
	BC Oil and Gas Commission	*Oil and Gas Activities Act*	--
Federal	Pest Management Regulatory Agency (Health Canada)	*Pest Control Products Act*	*Pest Control Products Regulations*
	Environment Canada	*Canadian Environmental Protection Act*	--
		Canada Water Act	--
		Species at Risk Act	--
	Canada Wildlife Services	*Migratory Birds Convention Act*	--
	DFO	*Fisheries Act*	*Operational Statement for the Maintenance of Riparian Vegetation in Existing Rights-of-Way*
	Canadian Food Inspection Agency	*Plant Protection Act*	--
	Transport Canada	*Transportation of Dangerous Goods Act*	*Transportation of Dangerous Goods Regulations*
	NEB	*Pipeline Act*	--
	NEB	*NEB Act*	*NEB Onshore Pipeline Regulation*

10.4 Consultation

Trans Mountain will consult with the public, adjacent landowners and Aboriginal communities affected by the Project regarding problem vegetation management and proposed methods of treatment.

Consultation with be ongoing up until construction.

10.5 Prevention

Preventative measures aimed at stopping the introduction, initial growth and spread of problem vegetation is an important component of the WVMP. These measures, where applicable, have been and will be incorporated into new facility design prior to construction and site maintenance activities as well as any other construction activities on the facility footprint and/or associated components.

A summary of the preventative measures for problem vegetation management that Trans Mountain will employ are provided below and supplement detailed preventative measures outlined in the IVM Plan.

Proposed Facilities

Surfacing Materials

- Use of appropriate surfacing materials within the facility development zone to limit growth of problem vegetation. This includes ensuring surfacing material is of a correct thickness and free of organic material to reduce the establishment of problem vegetation. One or a combination of the following options will be used for surfacing materials for new construction and upgrading of existing structures:
  - Crushed rock/gravel (washed where available); source sites will be visited prior to delivery of crushed rock/gravel to ensure site is acceptable due to the high risk of problem vegetation introduction.
  - Landscape fabric (geotextile).
  - Asphalt and concrete.

Maintaining Perimeter Fences and Access Roads

- Problem vegetation growing adjacent to perimeter fences and access roads will be removed or managed to prevent fire hazards and reduced visibility, to allow for easy access to facilities and to comply with applicable legislation.

Seeding Disturbed Areas

- Seed appropriate native or non-native grass mixes and fertilize, where warranted, to revegetate disturbed areas.
- Ensure problem vegetation maintenance equipment is free of problem vegetation seeds or debris.
- Restrict vehicle travel through problem vegetation infested areas.
- Plant native shrub/tree species, where warranted, depending on the site-specific objectives.
- Remove problem vegetation when adjacent to or crossing a wetland or watercourse (*i.e.,* river) and replace it with compatible, low-growing plant species (*i.e.,* shrubs, grasses) that will out-compete problem vegetation.
- Manage all problem vegetation on the facility footprint and/or associated components during all construction phases (pre-construction, construction, post-construction environmental monitoring) and the operational phase.
- Encourage alternative, compatible vegetation management techniques such as planting low growing shrubs, livestock grazing or other types of approved vegetation management practices.

- Limit vehicle travel through problem vegetation infested areas.

10.6 Identification

Vegetation specialists will record their location and the aerial extent of weed infestations on the facility footprint and/or associated components, during their normal inspection/patrols, maintenance and monitoring activities. Trans Mountain defines a Vegetation Specialist as a person who has a demonstrated ability and experience in identifying problem vegetation species. The Vegetation Specialist will be:

- local Trans Mountain field personnel who have special training or experience in problem vegetation identification;
- Regional Environmental Managers who have training or experience in problem vegetation identification; and/or
- consultants who specialize in problem vegetation identification.

The Vegetation Specialist will be familiar with legislated problem vegetation in Alberta and BC as well as problem vegetation identified in the IVM Plan. In addition, the Vegetation Specialist will be trained to identify problem vegetation at important growth stages (*i.e.,* trained to recognize when the problem vegetation cover is near or above the treatment threshold levels within a certain area). Vegetation identification guides will be issued to aid operators in their identification of problem vegetation. Where Trans Mountain staff is not trained to identify problem vegetation, a Trans Mountain environmental designate or a consultant specializing in problem vegetation identification and management will be retained to identify problem vegetation. Problem vegetation management on the facility footprint and/or associated components will focus on vegetation listed in relevant legislation (*i.e.,* Prohibited Noxious and Noxious plants in Alberta and provincially and regionally Noxious and Invasive plants in BC) as well as problem vegetation identified in the IVM Plan.

The legislated problem vegetation in Alberta and BC as well as woody problem vegetation of concern to Trans Mountain projects are provided in Attachment C1. Provincial rankings are in accordance with the respective *Weed Control Regulations* as well as the BC *Invasive Plants Regulation*.

10.7 Monitoring

As a component of Trans Mountain's patrols, problem vegetation will be monitored during aerial patrol flights and/or ground inspections (aerial patrol flights will occur during the PCEM phase of construction and relevant information will be provided to the Project Environmental Manager). Monitoring will be conducted as per the IVM Plan in conjunction with other scheduled aerial inspection activities for regular maintenance and operations activities. Where potential concerns are identified during the aerial patrol, on-ground monitoring will be conducted to record the species and density of problem vegetation as soon as practical following the aerial patrol flight. Aerial patrol flights will begin once the facility is activated (includes the period of the PCEM during the construction phase) and any relevant information will be provided to the Project Environmental Manager and PCEM Program Manager. Once the Project reaches the operational phase, a qualified environmental professional will conduct pre-treatment site monitoring in late spring of each year to determine the necessity for and the type of problem vegetation management required.

During regular maintenance and operations activities, incidental ground inspections for problem vegetation may be conducted to determine the extent (percent cover, composition, distribution, location of infestations, etc.) of problem vegetation (*i.e.,* presence of mature brush and trees, and weeds). Areas of new infestations, recommended treatment sites and adjacent landowner concerns will also be identified and documented during monitoring. To assist monitoring efforts, the baseline data collected during the pre-construction weed survey and the results of the PCEM Program (Environmental Issues Lists) will assist in establishing thresholds and determining if objectives of the WVMP are being met.

10.8 Treatment Thresholds

Setting treatment thresholds (based on federal and provincial legislation/regulations and/or requirements as well as accepted industry standards) includes prioritizing treatments when problem vegetation management becomes necessary in order to reduce the risk of problem vegetation exceeding the thresholds specified in the IVM Plan.

The treatment threshold objectives for problem vegetation species for the Project are as follows.

- Problem vegetation must be maintained at levels, by density and distribution, equivalent to or less than levels on observed adjacent lands with equivalent or similar land use and land management.
- Problem vegetation must be managed in compliance with provincial legislation and jurisdictional requirements (*i.e.,* the Alberta *Weed Control Act*, the BC *Weed Control Act* and the BC *Forest and Range Practices Act*).
- Problem vegetation specific to Trans Mountain projects, as outlined in the IVM Plan, will be managed, where warranted.
- Maintain the height of vegetation to a height that reduces the possibility of warning signs being obscured by low growing branches or a canopy effect created by larger trees.
- In areas where the tolerance for problem vegetation is low (*i.e.,* under or adjacent to piping, diesel fuel or propane tanks, electrical control building, etc.), vegetation will be managed as per the IVM Plan for defined areas on the facility footprint.

The priority for managing sites (treatment priority) where the established threshold has been reached can be determined by the level of risk and is further described in the IVM Plan. Criteria for the site risk levels are summarised in Table C.10.8-1.

TABLE C.10.8-1

SITE RISK LEVELS AND TREATMENT

Risk Level	Purpose or Intent	Treatment	Construction	Operations
1 High Risk	To stop the spread of problem vegetation (*i.e.,* Prohibited Noxious and Noxious) weeds currently threatening non-infested or highly susceptible sites including agricultural land, forestry cutblocks and tree farms and/or if the site is adjacent to transportation corridors such as roads or waterways.	• Problem vegetation management will involve IVM principles that may combine two or more of the following vegetation management treatments: non-chemical; cultural/biological; and chemical. • Problem vegetation management will be based on one or more of the following: pre-construction weed survey and PCEM Program (Environmental Issues List) findings; the invasiveness of the problem vegetation; problem vegetation densities on adjacent land (facility footprints and/or associated components); and adjacent land use. • All records of problem vegetation management will be tracked in the Problem Vegetation Management and Monitoring Database. • Prohibited Noxious weeds in Alberta must be destroyed while Noxious weeds must be controlled. Noxious and Invasive weeds within BC must be controlled and managed, respectfully.	• Initial treatments, monitoring and follow-up treatments will be completed as soon as possible. • A pre-construction weed survey will be completed and problem vegetation treatments will occur during the pre-construction phase, where warranted. • During the construction phase, problem vegetation on topsoil/root zone material storage piles will be controlled and/or destroyed. • During the PCEM phase, problem vegetation identified will be controlled and/or destroyed.	• Initial treatments, monitoring and follow-up treatments will be completed as soon as possible. • Problem vegetation management will have a strong focus on annual monitoring data (and construction phase reporting [*i.e.,* pre-construction weed survey report and PCEM Program – Environmental Issues List]) that identifies problem vegetation. The spread of Prohibited Noxious and Noxious weeds and woody problem vegetation will be stopped. In addition, woody problem vegetation will be managed when it is determined that the woody problem vegetation poses a risk to the access, maintenance and regular operations of the facility and associated components (borrow sites, temporary access roads and TWS).
2 Moderate Risk	To stop the increase of problem vegetation on sites in less susceptible areas. This includes sites adjacent to lands such as forested lands that have a well-established vegetation cover and are, therefore, less susceptible to problem vegetation introduction.		• Initial treatments, monitoring and follow-up treatments will be completed as soon as conditions are optimal and once problem vegetation management at high risk sites is complete. • A pre-construction weed survey will be completed and problem vegetation treatments will occur during the pre-construction phase, where warranted. • During the construction phase, problem vegetation on topsoil/root zone material storage piles/berms will be controlled and/or destroyed. • During the PCEM phase, problem vegetation identified will be controlled and/or destroyed.	• Initial treatments, monitoring and follow-up treatments will be completed as soon as conditions are optimal and once problem vegetation management at high risk sites is complete. • Problem vegetation management will have a strong focus on annual monitoring data (and construction phase reporting [*i.e.,* pre-construction weed survey report and PCEM Program – Environmental Issues List]) that identifies problem vegetation. The increase of problem vegetation species in less susceptible areas will be stopped. In addition, woody problem vegetation will be managed when it is determined that the woody problem vegetation poses a risk to the access, maintenance and regular operations of the facility and/or associated components.
3 Low Risk	To stop the increase and/or contain problem vegetation on sites in and adjacent to industrial lands.		• Initial treatments, monitoring and follow-up treatments will be completed as soon as conditions are optimal and once problem vegetation management at high and moderate risk sites is complete. • A pre-construction weed survey will be completed and problem vegetation treatments will occur during the pre-construction phase, where warranted. • During the construction phase, problem vegetation on topsoil/root zone material storage piles/berms will be controlled and/or destroyed. • During the PCEM phase, problem vegetation identified will be controlled and/or destroyed.	• Initial treatments, monitoring and follow-up treatments will be completed as soon as conditions are optimal and once problem vegetation management at high and moderate risk sites is complete. • Problem vegetation management will have a strong focus on annual monitoring data (and construction phase reporting [*i.e.,* pre-construction weed survey report and PCEM Program – Environmental Issues List]) that identifies problem vegetation. The increase of problem vegetation species will be stopped and/or contained where problem vegetation poses a risk on sites and adjacent to industrial lands. In addition, woody problem vegetation will be managed when it is determined that the woody problem vegetation poses a risk to the access, maintenance and regular operations of the facility.

10.9 Vegetation Management Options

Trans Mountain will implement an IVM approach for the treatment of problem vegetation utilizing different techniques for the area(s) of concern. The Pre-Treatment Monitoring Form completed for the infested area(s) will provide information required to develop a course of action. Depending on the type of problem vegetation that is encountered and how it will be managed (*i.e.,* destroyed, controlled or managed), various non-chemical (*i.e.,* mechanical and manual), cultural (*i.e.,* seeding) and chemical (*i.e.,* herbicide) vegetation management options will be considered for problem vegetation management on the facility footprint and/or associated components. An integrated approach combining non-chemical, cultural and chemical treatment options is generally most effective when tailored to the plant species and conditions at each site. The selection of a particular treatment option or technique will be determined and evaluated based on the following:

- urgency of the required treatment (i.e., Prohibited Noxious weeds, a legislative requirement for access to an area or concerns for facility safety or security);
- species (technique may differ if more than one undesirable species is being targeted);
- timing (growth stage of plants);
- bare ground versus vegetated;
- location of the problem vegetation;
- density and height of problem vegetation;
- accessibility to the problem vegetation (i.e., terrain, slope, remote areas);
- safety issues to Trans Mountain staff, contractors and the public;
- risk of fire (fuel loading on the ground);
- short and long-term effects of the method(s) being considered;
- expected efficacy of the method(s) being considered;
- benefits and limitations of each method;
- cost-effectiveness of each method;
- objectives of problem vegetation management;
- land use and land management practices being carried out on adjacent land;
- aesthetic consideration (plan holder reputation and community standing);
- environmental features such as wetlands, watercourses or lakes, riparian areas, wildlife and fish habitat;
- environmental sensitivities in surrounding areas;
- the choice of herbicide, herbicide properties and toxicity and appropriate application methods/techniques/equipment; and
- the consequences of not treating.

Potential techniques proposed for the management of problem vegetation (additional techniques for the management of problem vegetation are provided in Sections 9.12 and 9.13 of this WVMP) on or adjacent to the facility footprint and/or associated components include the following:

- **Non-Chemical Vegetation Management (manual and mechanical methods) -** consists of methods that destroy or suppress species through physical disruption. Such methods include pruning, pulling, digging, disking, brushing (selective slashing) and mowing. The degree of success of various mechanical treatment methods is dependent on the life cycle of the target species.

- **Cultural (seeding and revegetation) and Biological Vegetation Management -** cultural vegetation management is the establishment of competitive and desired vegetation to prevent or slow down invasion by problem vegetation and is a key component of successful problem vegetation management. Whether seeding to native plants or pasture grasses, it is important to consult with a Reclamation Specialist. Biological problem vegetation management involves the introduction of pests and parasites specific to certain species of problem vegetation. Agents (mainly insects) reduce the vigour of the problem vegetation and suppress their competitive ability against desirable plant species.

- **Chemical Vegetation Management (herbicides) -** herbicide application is an important option for the management of problem vegetation and provides an effective and time-efficient method of managing vegetation. A wide variety of treatment methods are available (*i.e.,* broadcast spraying, foliar spot spraying and wicking treatments, etc.) to help target specific species or problem areas. Where applicable, reduce the use of herbicides by spot spraying or wicking to target individual plants or broadcast spraying localized areas. Only qualified herbicide applicator contractors with valid Pest Control Services Licenses will undertake the application of herbicides.

Appropriate herbicides will be identified by qualified Trans Mountain personnel or the Vegetation Management Contractor.

An integrated approach combining non-chemical, cultural and chemical treatment options can generally be the most effective when tailored to the species and conditions on the facility footprint and/or associated components. Herbicides alone will only be considered where other vegetation management techniques have proven ineffective in managing problem vegetation.

10.10 Post-Treatment Evaluations

The timing and procedure for evaluating specific treatment programs will depend on the treatment method. Trans Mountain shall inspect problem vegetation management work carried out within three months of Vegetation Management Contractor activity using a Post-Treatment Inspection Form (Attachment C3). Each Vegetation Management Contractor's work shall be inspected to assess public and worker safety, environmental concerns, completion schedules and adherence to commitments made in the WVMP and the IVM Plan. The purpose of post-treatment evaluation is to measure the success of problem vegetation management and to evaluate the need for follow-up treatment(s).

Treatment program evaluations will be based on visual estimates as conducted by Trans Mountain employees assigned to problem vegetation management or others qualified and experienced to undertake the evaluations. A Post-Treatment Inspection Report will be completed following the evaluation.

10.11 Reporting and Accountability

Trans Mountain is committed to ensuring that the WVMP for the Project is implemented effectively, well documented and reviewed, and revised on a regular basis. Review and revision will ensure that the most effective monitoring and management practices are continually used to achieve the objectives. The tasks involved in implementing the WVMP have been separated with each task assigned to a specific individual at Trans Mountain (Tables C.10.11-1 and C.10.11-2).

TABLE C.10.11-1

WEED AND VEGETATION MANAGEMENT PLAN RESPONSIBILITIES DURING CONSTRUCTION

	Environmental Manager	Vegetation Specialist	Environmental Inspector	Vegetation Management Contractor
Task 1: Ensure the pre-construction weed survey is completed prior to spring, summer and fall treatments and before the commencement of construction activities on the facility footprint and/or associated components.	A	R	C	--
Task 2: Based on the recommendations made by the Vegetation Specialist during the pre-construction weed survey, determine scope of work and proceed with any budgeting and internal approvals requiring action.	A	R	C	C
Task 3: Advise the Environmental Inspector where treatment and monitoring (pre-construction and construction) is required and provide a timeline for completing the work.	A	C	--	--
Task 4: Confirm that all regulatory approvals are up-to-date and in place for vegetation management. Ensure all provincial legislation and requirements in the WVMP are followed during vegetation management activities.	A/R	C	C	C
Task 5: Hire and supervise the Vegetation Management Contractor.	A	--	R/C	C
Task 6: Conduct vegetation management activities and monitoring.	C	--	I/A	R
Task 7: Review herbicide application records and ensure vegetation management has been carried out according to site priorities and timelines.	A	C	R	C
Task 8: Provide the Post-Treatment Inspection and Monitoring Forms (completed by the Environmental Inspector or Vegetation Specialist) to the Environmental Manager.	I	R	A	--
Task 9: Ensure that all records of vegetation management are included in the Construction Monitoring database and included in the As-Built report for the proposed Project.	A	I	R	--

Notes: A = Accountable - The individual or group who is ultimately answerable, includes yes/no and power of veto. Only one "A" can be assigned to each task.

R = Responsible - The individual(s) or group(s) who actually arranges and contracts the task. The degree of responsibility is defined by the accountable person. An "R" can be shared.

C = Consulted - The individual(s) or group(s) to be consulted prior to a final decision or action being taken. Two-way communication is required.

I = Informed - The individual(s) or group(s) to be consulted prior to a final decision or action being taken. Two-way communication is required.

TABLE C.10.11-2

WEED AND VEGETATION MANAGEMENT PLAN RESPONSIBILITIES DURING OPERATIONS

	Environmental Manager	Environmental Specialist	Vegetation Specialist	Operations Supervisor	Vegetation Management Contractor
Task 1: Ensure annual and warranty vegetation monitoring and recommendations are completed prior to mid-June at all facility footprint locations.	A	R	C	C	--
Task 2: Based on the vegetation monitoring recommendations made by the Vegetation Specialist, determine vegetation management priorities and proceed with any budgeting and internal approvals requiring action.	I	A/R	C	C	C
Task 3: Advise the Operations Supervisor where treatment and monitoring is required and provide a timeline for completing the work.	I	A/R	C	C	--
Task 4: Confirm that all regulatory approvals are up-to-date and in place for vegetation management. Ensure all provincial legislation and requirements in the WVMP are followed during vegetation management activities.	A/R	R/C	C	C	C
Task 5: Hire and supervise the Vegetation Management Contractor to implement requirements of the annual vegetation survey as well as any warranty work that is required.	I	A/R	--	R/C	C
Task 6: Conduct vegetation management and monitoring activity.	I	A	R	I	R
Task 7: Review herbicide application records and ensure vegetation management has been carried out according to site priorities and timelines.	I	A/R	C	C	C
Task 8: Provide Pre and Post-Treatment Inspection and Monitoring Forms to the Operations Supervisor and the Environmental Specialist.	I	A	R	I	--
Task 9: Maintain a database of Pre and Post-Treatment Inspection and Monitoring Forms for all facility footprint locations.	A/R	R/C	--	--	--
Task 10: Review the WVMP on a 5 year basis and make changes as warranted, with recommendations from a Vegetation Specialist or Operations Supervisor.	A	R/C	C	C	--

Notes: A = Accountable - The individual or group who is ultimately answerable, includes yes/no and power of veto. Only one "A" can be assigned to each task.

R = Responsible - The individual(s) or group(s) who actually arranges and contracts the task. The degree of responsibility is defined by the accountable person. An "R" can be shared.

C = Consulted - The individual(s) or group(s) to be consulted prior to a final decision or action being taken. Two-way communication is required.

I = Informed - The individual(s) or group(s) to be consulted prior to a final decision or action being taken. Two-way communication is required.

10.12 Problem Vegetation Management: Non-woody Species

The following headings provide a detailed breakdown of each of the steps required for effective non-woody problem vegetation management. This section is intended for guidance to Vegetation Specialists and/or for those conducting inspection or evaluation of non-woody problem vegetation management methods.

10.12.1 Identification

Non- Woody Problem Vegetation

- Identify types of non-woody problem vegetation and record their location on the facility footprint during the pre-construction weed survey, annual inspection/patrols and maintenance and monitoring activities. The Vegetation Specialist will monitor for non-woody problem vegetation. Refer to

Attachment C1 for a list of plants of concern that will be the target of non-woody problem vegetation management.

- Pre-treatment and post-treatment evaluations will be conducted, where practical, in order to determine the efficacy of non-woody problem vegetation management methods.

10.12.2 Prevention

Preventing the Spread of Non-Woody Problem Vegetation

- Ensure that all equipment arriving onsite is clean of soil and vegetative debris prior to entering the work site. If equipment is in an unacceptable condition, clean with a shovel or sweep, high-pressure water or steam to remove remnant soil and vegetation debris prior to the equipment entering the work site.

- If necessary, clean equipment prior to leaving the work site, to reduce the risk of carrying non-woody vegetation, soil or vegetative debris to another location.

- Ensure all material brought to site (*i.e.,* gravel, soil, seed, etc.) is free of non-woody problem vegetation to the extent feasible.

10.12.3 Monitoring

Regular Inspections

- Conduct regular inspections to visually examine the facility footprint during maintenance and/or during routine operation activities and document the species, location, density and distribution of non-woody problem vegetation present.

Documentation

- Document vegetation presence (including desirable vegetation), population density and distribution on an annual basis. Record the following:
  - Evaluation of any previous non-woody problem vegetation management.
  - Non-woody problem vegetation species, location, density and distribution (or other appropriate method).

- Maintain records of non-woody problem vegetation management in the Problem Vegetation Management and Monitoring Database.

10.12.4 Treatment Threshold

Determine Whether Treatment Threshold Has Been Reached

- Compare the density and distribution of each non-woody problem vegetation species present onsite to the density and distribution of the same species off-site, the reported pre-construction and PCEM phases weed survey densities and/or to listed thresholds in KMC's IVM Plan, to determine whether the treatment threshold has been reached. Record the information required for the treatment decision (whether treatments are necessary, the best timing of treatments and the best treatment option[s]).

- Consult with the local land or regulatory authority, as required, prior to making a treatment decision.

Management Decision

- Initiate the non-woody problem vegetation management decision process and action when the treatment threshold for a particular facility has been exceeded.

10.12.5 Treatment Options

Treatment Options

- Where practical, choose treatments that will have the least environmental effect while providing adequate problem vegetation management.

Monitoring Form

- Complete a Pre-Treatment Monitoring Form prior to a non-woody problem vegetation management decision being made. List the strategies that will be used to protect the various environmental features that are listed including the establishment of appropriate size buffer zones around the established Pesticide Free Zones (PFZs), as identified in KMC's IVM Plan, that take into account such factors as the type of equipment being used, the potential for drift, the soil type and the slope of the ground.

10.12.6 Non-Chemical Vegetation Management Options

Non-Chemical Vegetation Management Options

- Where practical, consider non-chemical vegetation management options as the primary methods to manage non-woody problem vegetation.

Mowing

- Mow non-woody problem vegetation, primarily grasses or other herbaceous species, where warranted. Mow non-woody problem vegetation using equipment such as commercial lawnmowers, garden tractors or industrial tractors.

String Trimmers

- Cut non-woody problem vegetation at the ground surface to remove herbaceous vegetation growing within landscaped areas and along fence lines.

- Combine the use of string trimmers with a pre-mowing herbicide application, where necessary. Allow an appropriate time between herbicide treatment and mowing to allow herbicide to be absorbed by the plants.

Hand Pulling

- Conduct hand pulling for certain (*i.e.,* weed species that do not reproduce vegetatively via root pieces) established non-woody problem vegetation that can be easily uprooted.

10.12.7 Cultural and Biological Vegetation Management Options

Cultural and Biological Vegetation Management

- Use natural treatments which promote the establishment of local, competitive vegetation, including grasses, to provide long-term management of non-woody problem vegetation, where feasible.

- If a native grass seed mix or a cover crop is to be used to help manage the spread and growth of non-woody problem vegetation, ensure a seed Certificate of Analysis is obtained for each native seed species prior to purchase in order to ensure that the highest seed grade available is obtained and that no undesirable species seed is present in the seed lot prior to seed purchase. Where an agronomic seed mix or cover crop is to be used to help manage the spread and growth of non-woody problem vegetation, ensure only seed species with a grade of Canada No. 1 are used and a seed Certificate of Analysis is obtained for each species prior to purchase.

- The release of biological management agents for non-woody problem vegetation management will be strictly monitored and adhere to all applicable legislation.

10.12.8 Chemical Vegetation Management Options

Chemical Vegetation Management

- Use herbicides where necessary to establish a stable plant community. Herbicides may be required to target specific plant species and complexes on the facility footprint, primarily grasses and herbaceous broad-leaf plants growing on gravel areas. Only herbicides approved by Trans Mountain may be used. The use of herbicides may be required for the following:
  - Non-woody problem vegetation management in areas where non-chemical methods are not feasible or practical.
  - Management of non-woody problem vegetation where manual and mechanical treatment methods are not effective or practical.
- Only herbicides approved by Trans Mountain may be used.

Herbicide Application Contracts

- Initiate and monitor contracts for non-woody problem vegetation management that involve herbicide applications. Be knowledgeable of the application equipment, methods or techniques that may be used by contractors, including the benefits and limitations of each method, and the rationale/selection criteria that will be used in selecting a particular method or technique for non-woody problem vegetation management. All contractors are to be aware of Trans Mountain's safety requirements for the Project.
- Treatment area boundaries and environmentally sensitive areas will be marked/flagged and mapped. This information will be provided to the Vegetation Management Contractor. Marking/flagging will remain for at least 14 days following herbicide application.

Herbicide Labels

- Ensure familiarity with the properties, uses and label directions, precautions and limitations for each of the herbicide products applied.
- Consider the choice of herbicide, herbicide properties and toxicity, and appropriate application methods/techniques/equipment.
- Apply herbicides in accordance with manufacturer's instructions.

Proximity of Proposed Treatment Area to Water Sources (Wells)

- Do not apply herbicides for non-woody problem vegetation management within 30 m of a well or water intake (domestic, agricultural, commercial and industrial) unless completely satisfied that a smaller No Treatment Zone (NTZ) or PFZ will ensure that no herbicide enters the water supply, intake or well.

Watercourses, Lakes and Classified Wetlands

- Prior to herbicide application, confirm the location and classification of watercourses, wetlands and lakes (*i.e.,* fish-bearing/nonfish-bearing) and flag or mark any PFZs or NTZs.
- Do not apply herbicides within the NTZs or PFZ of watercourses/wetlands/lakes, both fish-bearing and nonfish-bearing, and classified wetlands, measured horizontally from the high watermark. Check the appropriate acts and regulations for NTZ and PFZ for specific herbicides.

Wildlife and Wildlife Habitat

- Be aware of and maintain appropriate protective buffer zones around inhabited raptor, heron and wood warbler nests, wildlife trees and mineral licks during non-woody problem vegetation management activities. Assess the size of these buffer zones on a site-by-site basis.

- Avoid treatment of low-growing plants that may be beneficial for wildlife habitat and browsing, where practical.

- Field check each treatment site prior to undertaking non-woody problem vegetation management to confirm treatment area boundaries, the locations of any required PFZs, NTZs, sites for posting required treatment notices and the presence of other environmental conditions that would preclude the use of herbicides.

Applicator Qualifications

- Conduct or supervise all applications of herbicides by a person who holds a Pesticide Applicator Certificate in the Industrial Vegetation Category. Record the name and certificate numbers of the applicators who will supervise/undertake herbicide applications.

Equipment Maintenance and Calibration

- Application contractors will ensure that all equipment is calibrated prior to the work on the Project. Equipment will be calibrated in accordance to the manufacturer's directions. Equipment will also be calibrated if:
  - There is a change in application personnel.
  - Any maintenance or equipment changes occur.
  - There is a change to the formula or herbicide concentration.

Supervision

- The Certified Pesticide Applicator must:
  - Be in continuous attendance at the site.
  - Have available proof of certification with them at each treatment site.
  - Within BC, supervise no more than four uncertified assistants at one time (BC *Integrated Pest Management Regulation* [BC MOE]).
  - Within Alberta, supervise no more than six uncertified assistants at one time (Government of Alberta 2010).
  - Maintain continuous contact, auditory and/or visual, with the uncertified assistants.
  - Be within 500 m of persons being supervised.
  - Must meet Trans Mountain's safety requirements and be prepared to provide proof of completion of safety courses.

Treatment Notices

- Treatment notices must be posted or given to affected parties before each herbicide use in BC, and must not be removed for at least 14 days after the use or as defined by appropriate regulatory authority (*Integrated Pest Management Regulation* [BC MOE]). Each treatment notice must be posted so that it is clearly visible and legible from each approach to access the treatment area, and must contain the following information:
  - The trade name or active ingredient of the herbicide that will be used.
  - The date and time of the herbicide use.
  - The confirmation number of the KMC's IVM Plan.

- A description of the treatment area.
- Precautions to be taken to prevent harm to people entering the treatment area.
- How to contact the plan holder or that person's agent to obtain information about the herbicide or herbicide use.

Mixing of Herbicides

Ensure that the following procedures are adhered to when mixing herbicides.

- Ensure all herbicide applicators are trained in WHMIS and all applicable material safety data sheets are on site and easily accessible.
- Conduct herbicide mixing in a safe and appropriate manner.
- Ensure the presence of personal washing stations (*i.e.,* eye was station) is present in the mixing area.
- Ensure that appropriate personal protective equipment will be worn at all times by all personnel to reduce the risk of unwanted exposure to herbicides.
- Where feasible, mixing stations will be located within the treatment areas.
- No mixing of herbicides will occur within 15 m of a sensitive area (*i.e.,* riparian area, wetland, watercourse, lake or NTZ).

Regulatory Requirements

- Ensure that all use requirements specified in the manufacturer's instructions and any corresponding environmental protection laws, are adhered to during herbicide application. Ensure that all use requirements specified in the Alberta *Environmental Protection and Enhancement Act and Pesticide Sales, Handling, Use and Application Regulation* as well as the BC *Integrated Pest Management Regulation* are adhered to during herbicide applications.
- Any unused herbicide waste produced from rinsing containers (*i.e.,* rinsate) will be disposed of onsite, where feasible, in a manner that adheres to the requirements outlined in the the *Environmental Management Act*, the BC *Hazardous Waste Regulation* (BC MOE) and the Alberta *Pesticide Sale, Handling, Use and Application Regulations* (Government of Alberta).
- All herbicide containers will be triple rinsed/pressure rinsed and disposed of in accordance with the manufacturer's instructions or as outlined in the IVM Plan and the provincial guidelines detailed in the BC MOE document, Handbook for Pesticide Applicators and Dispensers (BC Ministry of Water, Land and Air Protection 2005).
- Contact local authorities regarding any new bylaws/permitting for the construction area. Ensure that all local area sanitation or monitoring requirements are adhered to during all construction and operational phases.
- Adhere to Workplace Hazardous Materials Information System (Health Canada 2010) and Transportation of Dangerous Goods standards for pesticide containment, transport, storage and spill response.
- Store, handle and transport herbicides in a container in which they were originally packaged and with the label originally affixed by the herbicide manufacturer, or in a labelled container designed for containing herbicides. The labelling on the replacement container must include the herbicide trade name, the name and concentration of each active ingredient in the herbicide and the product registration number under the federal *Pest Control Products Act* and *Regulation*. The containment standards do not apply to tanks being used for mixing herbicides or for holding herbicides during use.
- Ensure that herbicides are transported or caused to be transported in a secure manner that prevents:

  - the escape, discharge or unauthorized removal of the herbicides from the transport vehicle; and
  - the contamination of food or drink intended for animal or human consumption, household furnishings, toiletries, clothing, bedding or similar items that are transported with the herbicides.

- If temporary herbicide storage in vehicle(s) is required, the storage area in the vehicle must:
  - adhere to all storage requirements outlined in the Integrated Pest Management Act and Regulations, the Pesticide Sales, Handling, Use and Application Regulation (Government of Alberta) and the WorkSafe BC document Standard Practices for Pesticide Applicators (WorkSafe BC 2009);
  - be separate from, and not used for storage of, food intended for human or animal consumption;
  - be ventilated so that herbicide vapours are vented to the outside;
  - have on each door providing access to the vehicle herbicide storage area, a sign that is clearly visible to a person approaching the door with the words, written in block letters: “WARNING: CHEMICAL STORAGE - AUTHORIZED PERSONS ONLY”;
  - be locked when unattended; and
  - be accessible only to authorized personnel; and
  - notify the local fire department of the presence of herbicides on the premises.

Spill Response

Follow the Spill Contingency Plan (see Appendix B) for responding to herbicide spills.

Ensure spill treatment equipment is present or near storage (including mobile storage), mixing and loading sites. Equipment shall include: personal protective equipment; absorbent material; neutralizing material; a long handled broom; shovel; and a waste receiving container with lid.

Keep a copy of the Spill Contingency Plan (see Appendix B) at or near each work site; ensure all personnel working on the Project are familiar with its contents.

Weather Monitoring

Ensure that:

- Measurements are made to record weather conditions prior to and periodically during herbicide applications.
- Wind speed and direction, precipitation, temperature and sky conditions (clear, overcast, cloudy, partly cloudy) are recorded for foliar and soil herbicide applications.
- Temperature, precipitation, frost and dew conditions are recorded for wick/wipe-on applications.
- Persons applying herbicides are responsible for checking each product label for guidelines for applying herbicides during various weather conditions.

Stop herbicide applications if any of the following occur:

- The maximum/minimum temperature stated on the herbicide label is exceeded.
- The wind speed and/or direction cause the foliar or soil application of herbicide to drift and/or miss the target vegetation.
- Ground wind velocity is greater than 8 km/hour.

- It begins to rain steadily, increasing the chances of excessive runoff and leaching.
- There is ice or frost on the foliage.

10.13 Problem Vegetation Management: Woody Species

Trans Mountain actively encourages the establishment of suitable low-growing natural vegetation in its reclamation seed mixes and in its ongoing application of problem vegetation management practices. Taller growing woody vegetation may be encouraged in environmentally sensitive areas such as around watercourses, wetlands and lakes to accomplish other environmental objectives.

Woody problem vegetation management will be conducted on the facility footprint and associated components (borrow sites, temporary access roads and TWS) to ensure: protection of public safety and environmental integrity; access for maintenance and inspection; and for the regular operation of the proposed Project as outline in the IVM Plan.

Woody problem vegetation management will be conducted due to the presence of the following conditions or issues:

- restricted aerial surveillance and/or visibility of the Project;
- effects to the safety and operations of the facilities;
- increases the fire hazard potential;
- effects to site security by providing easier access over security fencing;
- causes the deposition of organic debris or seed (seed rain) into facility sites that increases vegetation growth;
- has reached threshold limits as outlined in the IVM Plan; and
- restricts facility footprint access for maintenance, emergency response and/or patrols.

10.13.1 Treatment Thresholds

The decision to initiate treatment for woody problem vegetation management will be based solely on the presence of target vegetation that has the potential to disrupt the normal operation, maintenance and safety of the facility. Treatment decisions will also consider public safety, security, accessibility, species growth rates and social, economic and environmental considerations.

Management strategies will be achieved through the development and implementation of woody problem vegetation treatment procedures that address site-specific and regional considerations including appropriate regulatory authority legislation and regulations, consultation with the public, adjacent landowner and Aboriginal communities as well as land use and site conditions on the facility footprint and/or associated components. To ensure effective implementation of woody problem vegetation treatment procedures, it is necessary to understand:

- types of treatments that are available for woody problem vegetation management;
- how woody problem vegetation management treatments may vary on the facility footprint and/or associated components);
- timing constraints for woody problem vegetation management treatments; and
- methods for implementing woody problem vegetation treatment procedures.

10.13.2 Woody Problem Vegetation Management Methods

As discussed in Section 9.11 of this WVMP woody problem vegetation management activities include non-chemical, cultural and biological and chemical methods. Utilization of several or potentially all

methods of problem vegetation management are likely in the scope of a project; effective implementation of these methods will consider the location and relevant timing constraints in addition to the risk for fire, unauthorized encroachments as well as public, adjacent landowner and Aboriginal communities and operational requirements.

10.13.3 Management Method Variations

Woody problem vegetation management practices will vary on the facility footprint and/or associated component according to site-specific conditions. Since woody problem vegetation is likely to inhibit access on the facility footprint, trees and tall shrubs will be removed from the majority of the facility footprint except for specific locations with sensitive environmental conditions (*i.e.,* riparian areas). Low shrubs are allowed to regenerate in a controlled manner such that the facility footprint can still be identified and that access is not inhibited.

10.13.4 Timing

Woody problem vegetation management activities may be disruptive for wildlife, biological or physical processes as well as other activities associated with the intended land use for areas on the facility footprint and/or associated components. Where practical, woody problem vegetation management will be reduced on the facility footprint. Adherence to specific timing constraints is necessary for compliance with environmental regulations, effective utilization of woody problem vegetation management procedures as well as providing respect to operating agreements with the public, adjacent landowners or Aboriginal communities.

Timing constraints will vary according to the affected land use, the woody problem vegetation management procedures to be applied and the environmental components that may be affected.

Where the facility footprint encounters private lands, woody problem vegetation management procedures will be scheduled in consultation with the landowner, land users and/or tenants to avoid conflict with activities associated with industrial and recreational land uses.

Where the proposed Project traverses watercourses, wetlands, lakes and forested lands with known significant wildlife habitat and species of concern (*i.e.,* caribou and rare plants), Trans Mountain will determine through consultation with the public, adjacent landowners, regulatory authorities and Aboriginal communities, the appropriate woody problem vegetation management activities necessary to ensure compliance within environmental regulations and legislation.

Depending on the goals of woody problem vegetation management, certain plant species may respond most effectively to vegetation management practices at particular stages in their yearly growth cycle. Therefore, to ensure successful results from vegetation management practices, timing for these activities will be scheduled to occur during periods when they are anticipated to be most effective.

10.13.5 Selecting Methods and Equipment

Similar to planning the timing of woody problem vegetation management activities, selection of methods and equipment may require consideration for compliance with environmental regulations, environmentally sensitive features and providing respect to operating agreements with the public, adjacent landowners and Aboriginal communities. Appropriate methods will:

- Achieve objectives.
- Not create safety issues or inhibit access on the facility footprint and/or associated components.
- Reduce known environmental effects.
- Achieve compliance with requirements of legislation as well as regulatory, public, adjacent landowner and agreements with Aboriginal communities.

When assessing options for woody problem vegetation management, it is necessary to consider the respective advantages and disadvantages of each method. Furthermore, additional factors may influence which methods are selected, including:

- Site characteristics including the species to be managed, sensitivity considerations and intended land use.
- Expected response time from the point of treatment and the implications for both short-term and long-term operations.
- Logistical considerations and necessary resources including costs, equipment and crew.

Due to the broad landform and plant community variations encountered by the Project, the above-listed factors may vary on the facility footprint and/or associated components and, therefore, consideration will be made to how this variation may affect which methods are selected.

10.13.6 Identification

Woody Problem Vegetation

- Identify types of woody problem vegetation and record their location and height, during monthly inspection/patrols, maintenance and monitoring activities. The Vegetation Specialist will monitor for woody problem vegetation. Refer to Attachment C1 for a list of plants of concern that will be the target of woody problem vegetation management.
- Ensure that locations where management procedures are to be applied are properly communicated to personnel and that locations requiring special consideration are properly identified using stakes or flagging.
- Utilize maps, aerial photographs and/or Global Positioning Systems to communicate locations of special consideration, especially where woody problem vegetation management procedures are to vary during the scope of work or where the location of site-specific treatments is difficult to identify.

10.13.7 Monitoring

Regular Inspection

- Conduct regular inspections to visually examine the facility footprint and/or associated components during maintenance and/or during routine operation activities and document the density, location and type of woody problem vegetation present.

Documentation

- Document vegetation presence (including desirable vegetation), population density and distribution on an annual basis. Monitor woody problem vegetation responses to management treatments. Maintain records of woody problem vegetation management in the Problem Vegetation Management and Monitoring Database. Adjust procedures as necessary to achieve objectives outlined in the WVMP plan (see Section 11.0 of this appendix).

10.13.8 Treatment Threshold

Determination

- Determine whether the treatment threshold has been reached using available size, density and distribution information of woody problem vegetation and by referencing accepted threshold levels. Record the information required for the treatment decision (whether treatments are necessary, the best timing of treatments and the best treatment option[s]).
- Consult with the local land authority, as required, prior to making a treatment decision.

Management Decision

- Initiate the woody problem vegetation management decision process and action when the treatment threshold for a particular facility site and/or associated components has been exceeded.

10.13.9 Treatment Options

Treatment Options

- Choose treatments that will have the least environmental effect while providing adequate management.

Monitoring Form

- Complete a Pre-Treatment Monitoring Form prior to a woody problem vegetation management decision being made. List the strategies that will be used to protect the various environmental features that are listed including the establishment of appropriate size buffer zones around the established PFZs that take into account such factors as the type of equipment being used, the potential for drift, the soil type, the slope of the ground and the potential for soil disturbance.

10.13.10 Non-Chemical Vegetation Management Options

Non-chemical Vegetation Management Options

- Where practical, consider non-chemical management options (*i.e.,* hand pulling or tree and stump removal) as the primary methods to manage woody problem vegetation as outlined in Section 9.11 of this WVMP.

- Brushing activities will not occur during regulated restricted periods (*i.e.,* wildlife movement restrictions) unless authorized by the applicable regulatory authority.

Mowing/Brushing/Girdling/Pruning

Utilize commercial lawnmowers, industrial tractors, brush mowers, hydro-axes, mulchers and/or hand-held trimmers when:

- Regional herbicide application is not feasible either for aesthetic, health, safety or environmental reasons.

- Herbicide application is localized and does not address large-scale woody problem vegetation management goals.

- Objectives for woody problem vegetation management do not require short-term outcomes, allowing for natural succession.

Felling/Hand Clearing

At watercourses and wetland crossings, woody problem vegetation removal will be reduced to the amount necessary for equipment and vehicle passage. This woody vegetation buffer will extend across the facilities footprint and extend up the right-of-way from the watercourse/wetland/lake within the functional riparian area, or less if it affects operations.

Where applicable, fell trees away from watercourses, wetlands and lakes and from limits of the facilities footprint to reduce damage to streambeds, banks and adjacent trees. Hand clear, if necessary, to reduce disturbance. Remove any trees, debris and soil inadvertently deposited within the ordinary high water level in a manner that reduces disturbance of the streambed and banks. Do not stand or yard trees across watercourses.

Where applicable, fell all damaged or leaning trees immediately and remove any trees that fall off the facility footprint and/or associated components.

Where applicable, maintain low woody vegetation or vegetated ground mat within the vegetated buffer zone of watercourses, wetland and lakes, to the extent practical.

Geotextile

Use porous, polypropylene geotextile fabric below mulches, crushed rock and/or gravel to prevent the root growth of woody problem vegetation.

10.13.11 Chemical Vegetation Management Options

See Section 10.12.8 of this WVMP.

11.0 WILDLIFE CONFLICT MANAGEMENT PLAN

Background

Wildlife conflicts with 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. The magnitude of the conflict will depend on the species involved and the nature of the conflict. Although efforts will be made to avoid, limit or mitigate potential effects on wildlife and wildlife habitat wherever they occur, certain locations may be particularly sensitive to the presence of Project personnel. Trans Mountain will develop resource-specific approaches to reduce and address the potential conflict between Project personnel and the wildlife species most likely to be encountered along the Project and associated facilities (see Appendix L in this EPP for resource-specific measures).

Where disturbance is unavoidable, Project staff will consult with the appropriate regulatory authorities and, as appropriate, interested and affected Aboriginal communities to identify possible options and management strategies to be implemented to reduce effects to wildlife.

Objectives

The primary objective of the Wildlife Conflict Management Plan is to provide direction to Project personnel to ensure that wildlife conflicts are reduced or avoided during the construction and operation of the Project. Measures described in this Wildlife Conflict Management Plan will assist in preventing or reducing human-wildlife conflicts associated with all phases of the Project. The goal of the Wildlife Conflict Management Plan is to provide guidelines for:

- preventing direct and indirect mortality of wildlife; and
- reducing wildlife-related safety concerns for personnel.

Specific measures to reduce potential conflicts with grizzly, black bear and rattlesnakes are presented within this management plan. For each species, measures to avoid encounters, directions on what to do in case of an encounter, and the steps to follow after an encounter are provided. Measures outlined within the Traffic and Access Control Management Plan (see Appendix C) will further reduce the effects of traffic and access on wildlife.

Measures developed to avoid or reduce effects on wildlife species of economic importance or with special conservation status as well as their habitat during construction of the Project, are provided in Appendix L in this EPP.

Management Approach

The following approach will be applied for the Project to avoid or reduce the risk and severity of wildlife conflicts.

- All Project personnel and other visitors to the right-of-way will participate in Trans Mountain's environmental awareness training program which will include a discussion of the purpose and requirements of the Wildlife Conflict Management Plan.
- Construction camps will be constructed and maintained to prevent any bears and/or other wildlife from gaining access to the site. In addition to any other measures that Trans Mountain deems necessary to accomplish this objective, all construction camps will be fenced. The potential for wildlife conflict issues at each construction camp will be assessed and, where warranted, an electric fence with cattle guard type electrified gates and a bear alarm system to deter and detect wildlife will be installed. At construction camps with limited potential for bear conflicts, a chain-link fence will be installed (with a particular focus on preventing access by wolves, coyotes and ungulates such as moose, elk and deer), with a fenced Texas gate installed at the access point.
- Appropriate fencing will be installed at other Project temporary facilities such as stockpile sites and borrow sites, if warranted, to limit the potential for wildlife conflicts and for security.

- Construction camps will be laid out with buildings well-spaced in a straight line or a semi-circle. This layout will provide a bear that enters camp area an avenue of escape and allows designated personnel the opportunity to use deterrents in a safe manner. Cooking and food storage sites will be separate, yet visible from sleeping areas and preferably downwind.

Management Approach for Reducing and Managing Conflicts with Bears

Darkness, dense vegetation, blind corners, noise, wind, precipitation, fog and other conditions may make it difficult for people to see or hear a bear. Bears, particularly when human-habituated, are tolerant of humans and the likelihood of being injured by a bear is low. However, undetected bears in a construction camp site pose a potential risk to people and equipment. Two main situations leading to human injury by grizzly bears include:

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

The following measures 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:

- differentiating between grizzly and black bears;
- general ecology of grizzly and black bears relevant to human safety;
- grizzly and black bear ecology in the Project area;
- a discussion of the processes 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;
- locations or contacts for reporting bear observations or bear-human conflicts; and
- further information and suggested readings.

Camps will be designed and maintained 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. For example:

- Thick vegetation, such as shrubs that may obscure visibility, will be cleared or mowed to increase sightlines.
- 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 more 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. Larger buildings will have more than one exit.

All potential attractants in construction camps will be stored, as noted below, so that they are inaccessible to wildlife, particularly bears.

- All food will be stored in or near the building with cooking facilities.

- No food or garbage will be left outside unattended. All food will be stored indoors in appropriate containers.

- Garbage and food waste will be stored where bears cannot access the material and will not be allowed to pile up or develop strong odors. Used cooking oil and grease, and meat and fish scraps are powerful bear attractants. These materials will be collected and stored in an airtight container with a lid within a bear-proof garbage container until they can be disposed of.

- No food will be stored in facilities when they are closed for any length of time unless the storage area is bear-proof.

- 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.

- All garbage and food waste will be regularly transported to the nearest bear-proof transfer station or landfill for proper disposal (see Waste Management Standard).

- Grey water (wastewater from sinks, showers and basins) can combine the odours of cooking grease, food particles and soap. This can be a strong wildlife attractant. Grey water will be treated so that it does not attract wildlife (see Waste Management Standard). 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. Large, long-term camps will require an approved waste treatment system. Portable toilets should be regularly cleaned to reduce odours.

- The Lead Activity Inspector and Environmental Inspector will make regular inspections of facilities and camps. Environmental Inspector will accompany NEB inspection personnel during any period inspection of facilities.

- Project personnel and contractors will be prohibited from hunting and fishing along the right-of-way and at other construction sites during Project construction. Crews staying in construction camps will also not be allowed to hunt or fish.

Deterring a Bear Encounter

The approach for deterring a bear encounter includes:

- 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 (hazed away) and deterred every time it returns. Bear deterrents may include bear spray, noisemakers (bear bangers, blow horns), chasing by vehicle, electric fencing and/or other deterrents approved by the Regional Wildlife Officer will be asked to assist in situations where bears become aggressive. Any deterring or hazing of bears will be conducted by a qualified Wildlife Monitor, Environmental Inspector or a Wildlife Resource Specialist.

- 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, hazing, 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 and/or has obtained human food or garbage. The Environmental Inspector or Camp Manager will immediately notify the Regional Wildlife Officer. If the bear(s) has obtained human food or garbage, the reason for such will be immediately rectified to ensure the bear(s) receives no further food rewards.

Management Approach for Reducing and Managing Conflicts with Rattlesnakes

Rattlesnakes may be encountered in areas north of Kamloops, B.C. within and near the Lac Du Bois Grasslands Park. Potential encounters are generally limited to activities scheduled during periods when snakes are breeding or migrating to forage sites or hibernacula (*i.e.,* April to October).

Rattlesnakes are cryptic snakes, camouflaged in their habitat by their colouration and behaviour. Rattlesnakes are generally quiet and non-aggressive. Their first response to potential danger is to stay quiet and camouflaged. Their second response is escape. If cornered, however, rattlesnakes will rattle their tails vigorously while forming an aggressive coil with the head raised and the neck in an ‘s’ shaped curve. Striking is a last resort, usually employed if cornered or when the snake is facing immediate physical injury (*i.e.,* if stepped on).

As a result of their cryptic colouration and behaviour, rattlesnake presence goes largely undetected with the exception of direct encounters. Rattlesnake-human encounters may occur in two scenarios:

- When humans encounter a rattlesnake in its natural habitat, generally associated with rocks or vegetation.

- When rattlesnakes use anthropogenic cover objects that may then be moved by humans, leading to an encounter.

The following measures for avoiding a rattlesnake encounter and reducing risk of injury to Project personnel and wildlife will be implemented.

All Project personnel will receive education regarding rattlesnake awareness and staying safe in snake habitat. Without a good understanding of the principles and practices of staying safe in snake habitat, personnel may not properly respond to encounters and may perpetuate misinformation. The following information will be made available during the Project orientation.

- Differentiating between snake species, including rattlesnakes and gopher snakes, which imitate rattlesnake behaviour and are often misidentified.

- Snake ecology in the Project area.

- Understanding the behaviour of snakes relevant to human safety.

- How to work safely in snake habitat and avoid snake encounters.

- How to avoid creating anthropogenic features that may be used as cover objects and may cause snakes to remain on the work site.

- How to avoid displacing snakes from important habitats.

- Awareness that a snake encounter may occur despite all necessary precautions and guidelines on how to behave during a snake encounter.

- Locations or contacts for reporting snake observations or snake-human conflicts.

- Further information and suggested readings.

Work sites will be managed and maintained to prevent encounters with snakes. For example:

- Openings on temporary structures and buildings, including stairs will be closed-in, so that snakes and other small animals are not trapped inside them.

- Keep work sites uncluttered so that snakes moving through an area will not be attracted to stay. As rattlesnakes mainly eat small mammals, discourage small mammals like mice and voles from living on site by keeping the work site tidy and garbage free.

- Avoid making anthropogenic cover objects like woodpiles, leftover construction materials, brush piles, and rock piles. If piles cannot be avoided, keep elevated so any animals underneath will be clearly visible.

- Pets will be prohibited on Project facility and construction sites.

- Snake-proof fences may be considered where encounter risk cannot be mitigated. A fine-mesh wire screen buried at least 30 cm underground, and extending 60 cm above ground will help prevent small mammals from burrowing under the fence (and providing entranceways for snakes), and help stop snakes from moving under or over the fence.

Project Personnel will take the following actions and precautions to avoid human-snake encounters.

- Be familiar with snake species and behaviours.

- Stay on established trails and roads.

- Wear long loose pants and high boots that cover the ankles. This will help protect the legs and feet should a snake accidentally be stood on, causing it to bite.

- Always be aware of hand and foot placement. Avoid reaching into piles of rocks, under logs or objects, or into shrubs where snakes may be resting or concealed.

- Use a tool to lever or lift the objects off of the ground in case a snake is concealed.

Managing a Rattlesnake Encounter

The approach for managing a rattlesnake encounter includes.

- Project personnel will be educated in methods to behave during a snake encounter;

- Any snakes encountered on construction sites will be relocated to a safe, suitable location within 1,000 m of where it was encountered. Any relocation of snakes will be conducted by a qualified Wildlife Monitor or a Wildlife Resource Specialist;

- Any encounter will be managed on a case-by-case basis, utilizing appropriate measures that maximize human and snake safety; and

- Project personnel will report immediately to the Environmental Inspector or Camp Manager any snake that has entered a facility or construction site. The Environmental Inspector or Camp Manager will immediately notify the Regional Wildlife Officer.

ATTACHMENT C1

WEED SPECIES OF CONCERN

TABLE C1-1

WEED SPECIES OF CONCERN IN ALBERTA

Common Name	Scientific Name
NOXIOUS WEEDS	
black henbane	*Hyoscyamus niger*
blueweed	*Echium vulgare*
broad-leaved pepper-grass	*Lepidium latifolium*
common baby's-breath	*Gypsophila paniculata*
common mullein	*Verbascum thapsus*
common tansy	*Tanacetum vulgare*
creeping bellfower	*Campanula rapunculoides*
creeping (Canada) thistle	*Cirsium arvense*
Dalmatian toadflax	*Linaria dalmatica*
dame's rocket	*Hesperis matronalis*
downy brome	*Bromus tectorum*
field bindweed	*Convolvulus arvensis*
field scabious	*Knautia arvensis*
globe-podded hoary cress	*Cardaria pubescens*
great burdock	*Arctium lappa*
heart-podded hoary cress	*Cardaria draba*
hound's-tongue	*Cynoglossum officinale*
Japanese brome	*Bromus japonicus*
leafy spurge	*Euphorbia esula*
lens-podded hoary cress	*Cardaria chalepense*
lesser burdock	*Arctium minus*
ox-eye daisy	*Chrysanthemum leucanthemum*
perennial sow-thistle	*Sonchus arvensis*
scentless chamomile	*Matricaria perforata*
tall buttercup	*Ranunculus acris*
white cockle	*Silene pratensis*
woolly burdock	*Arctium tomentosum*
yellow clematis	*Clematis tangutica*
yellow toadflax	*Linaria vulgaris*
PROHIBITED NOXIOUS WEEDS	
autumn olive	*Elaeagnus umbellata*
bighead knapweed	*Centaurea macrocephala*
black knapweed	*Centaurea nigra*
brown knapweed	*Centaurea jacea*
Chinese tamarisk	*Tamarix chinensis*
common barberry	*Berberis vulgaris*
common buckthorn	*Rhamnus catharticus*
common crupina	*Crupina vulgaris*
common St John's-wort	*Hypericum perforatum*
diffuse knapweed	*Centaurea diffusa*
dyer's woad	*Isatis tinctoria*
Eurasian water milfoil	*Myriophyllum spicatum*
flowering rush	*Butomus umbellatus*
garlic mustard	*Alliaria petiolata*
giant hogweed	*Heracleum mantegazzianum*
giant knotweed	*Fallopia sachalinensis*
Himalayan balsam	*Impatiens glandulifera*
hoary alyssum	*Berteroa incana*
hybrid Japanese knotweed	*Fallopia bohemica*
hybrid knapweed	*Centaurea x psammogena*
Japanese knotweed	*Fallopia japonica*

TABLE C1-1 Cont'd

Common Name	Scientific Name
jointed goatgrass	*Aegilops cylindrica*
late-flowering eyebright (red bartsia)	*Odontites serotina*
marsh thistle	*Cirsium palustre*
meadow hawkweed	*Hieracium caespitosum*
meadow knapweed	*Centaurea x moncktonii*
medusahead	*Taeniatherum caput-medusae*
mouse-ear hawkweed	*Hieracium pilosella*
nodding thistle	*Carduus nutans*
orange hawkweed	*Hieracium aurantiacum*
pale yellow iris	*Iris pseudacorus*
plumeless thistle	*Carduus acanthoides*
puncturevine	*Tribulus terrestris*
purple loosestrife	*Lythrum salicaria*
rush skeletonweed	*Chondrilla juncea*
Russian knapweed	*Centaurea repens*
saltcedar	*Tamarix ramosissima*
saltlover	*Halogeton glomeratus*
smallflower tamarisk	*Tamarix parviflora*
spotted knapweed	*Centaurea maculosa*
squarrose knapweed	*Centaurea virgata* ssp. *Squarrosa*
sulphur cinquefoil	*Potentilla recta*
tansy ragwort	*Senecio jacobaea*
Tyrol knapweed	*Centaurea nigrescens*
yellow nutsedge	*Cyperus esculentus*
yellow starthistle	*Centaurea solstitialis*

Source: Alberta *Weed Control Regulation*.

Notes:
- In accordance with the Alberta *Weed Control Act*, Prohibited Noxious Weeds must be destroyed while Noxious weeds must be controlled or destroyed.
- Consult the appropriate acts, regulations and Regional District information on a regular basis for updates to species ranking.

TABLE C1-2

WEED SPECIES OF CONCERN IN BRITISH COLUMBIA

Common Name	Scientific Name	BC Ranking
anchusa	*Anchusa officinalis*	Invasive
annual sow-thistle	*Sonchus asper (L.) Hill*	Provincial Noxious
baby's breath	*Gypsophila paniculata*	Invasive
black knapweed	*Centaurea nigra*	Invasive
blueweed	*Echium vulgare L.*	Regional Noxious (Thompson-Nicola), Invasive
brown knapweed	*Centaurea jacea*	Invasive
bohemian knotweed	*Fallopia x bohemica*	Provincial Noxious
bull thistle	*Cirsium vulgare*	Invasive
bur chervil	*Anthriscus caucalis*	Provincial Noxious
burdock	*Arcticum* spp.	Regional Noxious (Fraser-Fort George, Thompson-Nicola), Invasive
common burdock	*Arctium minus*	Invasive
common crupina	*Crupina vulgaris Cass.*	Provincial Noxious
common reed	*Phragmites australis*	Provincial Noxious
common tansy	*Tanacetum vulgare L.*	Invasive
common toadflax	*Linaria vulgaris (P.) Mill.*	Provincial Noxious
creeping (Canada) thistle	*Cirsium arvense (L.) Scop.*	Provincial Noxious, Invasive
Dalmatian toadflax	*Linaria vulgaris Hill.*	Provincial Noxious, Invasive
dense-flowered cordgrass	*Spartina densiflora*	Provincial Noxious

TABLE C1-2 Cont'd

Common Name	Scientific Name	BC Ranking
diffuse knapweed	*Centaurea diffusa Lam.*	Provincial Noxious, Invasive
dodder	*Cuscuta* spp.	Provincial Noxious
English cordgrass	*Spartina anglica*	Provincial Noxious
field scabious	*Knautia arvensis*	Regional Noxious (Thompson-Nicola), Invasive
flowering rush	*Butomus umbellatus*	Provincial Noxious
garlic mustard	*Alliaria petiolata*	Provincial Noxious
giant hogweed	*Heracleum mantegazzianum*	Provincial Noxious
giant knotweed	*Fallopia sachalinensis*	Provincial Noxious, Invasive
giant mannagrass/reed sweetgrass	*Glyceria maxima*	Provincial Noxious
gorse	*Tragopogon dubius Scop.*	Provincial Noxious, Invasive
Himalayan knotweed	*Polygonum polystachyum*	Provincial Noxious
hoary alyssum	*Berteroa incana*	Invasive
hoary cress	*Cardaria* spp.	Regional Noxious (Thompson-Nicola), Invasive
hound's-tongue	*Cynoglossum officinale L.*	Provincial Noxious, Invasive
Japanese knotweed	*Fallopia japonica*	Provincial Noxious, Invasive
jointed goatgrass	*Aegilops cylindrica Host*	Provincial Noxious
leafy spurge	*Euphorbia esula L.*	Provincial Noxious, Invasive
marsh plume thistle	*Cirsium palustre (L.) Scop.*	Regional Noxious (Fraser-Fort George), Invasive
meadow hawkweed	*Hieracium pilosella*	Invasive
meadow knapweed	*Centaurea pratensis*	Invasive
milk thistle	*Silybum marianum*	Provincial Noxious
nodding thistle	*Carduus nutans L.*	Invasive
North Africa grass	*Ventenata dubia*	Provincial Noxious
orange hawkweed	*Hieracium aurantiacum L.*	Regional Noxious (Thompson-Nicola), Invasive
oxeye daisy	*Chrysanthemum leucanthemum L.*	Regional Noxious (Thompson-Nicola), Invasive
perennial pepperweed	*Lepidium latifolium*	Regional Noxious (Thompson-Nicola), Invasive
perennial sow-thistle	*Sonchus arvensis L.*	Provincial Noxious
plumeless thistle	*Carduus acanthoides*	Invasive
puncture vine	*Tribulus terrestris*	Invasive
purple loosestrife	*Lythrum salicaria L.*	Provincial Noxious, Invasive
purple nutsedge	*Cyperus rotundus L.*	Provincial Noxious
rush skeletonweed	*Chondrilla juncea L.*	Provincial Noxious, Invasive
Russian knapweed	*Centaurea repens L.*	Invasive
saltmeadow cordgrass	*Spartina patens*	Provincial Noxious
scentless chamomile	*Matricaria perforata Merat.*	Provincial Noxious, Invasive
scotch broom	*Cytisus scoparius*	Invasive
scotch thistle	*Onopordum acanthium*	Invasive
smooth cordgrass	*Spartina alterniflora*	Provincial Noxious
spotted knapweed	*Centaurea maculosa Lam.*	Provincial Noxious, Invasive
St. John's wort	*Hypericum perforatum*	Invasive
sulphur cinquefoil	*Potentilla recta*	Regional Noxious (Thompson-Nicola), Invasive
tansy ragwort	*Senecio jacobaea L.*	Provincial Noxious, Invasive
teasel	*Dipsacus fullonum*	Invasive
velvetleaf	*Abutilon theophrasti Medik.*	Provincial Noxious
wild chervil	*Anthriscus sylvestris*	Regional Noxious (Fraser Valley)
wild oats	*Avena fatua*	Provincial Noxious
yellow flag iris	*Iris pseudacorus*	Provincial Noxious, Invasive
yellow nutsedge	*Cyperus esculentus L.*	Provincial Noxious
yellow star-thistle	*Centaurea solstitialis L.*	Provincial Noxious, Invasive
yellow toadflax	*Linaria vulgaris*	Invasive

Source: BC *Weed Control Act* and *Forest and Range Practices Act – Invasive Plant Regulation*.

Notes:
- In accordance with the BC *Weed Control Act* and the *Forest and Range Practices Act*, Noxious weeds must be controlled while Invasive weeds must be managed.
- Consult the appropriate acts, regulations and Regional District information on a regular basis for updates to species ranking.

TABLE C1-3

PROBLEM VEGETATION OF CONCERN

Common Name	Scientific Name
Deciduous Trees	
balsam poplar	*Populus balsamifera*
big leaf maple	*Acer macrophyllum*
black cottonwood	*Populus trichocarpa*
Douglas maple	*Acer glabrum*
mountain alder	*Alnus viridis*
paper birch	*Betula papyrifera*
red alder	*Alnus rubra*
trembling aspen	*Populus tremuloides*
Coniferous Trees	
alpine larch	*Larix lyallii*
black spruce	*Picea mariana*
Douglas fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
lodgepole pine	*Pinus contorta latifolia*
ponderosa pine	*Pinus ponderosa*
subalpine fir	*Abies lasiocarpa*
western hemlock	*Tsuga heterophylla*
western larch	*Larix occidentalis*
western red cedar	*Thuja plicata*
white spruce	*Picea glauca*
yellow cedar	*Thuja occidentalis*
Shrubs	
arbutus	*Arbutus sp.*
bitter cherry	*Prunus emarginata*
chokecherry	*Prunus virginiana*
Himalayan blackberry	*Rubus armeniacus*
pin cherry	*Prunus pensylvanica*
salmonberry	*Rubus spectabilis*
scotch broom	*Cytisus scoparius*
thimbleberry	*Rubus parviflorus*
Wood's rose	*Rosa woodsii*
willow	*Salix sp.*
Grasses	
bamboo	*Bambuseae sp.*

TABLE C1-4

PROBLEM VEGETATION OBSERVED

Common Name	Scientific Name

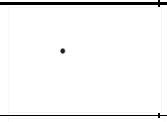
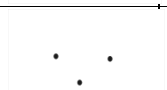
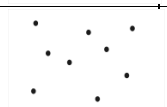
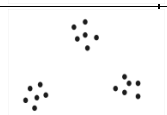
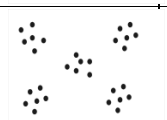
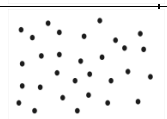
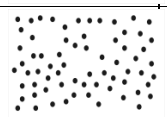
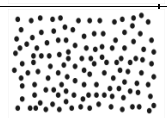
Additional weed information will be provided following the completion of the Weed Survey for the Project that is scheduled prior to construction.

ATTACHMENT C2

WEED DISTRIBUTION CODES

TABLE C2-1

BRITISH COLUMBIA MINISTRY OF FORESTS WEED DISTRIBUTION CODES

Code	Description	Guidelines for Field Assessment*			
		No. of plants in 20 m x 20 m area (low shrubs, herbs and mosses)	No. of plants/ha 100 m x 100 m area (tall shrubs and trees)	Diagram	Approximate % Cover Range
1	Rare individual, a single occurrence	1	< 5		1-5
2	A few sporadically occurring individuals	2 to 5	5 to 50		1-5
3	A single patch or clump of species	1 patch (occupying an area smaller than one quadrant of the plot)	Variable (3 patches)		1-10
4	Several sporadically occurring individuals	≥ 6	> 50		5-10
5	A few patches or clumps of species	2-5 patches (each occupying an area smaller than one quadrant of the plot)	Variable (3 to 10 patches)		10-30
6	Several well-spaced patches or clumps	≥ 6 patches (each occupying less than one quadrant of the plot)	Variable (10 to many disjunct patches)		10-30
7	Continuous uniform occurrence off well-spaced individuals	Many	Many		10-30
8	Continuous occurrence of a species with a few gaps in the distribution	Many	Many (continuous matrix formed by species crowns with some openings)		30-60
9	Continuous dense occurrence of a species	Many	Many		>60

Source: Luttmerding *et al*. 1990

Note: * The distribution code is determined over a sufficiently large area to account for normal variation in distribution pattern.

TABLE C2-2

ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT WEED DISTRIBUTION CODES

Class	Description of Abundance In Polygon	Distribution
0	None	
1	Rare	
2	A few sporadically occurring individual plants	
3	A single patch	
4	A single patch plus a few sporadically occurring plants	
5	Several sporadically occurring plants	
6	A single patch plus several sporadically occurring plants	
7	A few patches	
8	A few patches plus several sporadically occurring plants	
9	Several well spaced patches	
10	Continuous uniform occurrences of well spaced plants	
11	Continuous occurrence of plants with a few gaps in the distribution	
12	Continuous dense occurrence of plants	
13	Continuous occurrence of plants with a distinct linear edge in the polygon	

Source: Government of Alberta 2009.

Note: * The distribution code is determined over a sufficiently large area to account for normal variation in distribution pattern.

ATTACHMENT C3

MONITORING FORMS

PRE-TREATMENT MONITORING FORM

Date: _____ Name: _____ Daily page: _____ Overall Page: _____

Location: _____ Type: ROW/Facility/Road Land Use: _____ Photos _____

Species Observed (corresponds to site sketch)		**Growth stage** (Seedling/Juvenile/Mature)	**Height** (cm)	**Density Code** (1-9 or 1-13)	**Designation** (Prohibited Noxious/Noxious/Invasive**)**
1	On site				
	Adjacent				
2	On site				
	Adjacent				
3	On site				
	Adjacent				
4	On site				
	Adjacent				
5	On site				
	Adjacent				
6	On site				
	Adjacent				
7	On site				
	Adjacent				
8	On site				
	Adjacent				
9	On site				
	Adjacent				
10	On site				
	Adjacent				

Sketch of Site - Location of Problem Vegetation

Environmental Features

Watercourse/Wetland/Lake within 30 m ☐ yes ☐ no comments: _____

Riparian area within 10 m ☐ yes ☐ no comments: _____

Site requiring protection ☐ yes ☐ no comments: _____

Wildlife habitat within 10 m ☐ yes ☐ no comments: _____

Native plants present ☐ yes ☐ no comments: _____

Grazing concerns ☐ yes ☐ no comments: _____

Accessibility (circle) good/fair/poor comments: _____

Other: _____

Pesticide Free Zone

30 m ☐ 10 m ☐ none required ☐

Comments: _____

Treatment Options

Level of Management (circle): Destroy / Control / Manage

Management Methods (circle): Non-chemical / Cultural or Biological / Chemical

Method Type (circle):

- Non-chemical – Prune / Hand pulling or digging / Disking / Brushing (selective slashing) / Hand or equipment clearing / Mowing.
- Cultural/Biological - Seeding of native or agronomic species / Introduction of pests and parasites;
- Chemical (herbicide application) – Broadcast spraying / Spot spraying / Wicking

Rationale/Comments: _____

POST-TREATMENT MONITORING FORM

Date: _____ Name: _____ Daily page: _____ Overall Page: _____

Location: _____ Type: ROW/Facility/Road Land Use: _____ Ownership: Private/Public

Treatment Info

Vegetation Management Contractor Name:

Supervisor Name:

Date of Treatment: _____ Area Treated (ha): _____ Methods: Non-Chemical / Cultural/Biological / Chemical

Address: _____ Phone No. : _____

Non-chemical Summary

Treatment Used:

Description:

Cultural/Biological Summary:

Treatment Used:

Description:

Chemical Summary:

Licensee Name: _____ Licence No. : ____

Treatment Used: _____

Description: _____

Chemical Summary

Product Name	Active Ingredient	PCP No.	Target Species	App. Rate (L/ha)	Total Vol. (L)

Notes:

Environmental Protection

Required pesticide free zones were marked ☐ yes ☐ no comments: _____

Required pesticide free zones were maintained ☐ yes ☐ no comments: _____

Treatment area boundaries were marked ☐ yes ☐ no comments: _____

Treatment area boundary markings were adequate ☐ yes ☐ no comments: _____

Treatment notices posted ☐ yes ☐ no comments: _____

Watercourse/Wetland within 30 m were observed ☐ yes ☐ no comments: _____

watercourse/wetland/lake or /Riparian area within 10 m were observed ☐ yes ☐ no comments: _____

Wildlife habitat within 10 m were observed ☐ yes ☐ no comments: _____

Native plants were observed ☐ yes ☐ no comments: _____

Off site pesticide movement observed ☐ yes ☐ no comments: _____

Non-target effects observed ☐ yes ☐ no comments: _____

Other: _____

Treatment Objectives

Treatment objectives were achieved ☐ yes ☐ no

Describe how/where objectives were/were not achieved: _____

ATTACHMENT C4

MATERIAL SAFETY DATA SHEETS FOR PRIMARY HAZARDOUS MATERIALS

Material Safety Data Sheet

DIESEL FUEL

1 . Product and company identification

Product name : DIESEL FUEL

Synonym : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, D60, P40, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC).

Code : W104, W293; SAP: 120, 121, 122, 125, 126, 129, 130, 135, 287, 288

Material uses : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Bright oily liquid.

Odour : Mild petroleum oil like.

WHMIS (Canada) :

Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapour or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Severely irritating to the skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

2 . Hazards identification

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Kerosine (petroleum), hydrodesulfurized / Fuels, diesel / Fuel Oil No. 2	64742-81-0 / 68334-30-5 / 68476-30-2	95 - 100
Fatty acids methyl esters	61788-61-2 / 67784-80-9 / 73891-99-3	0 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

5 . Fire-fighting measures

Special remarks on fire hazards : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Kerosine (petroleum), hydrodesulfurized	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).
Fuels, diesel	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).
Fuel oil No. 2	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Bright oily liquid.

Flash point : Diesel fuel: Closed cup: ≥40°C (≥104°F)
Marine Diesel Fuel: Closed Cup: ≥60°C (≥140°F)
Mining Diesel: Closed Cup: ≥52°C (≥126°F)

Auto-ignition temperature : 225°C (437°F)

Flammable limits : Lower: 0.7%
Upper: 6%

Colour : Clear to yellow (This product may be dyed red for taxation purposes).

Odour : Mild petroleum oil like.

Odour threshold : Not available.

pH : Not available.

Boiling/condensation point : 150 to 371°C (302 to 699.8°F)

Melting/freezing point : Not available.

Relative density : 0.80 to 0.88 kg/L @ 15°C (59°F)

Vapour pressure : 1 kPa (7.5 mm Hg) @ 20°C (68ºF).

Vapour density : 4.5 [Air = 1]

Volatility : Semivolatile to volatile.

Evaporation rate : Not available.

Viscosity : Diesel fuel: 1.3 - 4.1 cSt @ 40°C (104°F)
Marine Diesel Fuel: 1.3 - 4.4 cSt @ 40°C (104°F)

Pour point : Not available.

Solubility : Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents and acids.

Hazardous decomposition products : May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Kerosine (petroleum), hydrodesulfurized	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m³	4 hours
Fuels, diesel	LD50 Dermal	Mouse	24500 mg/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Fuel oil No. 2	LD50 Oral	Rat	12000 mg/kg	-

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

11 . Toxicological information

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Kerosine (petroleum), hydrodesulfurized	A3	-	-	-	-	-
Fuels, diesel	A3	3	-	-	-	-
Fuel oil No. 2	A3	3	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1202	DIESEL FUEL	3	III		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Combustible liquid
Irritating material

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

15 . Regulatory information

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	2
Physical hazards	0
Personal protection	H

National Fire Protection Association (U.S.A.) :

References : Available upon request.
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Date of printing : **7/6/2010.**

Date of issue : 6 July 2010

Date of previous issue : 7/3/2009.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

GASOLINE, UNLEADED

1 . Product and company identification

Product name : GASOLINE, UNLEADED

Synonym : Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending, Conventional Gasoline.

Code : W102E, SAP: 102 to 117

Material uses : Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear liquid.

Odour : Gasoline

WHMIS (Canada) :

Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.

Flammable liquid. Irritating to eyes, respiratory system and skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Avoid contact with eyes, skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which may cause heritable genetic effects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

2 . Hazards identification

Skin : Irritating to skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Repeated or prolonged exposure to the substance can produce blood disorders.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Contains material which may cause heritable genetic effects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Gasoline	86290-81-5	85-100
Toluene	108-88-3	15-40*
Benzene	71-43-2	0.5-1.5
Ethanol	64-17-5	0.1-0.3

**Montreal: may vary from 3-40%*
**Edmonton: may vary from 1-5%*

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Flammable liquid (NFPA) .

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Avoid exposure - obtain special instructions before use. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly

7 . Handling and storage

closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Gasoline	**ACGIH TLV (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Toluene	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).
Benzene	**ACGIH TLV (United States). Absorbed through skin.** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s).
Ethanol	**ACGIH TLV (United States).** STEL: 1000 ppm 15 minute(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

8 . Exposure controls/personal protection

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: polyvinyl alcohol (PVA), Viton®. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Clear liquid.

Flash point : Closed cup: -50 to -38°C (-58 to -36.4°F) [Tagliabue.]

Auto-ignition temperature : 257°C (494.6°F) (NFPA)

Flammable limits : Lower: 1.3% (NFPA)
Upper: 7.6% (NFPA)

Colour : Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.

Odour : Gasoline

Odour threshold : Not available.

pH : Not available.

Boiling/condensation point : 25 to 220°C (77 to 428°F) (ASTM D86)

Melting/freezing point : Not available.

Relative density : 0.685 to 0.8 kg/L @ 15°C (59°F)

Vapour pressure : <107 kPa (<802.5 mm Hg) @ 37.8°C (100°F)

Vapour density : 3 to 4 [Air = 1] (NFPA)

Volatility : Not available.

Evaporation rate : Not available.

Viscosity : Not available.

Pour point : Not available.

Solubility : Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform and benzene. Dissolves fats, oils and natural resins.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents, acids and interhalogens.

Hazardous decomposition products : May release COx, NOx, phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Gasoline	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	13600 mg/kg	-
Toluene	LD50 Dermal	Rabbit	12125 mg/kg	-
	LD50 Oral	Rat	636 mg/kg	-
	LC50 Inhalation Vapour	Rat	7585 ppm	4 hours
Benzene	LD50 Dermal	Rabbit	>8240 mg/kg	-
	LD50 Oral	Rat	930 mg/kg	-
	LC50 Inhalation Vapour	Rat	13700 ppm	4 hours
Ethanol	LD50 Oral	Rat	7060 mg/kg	-
	LC50 Inhalation Vapour	Rat	>32380 ppm	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Gasoline	A3	2B	-	-	-	-
Toluene	A4	3	D	-	-	-
Benzene	A1	1	A	+	Proven.	+
Ethanol	A3	-	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : There is a wealth of information about the teratogenic hazards of Toluene in the literature; however, based upon professional judgement regarding the body of evidence, WHMIS classification as a teratogen is not warranted.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1203	GASOLINE	3	II		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Flammable liquid
Irritating material
Carcinogen

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

Label requirements : FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH MAY CAUSE HERITABLE GENETIC EFFECTS.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		3
Physical hazards		0
Personal protection		H

National Fire Protection Association (U.S.A.) :

References : Available upon request.
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Date of printing : **10/10/2012.**

Date of issue : 10 October 2012

Date of previous issue : 4/9/2010.

Responsible name : **Product Safety - DSR**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name **ETHYLENE GLYCOL**

Version # 02

Revision date 08-26-2011

Chemical name ETHYLENE GLYCOL

CAS # 107-21-1

Product Codes **J.T.Baker: 5387, 5845, 9298, 9300, 9346, 9356, L715**
Macron: 5001, 5037

Synonym(s) 1,2-Ethanediol; glycol; 1,2-Dihydroxyethane; Ethylene Alcohol; Ethulene Dihydrate

Manufacturer information

Avantor Performance Materials, Inc.
3477 Corporate Parkway
Suite #200
Center Valley, PA 18034 US
24 Hour Emergency 908-859-2151
Chemtrec 800-424-9300
Customer Service 855-282-6867

2. Hazards Identification

Emergency overview WARNING

Harmful if swallowed. Causes eye irritation. Can cause kidney damage. Causes central nervous system effects. May cause reproductive effects.

Potential health effects

Routes of exposure Inhalation. Ingestion. Skin contact. Eye contact.

Eyes Causes eye irritation.

Skin May cause skin irritation in susceptible persons.

Inhalation High mist concentrations may cause irritation of respiratory tract.

Ingestion Harmful if swallowed. Ingestion of ethylene glycol may result in nausea, vomiting, abdominal cramps, blindness, liver damage, irritation, reproductive effects, nerve damage, convulsions, edema of the lung, cardiopulmonary effects (metabolic acidosis), pneumonia and kidney failure which could result in death. The single lethal dose for humans is about 100 ml. Inhalation of high levels of vapors or mists for prolonged periods of time may also result in toxic effects.

Target organs Eyes. Central nervous system. Kidney. Reproductive organs.

Chronic effects Can cause kidney damage. Causes central nervous system effects. May cause adverse reproductive effects - such as birth defects, miscarriages, or infertility based on animal data.

Potential environmental effects The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
ETHYLENE GLYCOL	107-21-1	99 - 100

4. First Aid Measures

First aid procedures

Eye contact Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

Skin contact Wash skin with soap and water. Get medical attention if irritation develops or persists.

Inhalation	Move to fresh air. Treat symptomatically. Get medical attention, if needed.
Ingestion	Call a physician or poison control center immediately. Only induce vomiting at the instruction of medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Notes to physician	Keep victim under observation. Treat symptomatically. Symptoms may be delayed.
General advice	In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties	This product is not flammable. May burn, but does not ignite readily.
Extinguishing media	
Suitable extinguishing media	Water. Carbon dioxide (CO2). Dry chemical powder. Foam.
Unsuitable extinguishing media	None known.
Protection of firefighters	
Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases.
Protective equipment for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires.
Fire fighting equipment/instructions	Use water spray to cool unopened containers. Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Cool containers exposed to flames with water until well after the fire is out.
Specific methods	In the event of fire and/or explosion do not breathe fumes.
Hazardous combustion products	Carbon monoxide and carbon dioxide.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.
Methods for containment	Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Large Spills: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations. Collect in a non-combustible container for prompt disposal.

7. Handling and Storage

Handling	Wear appropriate personal protective equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Wash thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.
Storage	Keep container tightly closed.

8. Exposure Controls / Personal Protection

Occupational exposure limits

Canada - British Columbia

Material	Type	Value	Form
ETHYLENE GLYCOL (107-21-1)	Ceiling	100.0000 mg/m3	Aerosol.
		50.0000 ppm	Vapor.
	STEL	20.0000 mg/m3	Particulate.
	TWA	10.0000 mg/m3	Particulate.

Canada - Ontario

Material	Type	Value
ETHYLENE GLYCOL (107-21-1)	Ceiling	100.0000 mg/m3

Canada - Quebec

Material	Type	Value	Form
ETHYLENE GLYCOL (107-21-1)	Ceiling	50.0000 ppm	Vapor and mist.
		127.0000 mg/m3	Vapor and mist.

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal protective equipment

Eye / face protection

Wear safety glasses with side shields (or goggles).

Skin protection

Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection

If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with organic vapor cartridge, full facepiece, dust and mist filter.

General

Provide eyewash station and safety shower. Wear chemical protective equipment that is specifically recommended by the manufacturer. Launder contaminated clothing before reuse.

9. Physical & Chemical Properties

Appearance	Clear.
Color	Colorless.
Odor	Odorless.
Odor threshold	Not available.
Physical state	Liquid.
Form	Liquid.
pH	Not available.
Melting point	8.6 °F (-13 °C)
Freezing point	8.6 °F (-13 °C)
Boiling point	386.6 °F (197.3 °C)
Flash point	231.8 °F (111 °C) Closed Cup
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	15.3
Flammability limits in air, lower, % by volume	3.2
Vapor pressure	0.012265 kPa at 25°C

Vapor density	2.14
Specific gravity	1.1135 @20°C
Relative density	Not available.
Solubility (water)	Miscible
Partition coefficient (n-octanol/water)	-1.36
Auto-ignition temperature	748 °F (397.8 °C)
Decomposition temperature	Not available.
Molecular weight	62.07 g/mol
Molecular formula	C2-H6-O2

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions.
Conditions to avoid	Excessive heat.
Incompatible materials	Strong oxidizing agents. Acids.
Hazardous decomposition products	At thermal decomposition temperatures, carbon monoxide and carbon dioxide.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
ETHYLENE GLYCOL (107-21-1)	Acute Dermal LD50 Rabbit: 9530 mg/kg
	Acute Oral LD50 Rat: 5.89 g/kg

Acute effects	Harmful if swallowed. Can cause kidney damage. Causes central nervous system effects.
Sensitization	Not a skin sensitizer.
Local effects	Causes eye irritation.
Chronic effects	Prolonged exposure may cause chronic effects. Can cause kidney damage. Causes central nervous system effects.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Neurological effects	Central and/or peripheral nervous system damage. High vapor/aerosol concentrations (attainable only at elevated temperatures) may cause central nervous system effects such as dizziness, drowsiness or headaches.
Mutagenicity	Not classified.
Reproductive effects	Suspected of damaging the unborn child.
Teratogenicity	Components in this product have been shown to cause birth defects and reproductive disorders in laboratory animals.
Symptoms and target organs	Irritant effects. Drowsiness and dizziness. Decrease in motor functions. Unconsciousness. Birth defects. Renal injury.
Epidemiology	No epidemiological data is available for this product.
Further information	Ingestion of ethylene glycol may result in nausea, vomiting, abdominal cramps, blindness, liver damage, irritation, reproductive effects, nerve damage, convulsions, edema of the lung, cardiopulmonary effects (metabolic acidosis), pneumonia and kidney failure which could result in death. The single lethal dose for humans is about 100 ml. Inhalation of high levels of vapors or mists for prolonged periods of time may also result in toxic effects.

12. Ecological Information

Ecotoxicological data

Product	Test Results
ETHYLENE GLYCOL (107-21-1)	LC50 Fathead minnow (Pimephales promelas): 8050 mg/l 96.00 hours

Ecotoxicity This product has no known eco-toxicological effects. Not expected to be harmful to aquatic organisms.

Environmental effects Ecological injuries are not known or expected under normal use. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Aquatic toxicity The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability The product is expected to be biodegradable.

Partition coefficient -1.36

13. Disposal Considerations

Disposal instructions Dispose of contents/container in accordance with local/regional/national/international regulations. Incinerate the material under controlled conditions in an approved incinerator.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities. Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport Information

TDG

Not regulated as dangerous goods.

15. Regulatory Information

Canadian regulations This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS status Controlled

WHMIS classification D2A - Other Toxic Effects-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Saf-T-Data

Health: 2 - Moderate (Life)
Flammability: 1 - Slight
Reactivity: 1 - Slight
Contact: 2 - Moderate
Lab Protective Equip: B - GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: G - Green (General Storage)

16. Other Information

NFPA ratings

Health: 2
Flammability: 1
Instability: 0

Disclaimer

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

Issue date

08-26-2011

Material Safety Data Sheet

[image]

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Chevron Supreme Motor Oil

Product Use: Engine Oil

Product Number(s): CPS220002, CPS220011, CPS220059, CPS220060

Synonyms: Chevron Supreme Motor Oil SAE 10W-40, Chevron Supreme Motor Oil SAE 20W-50, Chevron Supreme Motor Oil SAE 30, Chevron Supreme Motor Oil SAE 40

Company Identification

Chevron Lubricants Canada Inc.

Lubrifiants Chevron Canada

6975-A Pacific Circle

Mississauga, ONT L5T 2H3

Canada

www.chevronlubricants.com

Transportation Emergency Response

CHEMTREC: (800) 424-9300 or (703) 527-3887

Health Emergency

Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623

Product Information

email : lubemsds@chevron.com

Product Information: (800) LUBE TEK

MSDS Requests: (800) 414-6737

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Highly refined mineral oil (C15 - C50)	Mixture	75 - 95 %weight

Information on ingredients that are considered Controlled Products and/or that appear on the WHMIS Ingredient Disclosure List (IDL) is provided as required by the Canadian Hazardous Products Act (HPA, Sections 13 and 14). Ingredients considered hazardous under the OSHA Hazard Communication Standard, 29 CFR 1910.1200, are also listed. See Section 15 for additional regulatory information.

SECTION 3 HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Not expected to be harmful if swallowed.

Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

Flashpoint: (Cleveland Open Cup) 205 °C (401 °F) (Min)

Autoignition: No Data Available

Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Keep out of the reach of children.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required.

If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

NOTE ON OCCUPATIONAL EXPOSURE LIMITS: Consult local authorities for acceptable provincial values in Canada. Consult the Canadian Standards Association Standard 94.4-2002 Selection, Use and Care of Respirators.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Amber

Physical State: Liquid

Odor: Petroleum odor

pH: Not Applicable

Vapor Pressure: <0.01 mmHg @ 100 °C (212 °F)

Vapor Density (Air = 1): >1

Boiling Point: >315°C (599°F)

Solubility: Soluble in hydrocarbons; insoluble in water

Freezing Point: Not Applicable

Specific Gravity: 0.885 @ 15.6°C (60.1°F) / 15.6°C (60.1°F) (Typical)

Viscosity: 9.9 cSt @ 100°C (212°F) (Min)

Evaporation Rate: No Data Available

Odor Threshold: No Data Available

Coefficient of Water/Oil Distribution: No Data Available

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Decomposition Products: None known (None expected)

Hazardous Polymerization: Hazardous polymerization will not occur.

Sensitivity to Mechanical Impact: No.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: The skin sensitization hazard is based on evaluation of data for similar materials or product components.

Acute Dermal Toxicity: LD50: >5g/kg (rabbit). The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: LD50: >5 g/kg (rat) The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.For additional information on the acute toxicity of the components, call the technical information center.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3). Contains an overbased calcium branched alkyl phenate sulfide.

Skin Absorption: In an in vitro study using a structurally-related radio-labeled material and human skin, skin absorption was 0.1µg/cm2/hr. Skin absorption was also minimal in in vitro and in vivo studies with rats. Repeated Dose Toxicity: In a 28-day oral toxicity study in rats at 50, 300, or 1000 mg/kg/day, systemic toxicity (reduced body weight gain, increased adrenal gland weight) was observed only at the high dose. In a 28-day dermal toxicity study in rats at approximately 21.5, 107, or 269 mg/kg/day, no toxicity was observed.

Reproductive Toxicity: No adverse reproductive effects were observed in a reproduction screening study of two finished lubricating oils containing 5% and 25% of this material and up to 1.68% branched alkylphenol, although male body weight was reduced.

Contains a branched alkylphenol and a calcium branched alkylphenol.

Repeated Dose Toxicity: In female rats dosed orally at 5, 20, 60, 250 or 1000 mg/kg/day for 20 days, time to sexual maturation was decreased and organ weights (ovary, uterus, liver and adrenal) were altered at >= 60 mg/kg/day. In a 28-day oral study in rats at 5, 20, 60, 180 and 300 mg/kg/day, body weight gain was decreased in males and food consumption was decreased in both sexes at >= 180 mg/kg/day. At >= 180 mg/kg/day, effects on reproductive organs in both sexes did not completely recover by 14 days post-treatment. Liver and adrenal changes occurred at >= 20 mg/kg/day. Thyroid hypertrophy occurred in males in all treated groups but did not persist through 14 days post-treatment.

Developmental Toxicity: In an oral rat developmental study at 20, 100, and 300 mg/kg/day, maternal weight gains were reduced during gestation and post-dosing at 300 mg/kg/day. At 300 mg/kg/day, there were increased incidences of fetal structural effects and reduced fetal body weights. During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

This material is not expected to be harmful to aquatic organisms. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material.

ENVIRONMENTAL FATE

Ready Biodegradability: This material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods. (See B.C. Reg. GY/92 Waste Management Act; R.R.O. 1990, Reg. 347 General-Waste Management; C.C.SM.c. W40 The Waste Reduction and Prevention Act; N.S. Reg. 51/95 and N.S. Reg. 179/96 for examples of Provincial legislation.)

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

TC Shipping Description: NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER TDG REGULATIONS

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE (AMENDMENT 34-08)

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO TI OR IATA DGR

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

Additional Information: NOT HAZARDOUS BY U.S. DOT. ADR/RID HAZARD CLASS NOT APPLICABLE.

SECTION 15 REGULATORY INFORMATION

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1
01-2A=IARC Group 2A
01-2B=IARC Group 2B
35=WHMIS IDL

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), EINECS (European Union), ENCS (Japan), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

One or more components has been notified but may not be listed in the following chemical inventories: DSL (Canada). Secondary notification by the importer may be required.

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations. (See Hazardous Products Act (HPA), R.S.C. 1985, c.H-3,s.2).

MSDS PREPARATION:

This Material Safety Data Sheet has been prepared by the Toxicology and Health Risk Assessment Unit, ERTC, P.O. Box 1627, Richmond, CA 94804, (888)676-6183.

Revision Date: July 31, 2009

SECTION 16 OTHER INFORMATION

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0

LABEL RECOMMENDATION:

Label Category : ENGINE OIL 1 - ENG1

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: 9,11,12,14,15,16

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2011-08-10
Supersedes: 2008-08-20

Class B3 Combustible Liquid

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**AEROSHELL* FLD. 4**
SYNONYMS:	HYDRAULIC FLUID MIL-H-5606A
PRODUCT USE:	Lubricating oil
PRODUCT CODE:	**421-150**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Liquid Red Colour Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

This product is not expected to be irritating and has a low level of toxicity under normal use.
Combustible Liquid.
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling: Eliminate all ignition sources.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (Petroleum), Hydrotreated Light Naphthenic, Low Flash	64742-53-6	30 - 60	Yes
Distillates (Petroleum), Hydrotreated Light	64742-47-8	10 - 30	Yes

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wipe excess from skin. Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention. If material is injected under the skin, get medical attention promptly to prevent serious damage; do not wait for symptoms to develop.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure. Obtain medical attention.

Notes to Physician: In general, lubricating oils have low oral toxicity. The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. High pressure injection under the skin may have serious consequences and may require urgent treatment.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Caution - Combustible. Do not use a direct stream of water as it may spread fire. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Product will float and can be reignited on surface of water. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide and dense smoke are produced on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Combustible". Eliminate all ignition sources. Isolate hazard area and restrict access. Wear appropriate breathing apparatus (if applicable) and protective clothing. Handling equipment must be grounded. Spilled material is slippery. Work upwind of spill if it is safe to do so. Avoid direct contact with material. Stop leak only if safe to do so. Dike and contain land spills; contain spills to water by booming. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. Notify appropriate environmental agency(ies). After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Combustible. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Do not pressurize drum containers to empty them. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.
Mineral oil, pure, highly and severely refined, excluding metal working fluids: 5 mg/m3 (inhalable fraction)

Mechanical Ventilation: Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Use explosion-proof ventilation as required to control vapour concentrations. Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: No special eye protection is routinely necessary. Wear safety glasses as appropriate.

Skin Protection: Not normally needed. Chemically-resistant gloves should be worn for frequent or prolonged contact with this product.

Respiratory If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved

Protection: respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Red Colour
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Freezing/Pour Point:	< -60 °C
Density:	873.5 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
pH:	Not applicable
Flash Point:	PMCC > 88 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	> 4.9 mm2/s @ 100 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Negligible
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (Petroleum), Hydrotreated Light Naphthenic, Low Flash	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Distillates (Petroleum), Hydrotreated Light	LD50 Oral Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Formulation: No data is specifically available for this product and therefore this toxicological information is based on data available for the ingredients.

Irritancy: This product is not a primary skin irritant after exposure of short duration, is not a skin sensitizer and is not irritating to the eyes.

Acute Toxicity: This product is not expected to be irritating and has a low level of toxicity under

normal use.

Chronic Effects: Long term intensive exposure to oil mist may cause benign lung fibrosis. Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne.

12. ECOLOGICAL INFORMATION

The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities.

Biodegradability: Not readily biodegradable.
Bioaccumulation: Potential for bioaccumulation.
Potential for bioconcentration.
Partition Coefficient (log K_{OW}): Not available
Aquatic Toxicity: Product is expected to be toxic to aquatic organisms.

Ingredient:	Toxicological Data
Distillates (Petroleum), Hydrotreated Light Naphthenic, Low Flash	
Distillates (Petroleum), Hydrotreated Light	LL50 (WAF method) Rainbow Trout (96hr) 1 - 10 mg/L. EL50 (WAF method) Daphnia Magna (48hr) 1 - 10 mg/L. EL50 - growth rate (WAF method) Algae (72hr) 1 - 10 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred into water and the insoluble portions are removed. The remaining solution is the water accommodated fraction.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:
This product is not regulated under the Canadian Transportation of Dangerous Goods Regulations for transport by road and rail.

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B3 Combustible Liquid
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act. This product and/or all components are listed on the U.S. EPA TSCA Inventory.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Combustible Liquid.
Handling Statement:	Eliminate all ignition sources. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reviewed and updated. Changes have been made to: Section 8 Section 15 Section 16

ATTACHMENT C5

NATIONAL ENERGY BOARD DETAILED INCIDENT REPORT

National Energy Board
Calgary, Alberta

Appendix 1
DETAILED INCIDENT REPORT

Type or print in black pen

Board Use Only

NEB Incident No. _____ Date Received _____ NEB Investigator _____

Investigator's Comments _____

_____

_____

Secretary
National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta T2P 0X8 • Fax: (403) 292-5503

PART A - OPERATOR INFORMATION

Name of Company _____

Address of Company _____

_____

Pipeline Name _____

PART B - TIME, WEATHER AND LOCATION OF INCIDENT

Date *(month)* _____ *(day)* _____ *(year)* _____

Hour *(24 hour system & time zone)* _____

Weather *temperature*: *^{0}C precipitation*: _____ *windspeed & direction*: _____

CSA Class Location ☐1 ☐2 ☐3 ☐4

Location (provide specific location using a chainage description (MLV, kmP), land survey description or prominent landmarks)

_____

_____

_____

_____

PART C - ORIGIN OF SPILL/RELEASE

Facility Involved:

☐ Line Pipe ☐ Tank Farm ☐ Pump Station ☐ Compressor Station ☐ Regulator/Meter Station ☐ Gas Plant

☐ Other Related Facility *(specify)* _____

Equipment Involved:

☐ Pipe ☐ Valve ☐ Pressure relief device ☐ Fitting ☐ Compressor ☐ Pump ☐ Pressure vessel ☐ Tank

☐ Instrumentation

☐ Other *(specify)* _____

PART D - SPILLS AND RELEASES *(Report LVP and HVP spills only if in excess of 1.5 m^3)*

☐ Gas ☐ LVP ☐ HVP ☐ Toxic Substance

Name of product/substance _____

Volume spilled/released _____ m^3 Volume recovered _____ m^3

Was there a fire? ☐ Yes ☐ No Was there an explosion? ☐ Yes ☐ No

PART E - IMMEDIATE CAUSE FOR INCIDENTS ON OPERATING PIPELINES (*Immediate Cause: means unsafe acts or unsafe conditions*)

☐ Failed pipe ☐ Operator personnel error ☐ Other *(specify)* _____

☐ Failed weld ☐ External loading or natural forces Refer to Part H

☐ Corrosion Refer to Part G ☐ Equipment malfunction/failure Refer to Part I

PART F - LINE PIPE DATA

Type of Failure _____

Nominal Diameter (mm) _____ Wall Thickness (mm) _____ Date of Manufacture _____

Weld Process _____ SMYS (MPa) _____

Pipe Specification ☐ Z 245 ☐ Other *(specify)* _____ Pipe Location: ☐ Below Ground ☐ Above Ground

Maximum Operating Pressure (kPa) _____ Pressure at Time of Incident (kPa) _____

Latest Presure Test Date _____ Maximum Test Pressure (kPa) _____ Test Duration (hrs) _____

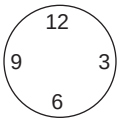
PART G - CORROSION FAILURES

Corrosion location: ☐ Internal ☐ External

Type of Corrosion *(specify)* _____

Type of Coating _____

Circumferential Position Looking Downstream (mark an X)



PART H - FAILURES DUE TO EXTERNAL LOAD OR NATURAL FORCES

☐ Damage by operator or its contractor ☐ Damage by other parties ☐ Earth movement ☐ Lightning/Fire

☐ Other (*specify*) _____

Name or Contractor/Other Party _____

Address _____

Telephone ( ) _____ Name of Representative _____

PART I - EQUIPMENT MALFUNCTION/FAILURE

Equipment _____ Manufacturer _____ Model# _____

Year Equipment Installed _____ Year Equipment Manufactured _____

PART J - ESTIMATE OF TOTAL INCIDENT COST *(Including repair, cleanup and restoration)*

$

PART K - REPAIR DESCRIPTION *(Description of all repairs to the pipeline made necessary by the incident and date of return to service of the pipeline)*

PART L - INJURY AND FATALITY DESCRIPTIONS

☐ Number of Fatalities ☐ Number of Serious Injuries

Serious Injury - includes an injury that results in: fracture of a major bone, amputation of a body part, loss of sight - one or both eyes, internal haemorrhage, third degree burns, unconsciousness, or loss of a body part or function of a body part

NAME	AFFILIATION	FATALITY OR INJURY DESCRIPTION AND CURRENT PATIENT CONDITION
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	
	☐ Company Employee ☐ Contractor ☐ Public	

PART M - IMMEDIATE INCIDENT CAUSE OF SERIOUS INJURY/FATALITY *(Immediate Cause - means unsafe acts and conditions)*

☐ Defective/inadequate safety devices, tools or equipment

☐ Improper operation of safety devices, tools or equipment

☐ Improper loading or placement

☐ Hazardous environment (gases, dust, smoke, fumes or vapours)

☐ Congested work area/disorderly workplace

☐ Other *(specify)*

PART N - NARRATIVE OF INCIDENT

Provide a complete description of the incident, including events leading up to, and following the incident. Also include additional information as specified in the guidelines to section 52 of the Onshore Pipeline Regulations. Attach any additional information that may supplement the narrative such as 1) drawing of the incident site 2) photographs 3) schematics 4) maps 5) reports (metallurgical, NDT, inspection, pressure test, etc.)

Attach additional sheets of narrative as required.

PART O - WITNESS INFORMATION

NAME _____ TELEPHONE NO. ( ) _____

_____ ( ) _____

_____ ( ) _____

_____ ( ) _____

_____ ( ) _____

PART P - BASIC CAUSES OF INCIDENT ***(Identify all basic causes contributing to the incident. Basic Cause - means the real or root causes of why the unsafe acts and unsafe conditions as described in the immediate cause occurred. Several Basic Causes may be assigned for one incident.)***

☐ Inadequate training ☐ Inadequate work standards or procedures ☐ Inadequate materials, tools or equipment

☐ Inadequate design/maintenance ☐ Non-compliance with work standards or procedures

☐ Other *(specify)* _____

Additional comments on selected basic cause: _____

_____

_____

_____

PART Q - CORRECTIVE ACTIONS TAKEN TO PREVENT SIMILAR INCIDENTS ***(If no corrective action taken, state reasons why)***

_____

_____

_____

_____

_____

_____

_____

_____

PART R - NAME OF PERSON CONDUCTING A COMPANY INCIDENT INVESTIGATION

Name _____

Title _____

Telephone ( ) _____ Fax ( ) _____

PART S - NAMES OF OTHER AGENCIES INVESTIGATING INCIDENT

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

Agency _____ Agency _____

Telephone _____ Telephone _____

Contact Name _____ Contact Name _____

PART T - NAME AND TITLE OF COMPANY REPRESENTATIVE FILING REPORT

Name _____ Signature _____

Title _____

Telephone ( ) _____ Fax ( ) _____ Date *(time)* _____ *(month)* _____ *(day)* _____ *(year)* _____

ATTACHMENT C6

ALBERTA SPILL REPORTING FACT SHEET AND FORM

Reporting Spills and Releases

FACTS AT YOUR FINGERTIPS

Report Immediately
You need to report a release to Alberta Environment at the first available opportunity, as soon as you know or should know about the release

The *Environmental Protection and Enhancement Act* (EPEA) requires any release of substances that could cause an adverse effect to the environment be reported to Alberta Environment.
The *Release Reporting Regulation* sets out what must be reported, when, how and to who reports must be made.
Individual approvals and codes of practice may also have requirements for reporting contraventions of the terms and conditions of the approval or code of practice, monitoring results and sampling programs.

WHEN TO REPORT

Releases of a substance into the environment that **may** cause, **is** causing or **has** caused an adverse effect must be reported to Alberta Environment. An adverse effect is impairment of, or damage to, the environment, human health or safety, or property.

WHO MUST REPORT

The person who releases, causes or permits the release, or has control of the substance released is responsible for reporting.
Prompt reporting helps to ensure adverse impacts are addressed properly and minimized if possible, and directly affected parties are notified.

HOW TO REPORT

Releases must be reported to Alberta Environment at the **first available opportunity,** as soon as the person responsible knows or should know about the release.

Reports can be made:

- By phoning **1-800-222-6514**
- In person at any Alberta Environment office

Electronic reporting may also be available. For further information please contact your regional Alberta Environment office.

When reporting, please provide:
The location and time of the release

- A description of the circumstances leading to the release
- The type and quantity of substance released
- The details of any action proposed or taken at the release site
- A description of the immediate surrounding area

A reference number will be issued to confirm that the report was made.

WRITTEN REPORT

A written report must be submitted to the appropriate Alberta Environment Director within seven days after the immediate report.
Written reports must include:

- The date and time of the release
- The location of the release
- The duration of the release and the release rate
- The concentration, total weight, quantity or amount released
- A detailed description of the circumstances leading to the release
- The steps or procedures which were taken to minimize, control or stop the release
- The steps or procedures which will be taken to prevent similar releases in the future
- Any other information required by the Director

Written reports can be faxed to (780) 427-3178 or mailed to:
Alberta Environment Environmental Response Centre 111 Twin Atria Building 4999 – 98 Avenue Edmonton, AB T6B 2X3

REPORTING SPILLS AND RELEASES

WHAT DOESN'T HAVE TO BE REPORTED

Generally, releases of the following substances do not have to be reported to Alberta Environment:

- Substances released according to an approval or code of practice
- Substances regulated by the Oil and Gas Conservation Act or the Dangerous Goods Transportation and Handling Act (these types of releases may need to be reported to other regulators)

The release of these substances are reportable if:
It has caused, is causing or may cause an adverse effect

- The amount exceeds the quantities or emission levels set out in the legislation, guideline, approval or code of practice
- The release is into a groundwater or surface water body

If unsure whether the quantities or levels are exceeded, the release should be reported.

WHAT HAPPENS AFTER YOU REPORT

Alberta Environment responds to all reports. The first priority is always to ensure that any spill or release is contained and appropriately cleaned up. Alberta Environment also ensures all appropriate authorities are notified to ensure proper response efforts are underway.
After the situation is being appropriately managed and is under control, Alberta Environment will work to gather more information about the release incident to determine the cause of the release and how to prevent future releases.
Once this is complete, a decision is made on whether enforcement action is necessary, and what that enforcement action should be.

PENALTIES FOR NOT REPORTING

Failure to report a release of a substance causing an adverse effect on the environment can result in a fine of up to $100,000 fine and a year in jail for an individual and $500,000 for an organization or company.

FOR MORE INFORMATION

For more information about release reporting requirements, contact the Alberta Environment regional office nearest you.

Southern Region

Phone: (403) 297-8271
2nd Floor, Deerfoot Square
2938 – 11 Street NE
Calgary, Alberta T2E 7L7

Phone: (403) 381-5322
2nd Floor, Provincial Building
200 – 5th Avenue South
Lethbridge, Alberta T1J 4L1

Central Region

Phone: (403) 340-7052
3rd Floor, Provincial Building
4920 – 51 Street
Red Deer, Alberta T4N 6K8

Phone: (780) 960-8600
Telus Building
250 Diamond Avenue
Spruce Grove, Alberta T7E 1T2

Northern Region

Phone: (780) 427-7617
111, Twin Atria Building
4999 – 98 Avenue
Edmonton, Alberta T6B 2X3

Phone: (780) 538-5351
Provincial Building and Courthouse
Main Floor, 10320 – 99 Street
Grande Prairie, Alberta T8V 6J4

ATTACHMENT C7

BRITISH COLUMBIA SPILL REPORTING INFORMATION FORM

TRANSMOUNTAIN

SPILL REPORTING INFORMATION FORM (template)

Provincial Emergency Program: 1-800-663-3456

The template form is based on the reporting information required under the B.C. *Spill Reporting Regulation*. Please complete this form and retain on file.

Person reporting spill:	Telephone number:
Date of reporting:	Time of reporting:
Person causing spill (if known):	Telephone number:
Date of spill:	Time of spill:
Spill location:	
Material type:	
Material quantity:	
Weather conditions:	
Other Agencies contacted: ☐ Police/Fire Dept. (911) ☐ Environment Canada (604-666-6100) ☐ Transport Canada (604-666-2955) ☐ CANUTEC (613-996-6666) ☐ ICBC (1-800-910-4222) ☐ Others:	**NOTE**: ensure contact numbers are correct and updated! Information is current as of May 2009.
Cause(s) and effect(s) of spill:	
Spill containment and clean up procedures initiated:	
Description of spill location and surroundings:	
Distance to nearest public facility, residence, First Nations community:	
Distance to nearest stream, water bodies, sensitive areas:	
Other comments/actions taken:	
Agencies on the scene:	
Report completed by:	Telephone number:
Title:	Date:

ATTACHMENT C8

IMMEDIATELY REPORTABLE SPILL QUANTITIES

TDG Class	Substance	Immediately Reportable Quantities	Alberta	British Columbia
1 2.3 2.4 6.2 7 None	Explosives Compressed gas (toxic) Compressed gas (corrosive) Infectious substances Radioactive Unknown substance	Any amount	Class 1: Any quantity that: (a) could pose a danger to public safety or is greater than 50 kg; or (b) is included in Class' 1.1, 1.2, 1.3 or 1.5 and is (i) not subject to special provision 85 or 86 but exceeds 10 kg net explosives quantity, or (ii) subject to special provision 85 or 86 and the number of articles exceeds 1 000 SOR/2008-34. Class 2: Any quantity that could pose a danger to public safety or any sustained release of 10 minutes or more. Class 6.2: Any quantity. Class 7: Any quantity that could pose a danger to public safety. None: not listed.	Class 1: Any quantity that could pose a danger to public safety or 50 kg. Class 2.3: 5 kg. Class 2.4: not listed. Class 6.2: 1 kg or 1L, or less if the waste poses a danger to public safety or the environment. Class 7: Any quantity that could pose a danger to public safety and an emission level greater than the emission level established in Section 20 of the "Packaging and Transport of Nuclear Substances Regulations". None (unknown substance): not listed.
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100L	Class 2: Any quantity that could pose a danger to public safety or any sustained release of 10 minutes or more.	Class 2.1: 10 kg. Class 2.2: 10 kg.
3.1 3.2 3.3	Flammable liquids	>100L	Class 3: 200L.	Class 3: 100L.
4.1 4.2 4.3	Flammable solids Spontaneously combustible solids Water reactant	>25 kg	Class 4: 25 kg.	Class 4: 25 kg.
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	>50L or 50 kg	Class 5.1: 50 kg or 50 L. Class 9: 25 kg or 25 L. (Class 9.1 not listed.)	Class 5.1: 50 kg or 50L. Class 9 (miscellaneous products): 25 kg or 25L. (Class 9.1 not listed.)
5.2 9.2	Organic peroxides Environmentally hazardous	> 1L or 1 kg	Class 5.2: 1 kg or 1 L. Class 9: 25 kg or 25 L. (Class 9.2 not listed.)	Class 5.2: 1 kg or 1L. Class 9: 25 kg or 25L. (Class 9.2 not listed.)
6.1 8 9.3	Poisonous substances Corrosive substances Dangerous wastes	>5L or 5 kg	Class 6.1: 5 kg or 5 L. Class 8: 5 kg or 5 L. Class 9: 25 kg or 25 L. (Class 9.3 not listed.)	Class 6.1: 5 kg or 5L. Class 8: 5 kg or 5L. Class 9: 25 kg or 25L. (Class 9.3 not listed.)
9.1	PCB mixtures of 5 or more ppm	>0.5L or 0.5 kg	Class 9.1 (PCB mixtures of five or more ppm): not listed.	Class 9.1 (PCB mixtures of five or more ppm): not listed.
None	Other contaminants (*e.g.*, crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)	>100L or 100 kg	Not listed.	Not listed.
None	Sour natural gas (*i.e.,* contains H2S) Sweet natural gas	Uncontrolled release or sustained flow of 10 minutes or more	Not listed.	Not listed.

ATTACHMENT C9

RESPONDING TO A PIPELINE EMERGENCY

Contact Us

If you have questions about anything in this brochure, or would like to participate in our upcoming training exercises, please contact us:

Manager, Emergency Response and Security
(604) 291-2744

Response Planning Coordinator
(403) 514-6539

email: pipelinesafety@kindermorgan.com
www.kindermorgan.com/pipelinesafety

In case of an emergency:
Trans Mountain or Jet Fuel pipeline
(Alberta and British Columbia)
1(888) 876-6711

Express Canada pipeline
(Alberta)
1(888) 449-7539

Always Call Before You Dig

BC One Call	1 (800) 474-6886
Alberta One Call	1 (800) 242-3447

If undeliverable, return to:
Kinder Morgan Canada
Emergency Response
7815 Shellmont Street, Burnaby, BC, V5A 4S9

Responding to a Pipeline Emergency

Important Safety Information

KINDER MORGAN CANADA

Pipeline safety is a shared responsibility. You are receiving this information because you have been identified as an emergency response individual or organization that would respond in the unlikely event of a pipeline emergency. Your safety is important to us. Please take a moment to read this brochure and share it with your colleagues.

As an emergency responder, you provide a vital service to those in the communities we serve. Kinder Morgan operates high pressure pipelines that transport petroleum products through communities in British Columbia and Alberta. Pipelines are considered one of the safest and most efficient methods for transporting petroleum products. We work hard to keep it that way. Pipeline incidents, although rare, can have severe consequences.

This brochure outlines some basic safety considerations if you are ever called upon to respond to a pipeline emergency.

Signs of a Pipeline Leak or Rupture

Given the steps we take to maintain our pipelines, a leak is highly unlikely. However, if you notice any of the following, evacuate the area immediately:

You may smell:
- A strong petroleum odour
- A strong sulphur or rotten egg smell

You may see:
- Dead or discolored vegetation
- Isolated vapour or mist clouds
- Pools of liquid when the right-of-way is dry
- An oily or rainbow sheen on water

You may hear:
- A loud hissing or roaring sound

Pipeline Incident Response Tactics

When responding to a pipeline emergency:
- Evacuate the area immediately, ensuring that people leave the area on foot and in an upwind direction
- Secure the area and keep traffic away
- Conduct vapour monitoring for H2S, LEL, and Benzene
- Refer to the 2008 Emergency Response Guidebook:
  - 128 Diesel, Gasoline, Fuel Oil
  - 117 H2S
  - 130 Benzene
- Use only intrinsically safe cell phones and radios to call Kinder Morgan's emergency line: 1 (888) 876-6711
- Do not touch the product or try to operate any of the pipeline valves
- Do not try to extinguish any flames before the supply is shut off by our control centre
- Do not use any potential source of ignition: vehicle engines, matches, cell phones, or cameras

Properties of Oil

We ship a variety of petroleum products: heavy crude, light crude, refined products, and synthetic crude. Our Trans Mountain pipeline ships these products in batches, which can be from 30km to 250km in length. It is important to understand that different crude oils can pose different hazards depending on their chemical composition.

If a rupture occurs, these products can emit potentially dangerous levels of H2S and most crude oils contain Benzene, a known carcinogen. All crude oils can ignite and are a potential source of fire or an explosion so caution is required.

Emergency Response Training and ICS

Kinder Morgan actively uses the Incident Command System (ICS) to manage incidents. ICS outlines clear roles and responsibilities with respect to emergency response. We work closely with local emergency responders and regularly practice table top and deployment exercises. If an incident were to occur, we can act quickly to protect our employees and the public as well as mitigate any harm to the environment or property.

The Responder Newsletter and CAER Presentations

Our quarterly newsletter, the Responder, is a way for us to keep connected with the emergency community. It provides information on responding to a pipeline emergency and pipeline safety information. To sign up, please send an email to: pipelinesafety@kindermorgan.com

If you live or work in any of the communities near our pipelines, we strongly urge you to attend one of our Community Awareness for Emergency Response (CAER) presentations. These educational sessions focus on not only providing important safety information but also focuses on building strong relationships with first responders and government agencies.

Pipeline Markers

One of the ways we indicate the presence of our pipeline is with pipeline markers. Our pipelines are most often located in a right-of-way, which is stretch of land typically 18 metres wide. It is designed to allow us access to our pipelines for monitoring, maintenance, and for quick access in the unlikely event of an emergency. Pipeline markers are strategically placed along the right-of-way but do not necessarily mark the exact location of the pipe.

Our Commitment to Pipeline Safety

Kinder Morgan is a leader in energy transportation. Our integrity management program ensures that we take the necessary preventative measures to maintain the long-term physical condition of our pipelines with regular inspection, maintenance, and repair. You can read more about our integrity management program on our website at: www.kindermorgan.com/pipelinesafety

Always Call Before You Dig

Excavation activity can cause damage to pipelines. One Call centres are central agencies that provide information on underground utilities. Kinder Morgan is an active member of all local One Call Centres and we strongly promote Call Before You Dig. Simply call three days prior to the work beginning and the One Call centre will notify its member companies of your project plans. If your work is near a Kinder Morgan pipeline, we will contact you to discuss your plans and provide you with a free locate.

ATTACHMENT C10

EXAMPLE WATER WITHDRAWAL AND DISCHARGE FORM

The following is an example of the Water Withdrawal and Discharge Forms. Information related to the fish species presence, habitat utilisation, channel morphology, streamflow, reclamation requirements, *etc.,* is provided in the Water Crossing Summary Tables provided in Appendix J.

SOURCE WATER OVERVIEW

Source Water: **Name:** _____ _____ **UTM of Withdrawal Site:** Northing: _____ Easting: _____ **Nearest KP :** _____

Intended Water Use: _____

Volume to be Withdrawn (m^3) _____

Rate of Withdrawal (L/s): _____

Timing of Withdrawal(s): _____ _____

Socio-economic/Environmental Issue(s): _____

Instream Period of Least Risk: _____ to _____

Erosion Control Measure(s): _____

Spill Containment/Contingency Measures: _____

DISCHARGE SITE OVERVIEW

Receiving Land or Water: Land: ____ Water: _____ Land Area: _____ ha Water Name: _____ **UTM of Discharge Site:** Northing: _____ Easting: _____ **Nearest KP :** _____

Water Use: _____

Volume to be Discharged (m^3) _____

Rate of Discharge (L/s): _____

Timing of Discharge(s): _____ _____

Socio-economic/Environmental Issue(s): _____

Instream Period of Least Risk: _____ to _____

Erosion Control Measure(s): _____

Spill Containment/Contingency Measures: _____

SUMMARY OF MONITORING MEASURES

Monitoring Requirements as per Regulatory Approvals:

Planned Monitoring Program (including parameter(s) to be monitored, sampling intervals and sampling location(s)):

APPENDIX D

CONTACTS

TABLE D-1

EMERGENCY CONTACTS

Contact	Location	Phone Number
ALBERTA		
RCMP		911 or
	Edmonton	1-780-412-5424
	Stony Plain	1-780-968-7200
	Edson	1-780-723-8822
	Hinton	1-780-865-2455
Alberta Health Services: Emergency Medical Services (Ambulance)		911 or
	Gateway EMS Station (Edmonton)	1-780-342-1172
	Grande Prairie EMS Station (Grande Prairie)	1-780-513-5280
	West View Health Centre (Stony Plain)	1-780-968-3600
	Edson Healthcare Centre (Edson)	1-780-723-3331
	Hinton Healthcare Centre (Hinton)	1-780-865-3333
Hospital/Clinic	University of Alberta Hospital (Edmonton)	1-780-407-8822
	Royal Alexandra Hospital (Edmonton)	1-780-735-4111
	West View Health Centre (Stony Plain)	1-780-968-3600
	Edson Healthcare Centre (Edson)	1-780-723-3331
	Hinton Healthcare Centre (Hinton)	1-780-865-3333
Fire		911 or 311
	Edmonton	1-780-442-5445
	Stony Plain	1-780-963-3551
	Edson	1-780-723-3178
	Hinton	1-780-865-6020
Alberta Energy and Utilities Board (ERCB) 24-hour Emergency Line	St. Albert	1-780-460-3800
	Drayton Valley	1-780-542-5182
National Energy Board	Calgary	1-800-899-1265
Department of Fisheries and Oceans Observe, Record and Report Hotline	Alberta and BC	1-800-465-4336
Transportation Safety Board	Quebec	1-819-997-7887
Alberta Environment and Sustainable Resource Development - 24-Hr Emergency Hotline	Edmonton	1-800-222-6514
WCSS Oil Spill Co-operative – 24-Hr Emergency	Alberta and BC	1-866-541-8888
Forest Fires	Alberta	310-FIRE (3473)
Trans Mountain – EHS	Edmonton	1-780-449-5903
Trans Mountain Operations Supervisor	Stoney Plain/Edmonton	1-780-449-5980
Trans Mountain. – 24-hour Emergency Line	Alberta and BC	1-888-876-6711
BRITISH COLUMBIA		
RCMP		911 or
	Valemount	1-250-566-9800
	Clearwater	1-250-674-2237
	Barriere	1-250-672-9918
	Kamloops	1-250-828-3000
	Merritt	1-250-378-4262
	Hope	1-604-869-7750
	Burnaby	1-604-294-7922
Emergency Medical Services (Ambulance)		911 or
	Valemount	1-250-566-4703
	Clearwater	1-250-674-3344
	Barriere	1-250-672-9244
	Kamloops	1-250-828-4770
	Merritt	1-250-378-5912
	Hope	1-604-869-5112
	Burnaby	1-604-872-5151

TABLE D-1 Cont'd

Contact	Location	Phone Number
Hospital/Clinic	Valemount Health Centre (Valemount) Dr. Helmcken Memorial Hospital (Clearwater) Barriere Community Health Centre (Barriere) Royal Inland Hospital (Kamloops) Nicola Valley Health Centre (Merritt) Fraser Canyon Hospital (Hope) Burnaby Hospital (Burnaby)	1-250-566-9138 1-250-674-2244 1-250-672-9731 1-250-374-5111 1-250-378-2242 1-604-860-7732 1-604-434-4211
Fire	 Valemount Clearwater Barriere Kamloops Merritt Hope Burnaby	911 1-250-566-9800 1-250-674-3733 1-250-672-9711 1-250-372-5131 1-250-378-5626 1-604-869-5671 1-604-294-7190
BC Ministry of Environment 24-hour Spill Line	BC	1-800-663-3456
National Energy Board	Calgary	1-800-899-1265
Department of Fisheries and Oceans Observe, Record and Report Hotline	Alberta and BC	1-800-465-4336
Transportation Safety Board	Quebec	1-819-997-7887
Ministry of Environment Spill Response	BC	1-800-663-3456
Conservation Officer Service	BC	1-877-952-7277
WCSS Oil Spill Co-operative – 24-Hr Emergency	Alberta and BC	1-866-541-8888
Forest Fires	BC Forest Fires Reporting Centre	1-800-663-5555
Trans Mountain – EHS	Burnaby	1-604-268-3008
Trans Mountain – EHS (Kamloops)	Kamloops	1-250-371-4017
Trans Mountain Operations Supervisor	Burnaby	1-604-268-3040
Trans Mountain Operations Supervisor	Sumas	1-604-268-3080
Trans Mountain Operations Supervisor	Kamloops	1-604-268-4040
Trans Mountain Operations Supervisor	Clearwater	1-250-587-6350
Trans Mountain – 24-hour Emergency Line	Alberta and BC	1-888-876-6711

APPENDIX E

TERRAIN FEATURES (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various terrain features and issues within the facility sites located within Alberta and BC. Table E-1 lists the terrain feature encountered with corresponding resource-specific mitigation measures.

For further details on terrain features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE E-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR TERRAIN FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX F

SOILS (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for soils located along the within the facility sites located within Alberta and BC. Table F-1 lists the soil map units, ratings for water erosion and wind erosion as well as compaction susceptibilities, topsoil depths, stripping criteria, soil type and all corresponding resource-specific mitigation measures.

For further details on the soil types encountered and determination of corresponding soil map units and recommendations, refer to the Soils Technical Report for the Project as well as the Environmental Facility Drawings.

TABLE F-1

RESOURCE-SPECIFIC MITIGATION MEASURES ASSOCIATED WITH SOILS WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX G

HYDROLOGY (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various ground and surface water features and issues within the facility sites located within Alberta and BC. Table G-1 lists the groundwater feature encountered with corresponding resource-specific mitigation measures.

For further details on ground and surface water features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE G-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR GROUND AND SURFACE WATER FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX H

WATER QUALITY (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various water quality features and issues within the facility sites located within Alberta and BC. Table H-1 lists the water quality feature encountered with corresponding resource-specific mitigation measures.

For further details on water quality features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE H-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR WATER QUALITY FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX I

AQUATIC RESOURCES (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for construction activities to be conducted within and adjacent to the aquatic environments within the facility sites located within Alberta and BC. Table I-1 provides least risk windows and lists the features and issues with the corresponding resource-specific mitigation measures for fish habitat protection.

For further details on the aquatic environments, refer to the Environmental Facility Drawings for the Project.

TABLE I-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR WATERCOURSES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX J

VEGETATION (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for rare plants and weed species encountered within the facility sites located within Alberta and BC. Table J-1 provides specific locations where rare plants may be encountered and the mitigation measures and monitoring requirements. Table J-2 provides specific locations where weed species may be encountered and the corresponding mitigation measures.

For further details on the rare plant communities and weed species encountered and determination of corresponding mitigation recommendations, refer to the Vegetation Technical Report and Environmental Facility Drawings for the Project.

TABLE J-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR RARE PLANT COMMUNITIES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

TABLE J-2

RESOURCE-SPECIFIC MITIGATION MEASURES FOR WEEDS ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX K

WETLANDS (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for key areas where there is potential to encounter wetlands within the facility sites located within Alberta and BC. Table K-1 provides specific locations along the Project footprint where wetlands may be encountered and mitigation measures and monitoring requirements in both Alberta and BC for each wetland traversed by the Project.

For further details on the wetlands encountered and determination of corresponding mitigation recommendations, refer to the Wetlands Technical Report and Environmental Facility Drawings for the Project.

TABLE K-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR WETLANDS ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX L

WILDLIFE AND WILDLIFE HABITAT (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for key wildlife and wildlife habitat within the facility sites located within Alberta and BC. Tables L-1 and L-2 provide the specific locations where wildlife or wildlife habitat may be encountered and the corresponding mitigation measures to be implemented to reduce or avoid adverse potential effects to wildlife and wildlife habitat.

For further details, refer to the Wildlife Technical Report and alignment sheets for the Project.

TABLE L-1

RESOURCE SPECIFIC MITIGATION MEASURES FOR WILDLIFE FEATURES ENCOUNTERED IN THE VICINITY OF FACILITY SITES

Facility	Legal Location (LSD/PNG)	Feature	Timing Constraint Period (Alberta)	Least Risk Window (BC)	Reference to Potential Mitigation Measures
Hinton Pump Station	14-33-49-26 W5M	Amphibian Breeding Pond (long toed salamander)	Year-Round	N/A	Refer to Table L-2 for specific mitigation measures including timing windows and setback distances.
Blackpool Pump Station	c-073-B/92-P-09	Amphibian Breeding Pond (Columbia spotted frog, northern pacific tree frog and western toad)	N/A	Refer to Table L-2 for timing windows	Refer to Table L-2 for specific mitigation measures including timing windows and setback distances.
Burnaby Terminal	b-025-D/92-G-07	Red-tailed Hawk Nest	N/A	August 11 to January 25	Refer to Table L-2 for specific mitigation measures including timing windows and setback distances.

Note: Information presented within the Resource-specific Mitigation Table is provided for the currently surveyed facility site, only information pertaining to those features remaining within the boundaries of the facility site following final facility site delineation, will be retained within the Resource-specific Mitigation Table for reference during construction.

TABLE L-2

WILDLIFE AND WILDLIFE HABITAT-SPECIFIC PROTECTION MEASURES IN THE VICINITY OF FACILITY SITES

Concern	Province / Location	Recommended Mitigation
Habitat Loss/Alteration	Alberta / BC	• Do not clear timber, stumps, brush or other vegetation beyond the marked construction boundary. • Reclaim those areas not required for ongoing operations.
Wildlife Disturbance and Attraction of Wildlife	Alberta / BC	• Schedule clearing and construction activities to avoid sensitive wildlife timing windows wherever feasible. • Prohibit recreational use of all-terrain vehicles or snowmobiles by personnel at facilities. • Prohibit personnel from having pets at facilities. • Prohibit personnel from feeding or harassing wildlife. • Dispose of food waste and industrial waste properly. • Report any issues related to wildlife encountered during construction and operation to the Environmental Inspector, who will report to the appropriate regulatory authorities, as warranted.
Sensory Disturbance	Alberta / BC	• Use low lighting and/or task lighting (*e.g.*, downturned shaded fixtures to prevent sky-lighting or bird disorientation), and a higher lumen/watt ratio at all new facilities or facility expansions. • Comply with appropriate regulatory guidelines related to noise during construction and operation of facilities to minimize disturbance related to noise.
Migratory Birds	Alberta / BC	• In Alberta, schedule clearing and construction activities outside of the migratory bird restricted activity period (RAP) of May 7 to August 20. Wetlands attractive to migratory birds should not be cleared/disturbed from April 20 to August 25 (Gregoire pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird RAP, follow the measures for conducting migratory bird nest sweeps described below. • In BC, schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15 (Wilson pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird RAP, follow the measures for conducting migratory bird nest sweeps described below. • In simple habitat types where active nests are easier to locate (*i.e.,* previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (*e.g.,* presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (*i.e.,* clearly marked protective buffer around the nest and/or non-intrusive monitoring). • In complex habitats where active nests are more difficult to find (*e.g.,* forests), it is recommended that pre-clearing be conducted. If this is not possible and activity is scheduled to occur within the migratory bird RAP, contact Environment Canada prior to activity to discuss the area to be cleared. Use non-intrusive methods to conduct an area search for evidence of nesting (*e.g.,* presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (*i.e.,* clearly marked protective buffer around the nest and/or non-intrusive monitoring).
Ungulate Winter Range for Mule Deer (u-3-003)	BC • Kingsvale Pump Station • Kingsvale power line (6.2 km)	• A timing window does not apply to this UWR (Surgenor pers. comm.). • For the proposed Kingsvale power line, minimize the right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace (*e.g.*, placing log decks, storage areas, other temporary construction areas outside of the UWR). Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Implement measures to reduce access (human and predator) along the Kingsvale power line right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations. • Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Ungulate Winter Range Order.
Wildlife Habitat Area for Williamson's Sapsucker (3-143)	BC Kingsvale power line (952 m)	• Conduct a survey to confirm status and presence of nest trees along the proposed Kingsvale power line right-of-way. In the event an active nest tree is found, consult with BC MFLNRO to discuss practical options and mitigation strategies. • Schedule clearing and construction activities outside the breeding season of March 15 to August 31 to the extent feasible (BC MOE 2009). • During operations, retain coarse woody debris and snags (if not deemed a hazard) on the power line right-of-way (to provide foraging habitat) where practical (BC MOE 2009). • Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. • Avoid the use of pesticides (except for herbicides to control invasive plants or noxious weeds; only use as spot treatments and outside the breeding season of March 15 to August 31 (BC MOE 2009). • Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Wildlife Habitat Area Order.

TABLE L-2 Cont'd

Concern	Province / Location	Recommended Mitigation
Raptor Nest	Alberta/BC	• Schedule clearing and construction activities outside of sensitive time periods for raptors (provided below) to the extent feasible. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests. In the event an active raptor nest is discovered, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies. • In Alberta, implement the appropriate setback in the event an active nest of a sensitive raptor is found (*i.e.*, ferruginous hawk, bald eagle, golden eagle, prairie falcon, peregrine falcon). For high disturbance activities (*i.e.*, conventional pipeline), a 1,000 m setback is recommended year-round. For medium disturbance activities (*i.e.,* conventional pipeline parallel to a linear corridor), a 1,000 m setback is recommended from March 15 to July 15 and a 100 m setback is recommended from July 16 to March 14 (Government of Alberta 2013). All other raptor nests (*e.g.*, red-tailed hawk) have a recommended 100 m setback when they are active (Government of Alberta 2013). • In Alberta, although the Edmonton Terminal is located in a provincially identified Sensitive Raptor Range for bald eagle, no bald eagle nests have been recorded within 1,000 m of the Edmonton Terminal. If an active bald eagle nest is found, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies. • In BC, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl nests are protected year-round by the BC *Wildlife Act* and may not be cleared. The *Guidelines for Raptor Conservation* (BC MOE 2013) provides information on sensitive breeding and nesting time periods and buffers for raptor nests according to their tolerance to human disturbance. These buffers range from 50 m to 500 m depending on the surrounding land use and species. During the breeding season, an additional 100 m "quiet" buffer is recommended. Clearly mark the appropriate buffers with fencing to prevent access to the nest buffers. • If construction is unavoidable within the recommended year-round and breeding buffers, a Nest Management Plan addressing various mitigation (including nest monitoring during the breeding period) is recommended. • If construction activities require the removal of a raptor nest that is protected year-round under the BC *Wildlife Act* (*i.e.*, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl), Trans Mountain will work with the appropriate regulatory authorities to develop a Nest Removal Management and Compensation Plan. Upon confirmation the nest is inactive, nest removal should occur during the least risk window of August through December. When a nest is removed the installation of a replacement structure (*i.e.*, a platform on a pole or transplanted tree) should be erected in nearby suitable habitat (BC MOE 2013).
Amphibian Breeding Pond	Alberta/BC Hinton, Blackpool	• Schedule clearing and construction activities outside of the breeding and seasonal migration periods for amphibians, where feasible. In Alberta, this is generally mid-April to mid-June (Government of Alberta 2013). In BC, this will vary depending on pipeline segment and can be from mid-April to mid-June (Hargreaves to Hope) and from February to late-July or August (Hope to Westridge) (Wind pers. comm). • In Alberta, in the event that a western toad breeding pond is found, a year-round 100 m setback distance is recommended (Government of Alberta 2013), while Environment Canada recommends a year-round 400 m federal setback distance for western toad breeding ponds and wintering sites (Environment Canada 2011). • In Alberta, in the event a long-toed salamander breeding pond is found, a year-round 200 m setback distance (where new-cut is required) and a 100 m setback distance (when paralleling existing linear disturbance) is recommended (Government of Alberta 2013). In reference to the long-toed salamander breeding pond at NW 33-49-26 W5M located approximately 30 m north of the Hinton Pump Station, AESRD will be consulted to discuss mitigation options. For activity in the summer (breeding season), mitigation may include exclusion fencing, onsite monitors and relocation if warranted. • In BC, protect identified amphibian breeding ponds by implementing appropriate buffers (150 m undeveloped; 100 m rural; 30 m urban) (BC MOE 2012). • Install fencing along construction workspace near identified breeding ponds to prevent dispersing amphibians from entering the construction zone and limit vehicular activity in spring and early fall to reduce effects during the breeding and dispersal periods (Wilkinson pers. comm.). All fencing installed during clearing and construction activities should be removed once they are no longer necessary to prevent barriers to amphibian movement following construction. • Do not mow/brush vegetation within wetland riparian (fringe) areas during operation. • Conduct an amphibian salvage prior to clearing and construction activities at known amphibian breeding pond locations. Ensure the appropriate permit is obtained. In BC, adhere to the *Best Management Practices for Amphibian and Reptile Salvages in BC* (EDI Environmental Dynamics *et al. in prep*). • If the proposed activity is located within the recommended setback distance of an amphibian breeding pond, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies.
Species with Special Conservation Status	Alberta/BC	• In the event that a species with special conservation status is observed during construction, the appropriate regulatory authorities will be contacted to determine if additional mitigation measures are warranted. • Implement the Wildlife Species of Concern Discovery Contingency Plan in the event that wildlife species of concern are identified during construction.

APPENDIX M

HERITAGE RESOURCES (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for key areas of archaeological and palaeontological potential within the facility sites located within Alberta and BC. Table M-1 provides archaeological sites by Borden designations and the corresponding mitigation measures to be implemented. Table M-2 provides mitigation for areas with palaeontological potential encountered by the facility sites.

For further details on the areas of archaeological and palaeontological potential encountered within the facility sites, refer to the Palaeontology Technical Report as well as the Archaeology Technical Report as well as the Environmental Facility Drawings for the Project.

TABLE M-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR SITES OF ARCHAEOLOGICAL POTENTIAL WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

TABLE M-2

RESOURCE-SPECIFIC MITIGATION MEASURES FOR SITES OF PALAEONTOLOGICAL POTENTIAL WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX N

SOCIO-ECONOMIC AND AGRICULTURAL (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various land and resource use features and issues within the facility sites located within Alberta and BC. Table N-1 lists the land and resource use feature encountered with corresponding resource-specific mitigation measures.

For further details on land and resource use features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE N-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR SOCIO-ECONOMIC AND AGRICULTURAL USE FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX O

AIR QUALITY (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various air quality features and issues within the facility sites located within Alberta and BC. Table O-1 lists the air quality feature encountered with corresponding resource-specific mitigation measures.

For further details on air quality features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE O-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR AIR QUALITY FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX P

NOISE (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for various noise features and issues within the facility sites located within Alberta and BC. Table P-1 lists the noise feature encountered with corresponding resource-specific mitigation measures.

For further details on noise features encountered and coinciding recommendations refer to the Environmental Facility Drawings for the Project.

TABLE P-1

RESOURCE-SPECIFIC MITIGATION MEASURES FOR NOISE FEATURES ENCOUNTERED WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX Q

TRADITIONAL LAND USE (RESOURCE-SPECIFIC MITIGATION)

Resource-specific mitigation measures have been identified for traditional land use features within the facility sites located within Alberta and BC. The traditional land use features encountered with corresponding resource site‑specific mitigation measures are provided in Table Q-1.

For further details on traditional land use features encountered refer to the Environmental Facility Drawings for the Project.

TABLE Q-1

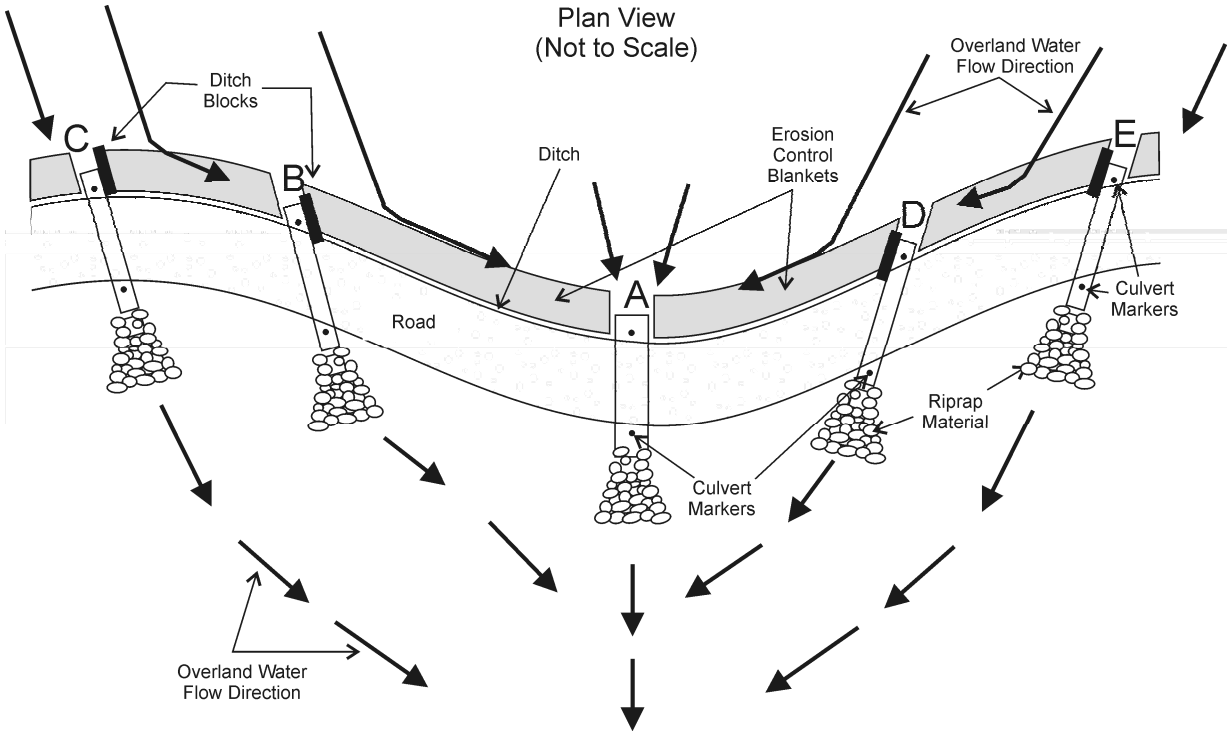
RESOURCE-SPECIFIC MITIGATION MEASURES FOR TRADITIONAL LAND USE WITHIN THE FACILITY SITES

Start (RK)	End (RK)	Legal Location	Feature	Issue	Description	Mitigation

APPENDIX R

DRAWINGS

LIST OF DRAWINGS

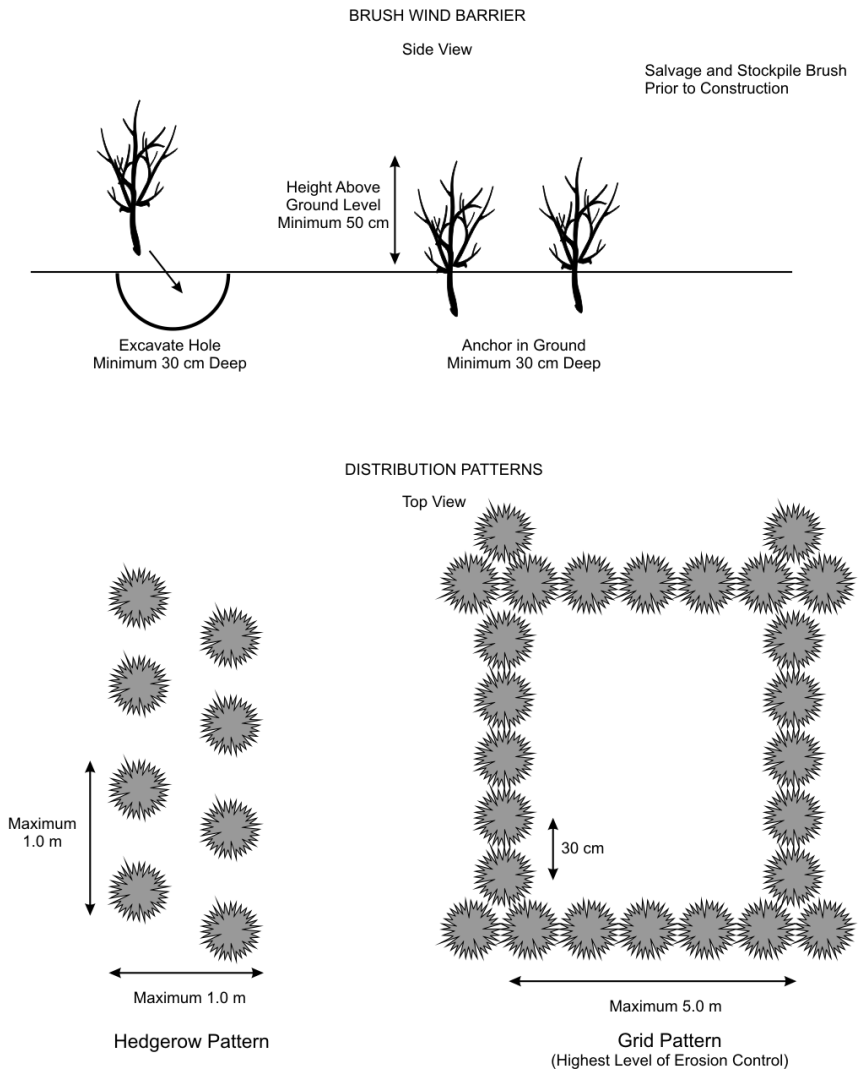


Notes:

1. Install clearly visible culvert markers on the ditch side for all plastic and metal cross drain culverts where the inlet is at risk due to grading or snow removal.
2. Protect the inlet of culverts from encroachment of road embankment fill materials.
3. Where sedimentation is a problem, construct catch basins adjacent to the inlet of cross drain culverts.
4. Except where ditch water converges at the culvert, install ditch blocks immediately downstream of all cross drain culvert inlets.
5. Construct the crest of ditch blocks lower than the road shoulder.
6. Skew culvert to road centreline by 3° for each 1% that road grade exceed 3%, to a maximum of 45°, with a minimum slope 2%. Otherwise, provide suitable mitigative measures to minimize erosion.
7. Protect the outlet of culverts from encroachment of road embankment fill materials.
8. Protect unstable or erodible fill at culvert outlets with flumes, riprap or other erosion resistant materials.

Adapted from BC Oil and Gas Guidelines (1995)

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	ACCESS ROADS – CULVERT		
	7894	December 2013	Drawing 1



CRITERIA FOR IMPLEMENTATION

A brush wind barrier may be installed at highly exposed sites where soils may be difficult to stabilize.

Notes:

1. Aboveground stems of shrubs and trees (slash) will be salvaged during clearing and stockpiled.
2. Brush will be applied by hand or machine and will be securely anchored to the ground. Clumps of 5 to 10 stems will be placed into the soil to a minimum depth of 30 cm and will protrude upwards from the ground surface for a minimum height of 50 cm.
3. Brush stem clumps will be spaced in a random pattern a maximum of 1 m apart. Alternatively, the brush wind barrier will be installed in a hedgerow, grid pattern for the highest level of wind erosion control for exposed windblown ridges where the erosion hazard is severe. The stems will be laid in dense, continuous rows. The grid rows will be placed a maximum of 5 m apart.
4. Stems of the brush wind barriers are not expected to regrow.

Adapted from: AXYS Environmental Consulting Ltd. and David Walker & Associates (1998)

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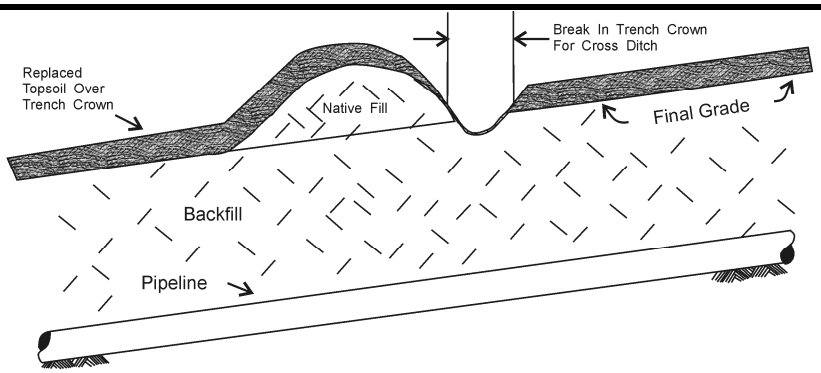
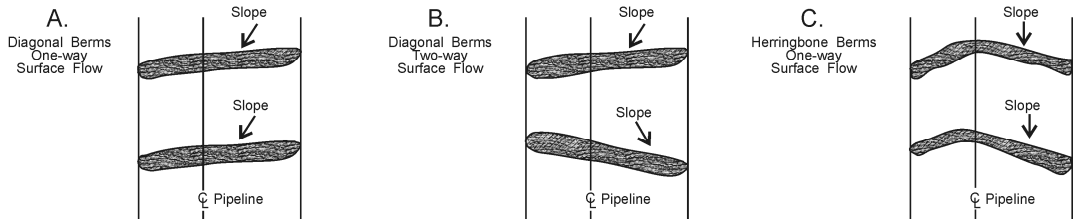
	BRUSH WIND BARRIER		
	7894	December 2013	Drawing 2

Profile
(Not to Scale)



Plan View
(Not to Scale)



Notes:

Representation Only

1. Install diversion berm and cross ditch on moderate and steep slopes on non-cultivated lands to divert surface water off the construction right-of-way. Install berms immediately downslope of trench breakers to collect seepage forced to the surface.
2. Skew berm across the construction right-of-way at downhill gradient of 5-10%.
3. Construct diversion berm of compacted native subsoils where extensive disturbance of the sod layer has occurred. Diversion berms should be constructed of timbers, imported logs or sandbags if disturbance of the sod layer is limited. Avoid use of organic material. Where native material is highly erodible, protect upslope of berm and base of cross ditch by burying a geotextile liner approximately 20 cm below the surface or armour upslope face of berm with earth-filled sand bags.
4. Typical diversion berm height and widths are approximately 0.75 m for summer construction and 1.0 m for winter construction. Trans Mountain shall inspect berms after heavy rains and the first spring following construction; replace or restore berms, if warranted.
5. Tie berms into existing berms on adjacent rights-of-way, where applicable.
6. Leave a break in trench crown immediately upslope of diagonal berm and cross ditch to allow passage of water across the construction right-of-way.
7. Use diagonal berms where direction of slope and surface water movement is oblique to construction right-of-way.
8. Use herringbone berm and cross ditch where direction of slope and surface water movement is parallel to construction right-of-way so runoff does not cross ditchline.
9. Determine location and direction of berm based on local topography and drainage patterns. Typical diversion berm spacing is indicated below.

Slope Gradient (° ;%)	Typical Spacing (m) Erosion Hazard*		
	High	Medium	Low
<7; <12	30-45	45-60	60 or more
7; 12	25	38	51
8; 14	22	33	44
9; 16	19	29	38
11; 19	16	24	32
14; 25	12	18	24
18; 33	9	14	18
27; 50	6	9	12

* High = fine sand and silts; medium = clays and coarse sands; low = rock or gravel.

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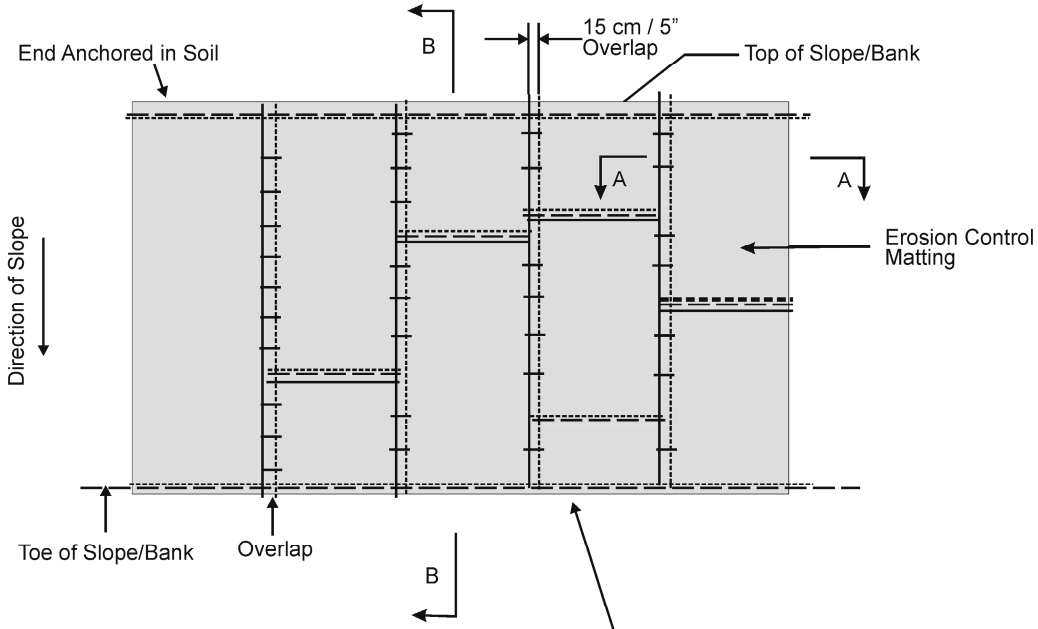
TRANS MOUNTAIN EXPANSION PROJECT

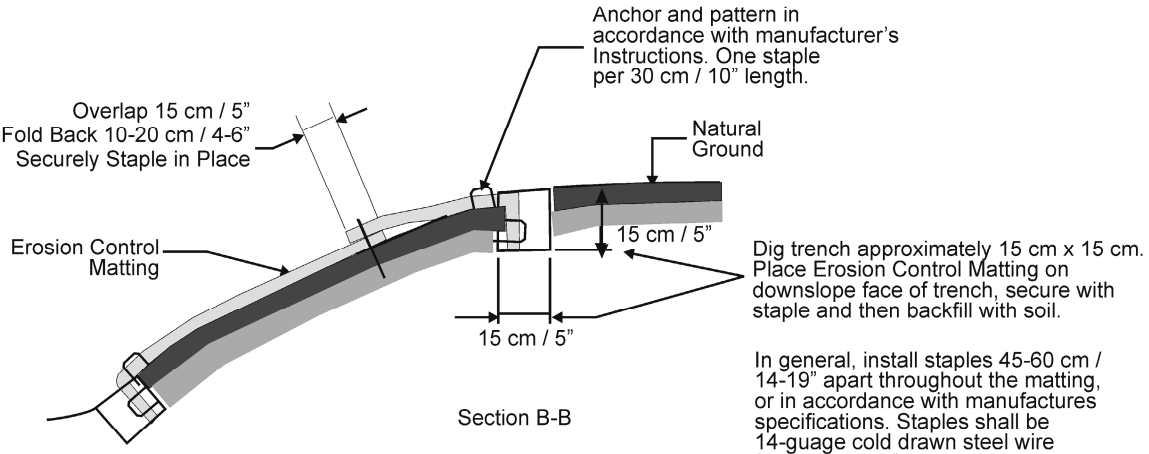
TRANSMOUNTAIN

CROSS DITCHES AND DIVERSION BERMS

7894	December 2013	Drawing 3

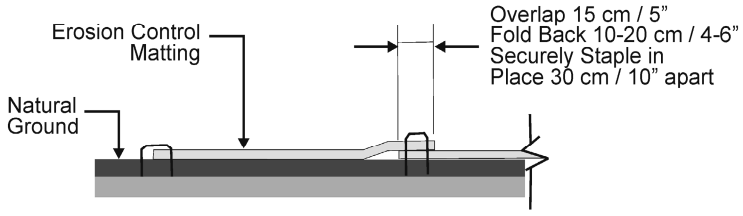


Plan View
(Not to Scale)



In general, install staples 45-60 cm / 14-19" apart throughout the matting, or in accordance with manufactures specifications. Staples shall be 14-guage cold drawn steel wire formed in a "U" shape not less than 30 cm / 10" length.

Section B-B

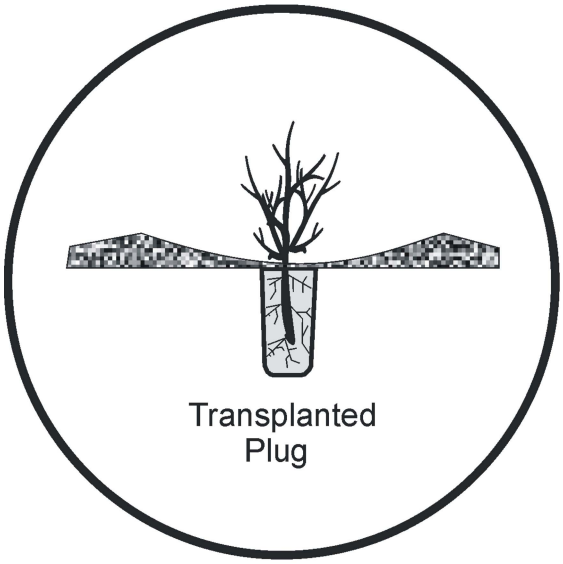


Section A-A

Note: When used at streambanks, erosion control matting should be secured to the bank using willow cuttings rather than staples.

Representation Only

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	EROSION CONTROL MATTING/BLANKET		
	7894	December 2013	Drawing 4



Plant Material Selection

Use appropriate woody plant species identified growing within or adjacent to the proposed crossing and approved by the Reclamation Resource Specialist.

Purchase or contract propagate rooted stock plants using locally collected plant material.

All collection and salvage of woody plant material from public and private lands will be conducted following approval by the appropriate land owner/manager.

Contract Propagated or Purchased Plug Grown Plants

Plant material will be collected from locations on or adjacent to the construction right-of-way, or as close to the planned watercourse or wetland crossing as is practical from within the same Natural Subregion/BGC Zone.

1. Through site vegetation surveys and recommendations provided by a Reclamation Resource Specialist, plant species that are suited to growing conditions at the site will be chosen.
2. Plant material including stem and root cuttings and/or seeds will be collected by qualified personnel in the season determined by the propagator.
3. Boxed, cellophane wrapped plants will be delivered to the site(s) or stored at a suitable location as close to the planting site as is possible, ensuring plant quality is maintained through the planting period.

Installation of Plants

4. Using standardized silviculture equipment and techniques, install rooted woody plants in the riparian area on the construction right-of-way singularly and/or in random groupings that emulate the composition and natural variability of adjacent off construction right-of-way vegetation.

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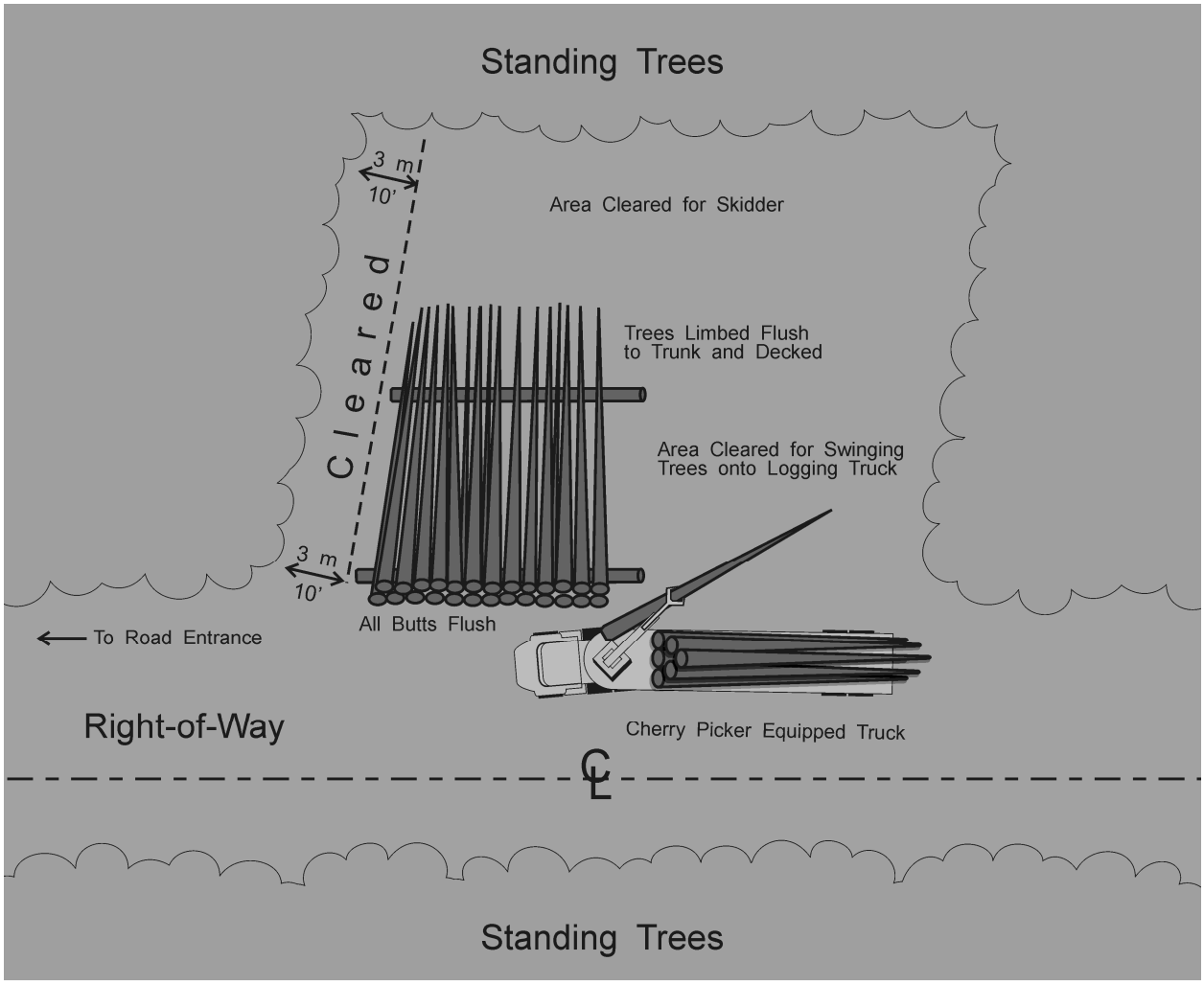
	ROOTED STOCK SELECTION AND INSTALLATION		
	7894	December 2013	Drawing 5



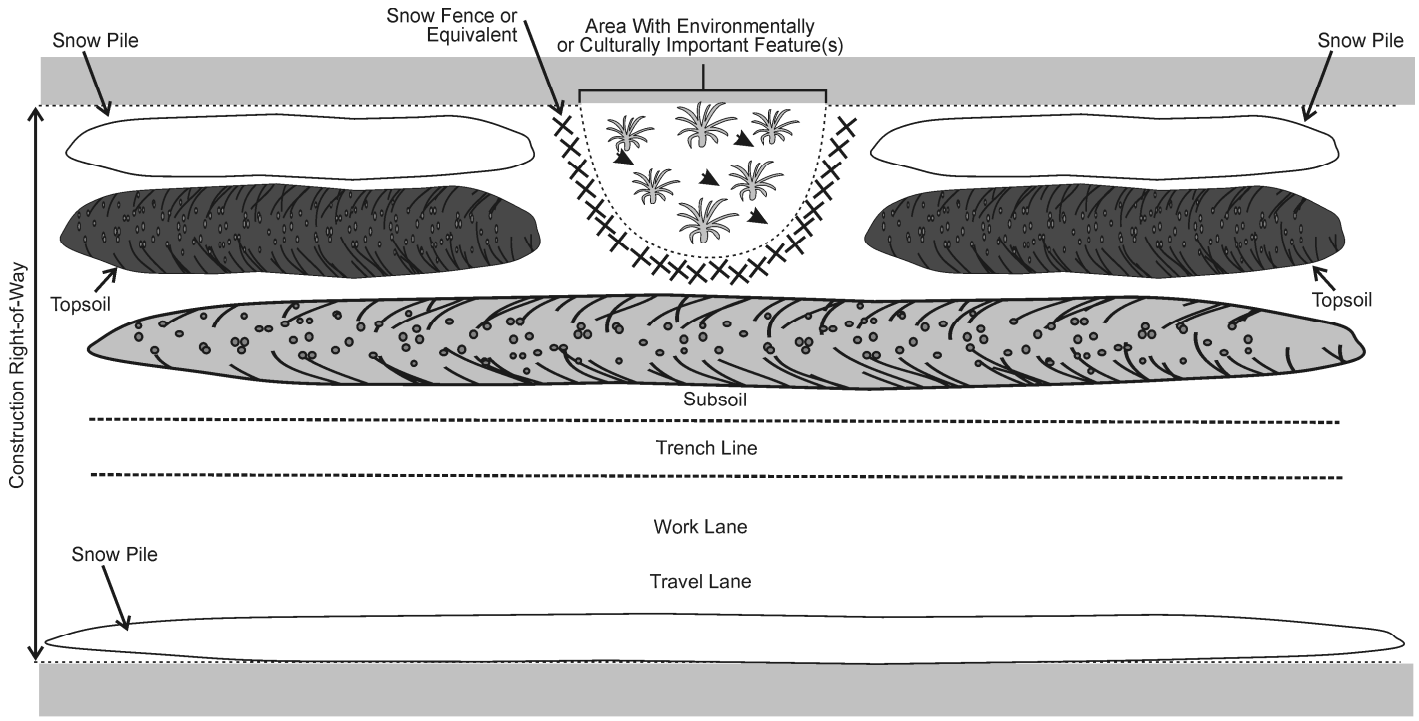
Plan View
(Not to Scale)

Representation Only

Implementation:

1. Salvage progressively, if feasible. Salvage merchantable timber as specified by the appropriate regulatory authority and the Environmental Manager.
2. Wherever practical, locate deck site(s) in previously disturbed areas, natural clearings, seismic line intersections and other areas which do not require clearing. Avoid grading. Do not salvage root zone material at deck sites unless the area will be used for other activities (*e.g.*, burning debris piles, etc.). Do not establish log decks within a watercourse or wetland buffer zone, on existing access roads, and/or pipelines.
3. On a new clearing, locate log deck site(s) on areas of level terrain, where feasible, and in merchantable timber stands to limit the loss of merchantable timber, where practical. Maintain maximum skidding distances of 400 m between log deck locations to avoid damage to ground and timber. Ensure log skidding and hauling shall only be conducted during dry or frozen conditions.
4. Request logging operators begin hauling timber as early as practical during construction, preferably after grading but before stringing and trenching. Where no existing log deck sites are available, haul timber to a suitable and approved location. If warranted, obtain additional workspace approvals to establish log decks adjacent to the construction right-of-way. Regulatory approvals for log deck locations may be required from applicable agencies.
5. Ensure the butt ends of piled tree lengths are flush. Do not top skid. Face all butts to the construction corridor or direction of haul. Decks must be clean with no sticks, branches, plastic, metal, tangled stems, standing trees or roots.
6. Do not doze merchantable timber. Stack merchantable timber at the log deck in a manner that is accessible to hauling trucks.

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	LOG DECKING		
	7894	December 2013	Drawing 6



Plan View
(Not to Scale)

Representation Only

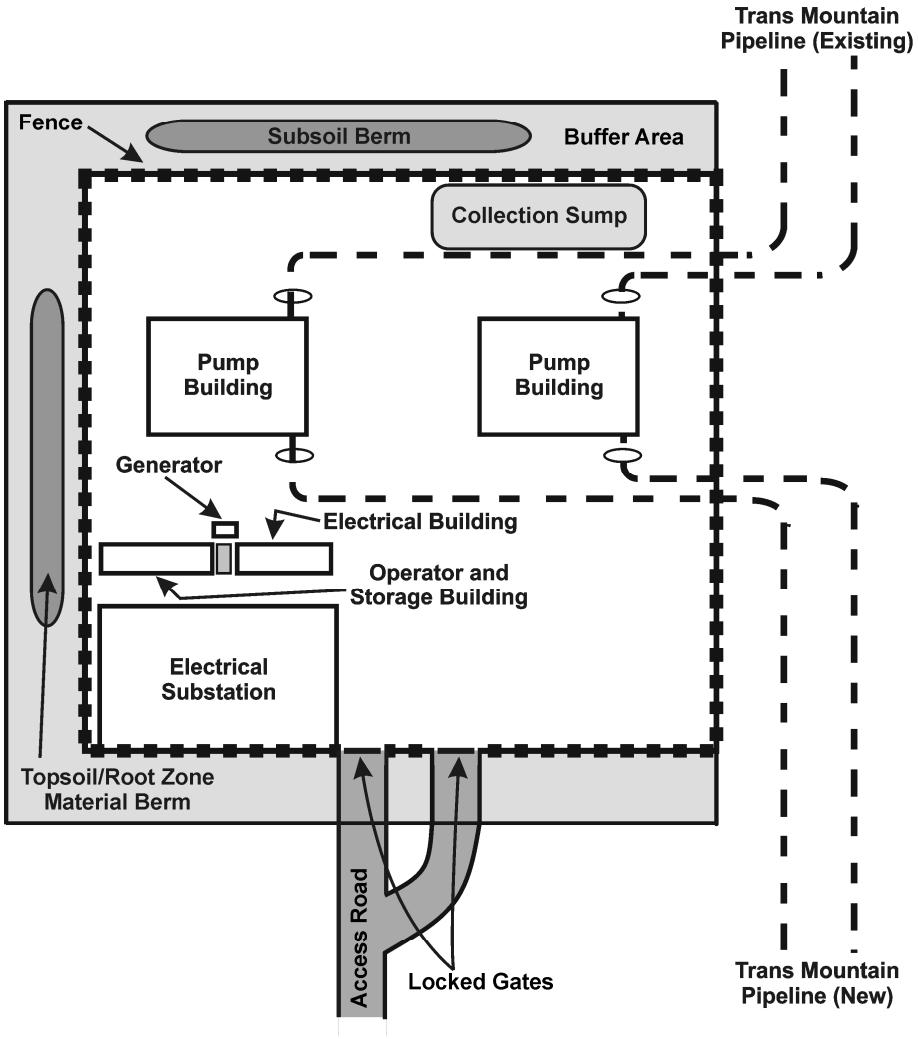
Criteria for Implementation:

The width of the construction right-of-way will be narrowed to avoid site-specific features such as archaeological sites, rare plants, sensitive ecological communities and site-specific wildlife habitat. The specific features will be fenced or otherwise protected throughout the duration of construction.

Notes:

1. Identify and stake or flag the boundaries of the feature to be protected prior to commencement of surveying activities where it encroaches on the construction right-of-way. Ensure the specific feature is flagged with the appropriate colour of flagging for the resource to be protected.
2. Clearly post signs prohibiting workers or equipment from entering the fenced area.
3. Where narrowing on the work side or subsoil side is sufficient to protect the feature, minimize the workspace to as narrow an area as safely feasible.
4. Where further narrowing is necessary, develop site-specific plans to complete construction through the area while protecting the feature.
5. Maintain fencing and barriers until all construction and reclamation activities are completed.

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	NARROW DOWN FENCING		
	7894	December 2013	Drawing 7



Activity:	Notes:
1. Preconstruction Site Assessment	- Refer to the Facility Environmental Drawings to determine stripping depths and soil storage locations.
2. Strip and Stockpile Topsoil / Root Zone Material	- Strip all topsoil/root zone material from work area and store in berms along the most appropriate edges of site. Strip to full depth of topsoil or the root zone material (*i.e.*, duff layer plus upper mineral soil material) using the Facility Environmental Drawings as a guide. - Locate topsoil/root zone material storage berms away from areas where potential flooding may occur.
3. Grade Pad and Work Area	- Consider drainage for the site and construct a level work area for construction and installation of equipment and buildings out of underlying subsoil and/or gravel that has been transported to the site.
4. Store Graded Upper Subsoil	- Where grading of upper subsoil is required, stockpile excess subsoil separately from topsoil/root zone material. Topsoil and subsoil berms can be placed along the same sides of the site or separately along different sides if preferable.
5. Partial Reclamation	- Replace a portion of the stored topsoil/root zone material over disturbed areas that are not required for ongoing operations and maintenance. - Seed partially reclaimed areas and soil stockpiles using the appropriate seed mix (see Table 1).

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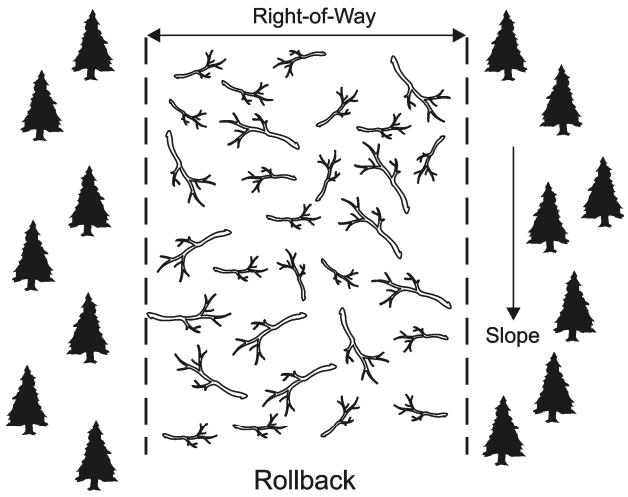
TRANS MOUNTAIN EXPANSION PROJECT

TRANSMOUNTAIN

PUMP STATION CONSTRUCTION - TOPSOIL/ROOT ZONE MATERIAL SALVAGE

7894	December 2013	Drawing 8



Rollback

Plan View
(Not to Scale)

CRITERIA FOR IMPLEMENTATION

Slash and nonsalvageable timber may be used as rollback for erosion control where available and acceptable to the appropriate authority, as well as at strategic locations along the right-of-way for access control. Specific locations will be determined by Trans Mountain's Environmental Inspector(s) at the time of clearing. Do not use Douglas-fir for rollback.

Notes:

1. Retain slash and nonsalvageable timber, where required, for use as rollback.

2. Larger diameter slash (*e.g.,* 10 cm in diameter or larger) should be used for rollback intended for riparian area access control, plant micro-sites establishment or as soil erosion control.

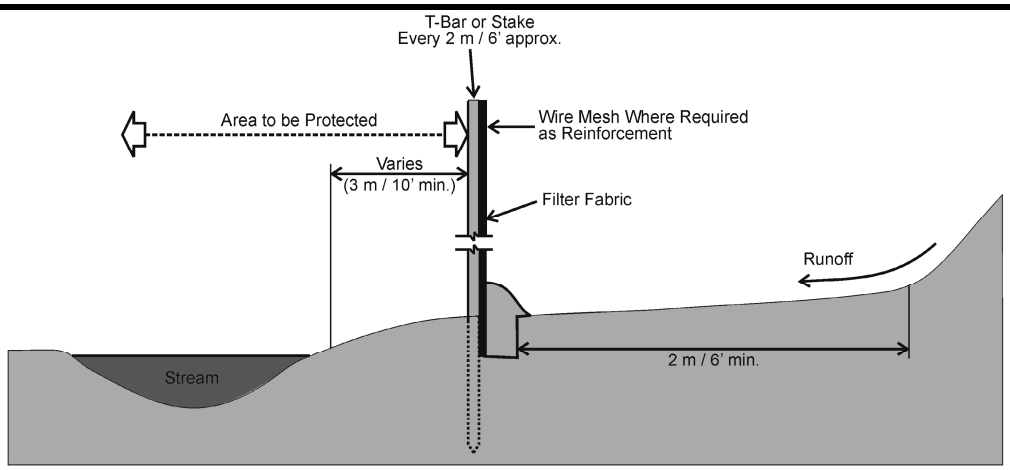
3. The amount of timber retained for use as rollback will be determined by Trans Mountain's Construction Supervisor(s) in consultation with Trans Mountain's Environmental Inspector(s) and the appropriate authority. Store material for rollback along the edges of the right-of-way.

4. Walk down rollback with a dozer on steep slopes, if safe to do so.

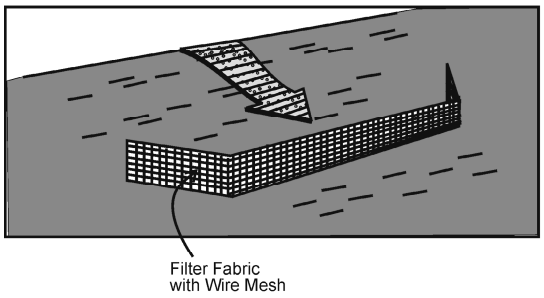
5. Spread slash and nonsalvageable timber evenly over the right-of-way where access is a concern. Do not walk down rollback.

6. Leave gaps in the rollback at obvious wildlife trails.

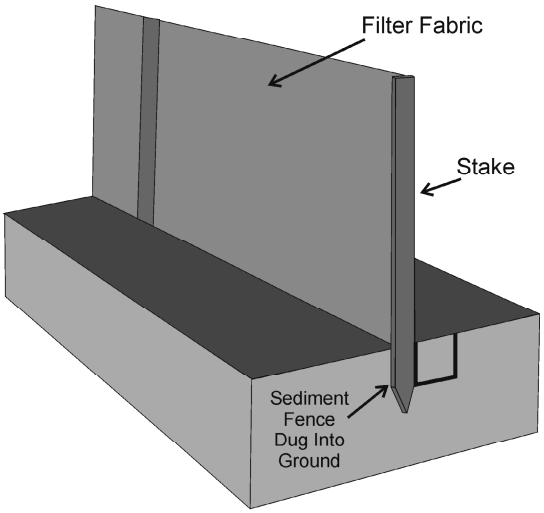
tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	ROLLBACK		
	7894	December 2013	Drawing 9



Profile View
(Not to Scale)



Oblique View
(Not to Scale)



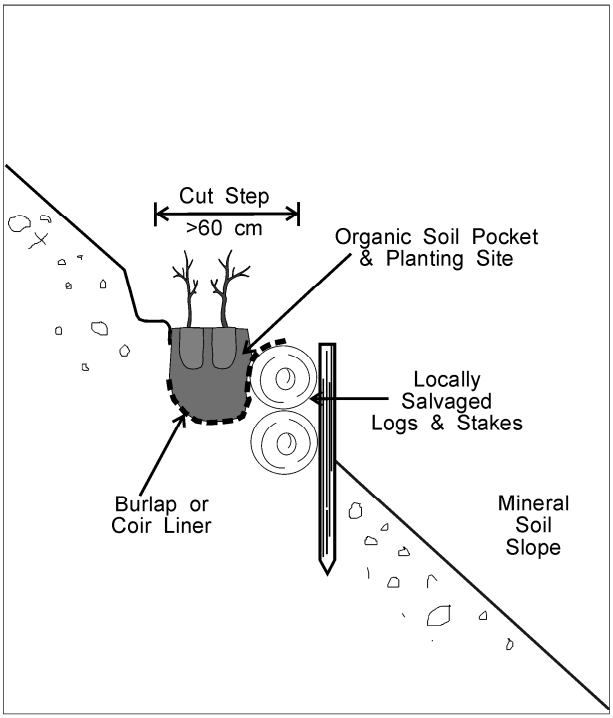
Oblique View
(Not to Scale)

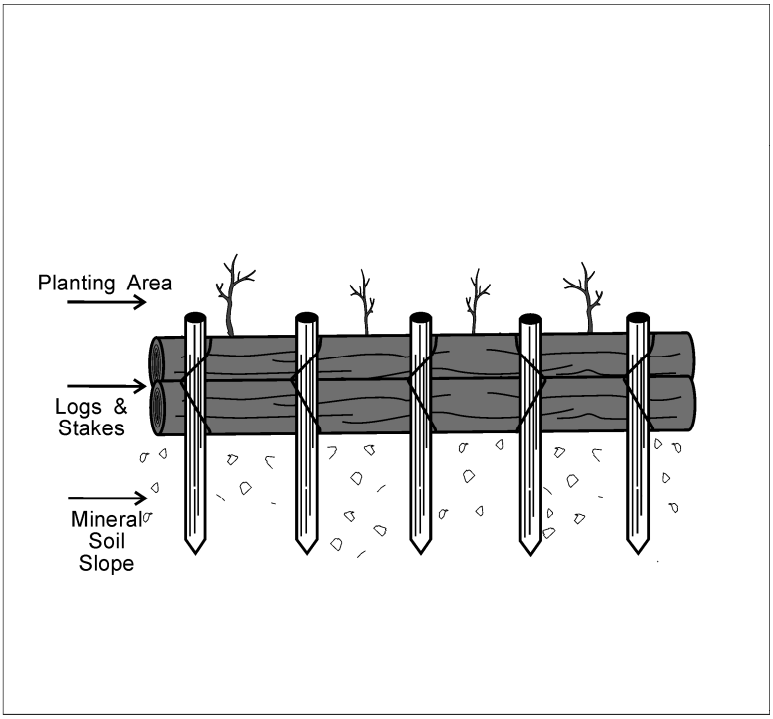
Representation Only

Notes:

1. Watercourses that have moderate to high sensitivity of fish habitat and/or have steep approach slopes at the proposed crossings may need sediment fences during construction, as determined by Trans Mountain's Environmental Inspector(s).
2. Install sediment fences at the base of approach slopes to watercourses prior to clearing and grading using the method and materials above or other approved designs.
3. Ensure sediment fence is keyed into the substrate. Excavate a narrow trench, place the base of the sediment fence in the trench and place the fill back into the trench, securing the sediment fence in place.
4. Place sediment fences a minimum 2 m (6 feet), if feasible, from the toe of the slope in order to increase ponding volume.
5. Maintain sediment fences in place at the base of the approach slopes until revegetation of the construction right-of-way is complete.
6. In areas with frequent traffic, install two or more sediment fences in a staggered and overlapped configuration to allow vehicle passage without removal or opening of the sediment fence.
7. Ensure that sediment fences, if removed or damaged, are reinstalled or repaired prior to the end of the work day.
8. Install sediment fences, where warranted, to eliminate the flow of sediment from clean subsoil piles and disturbed areas into nearby wetlands.
9. Remove any sediment fences around wetlands that remain after the disturbed area is revegetated and the area is stable.

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	SEDIMENT FENCE		
	7894	December 2013	Drawing 10



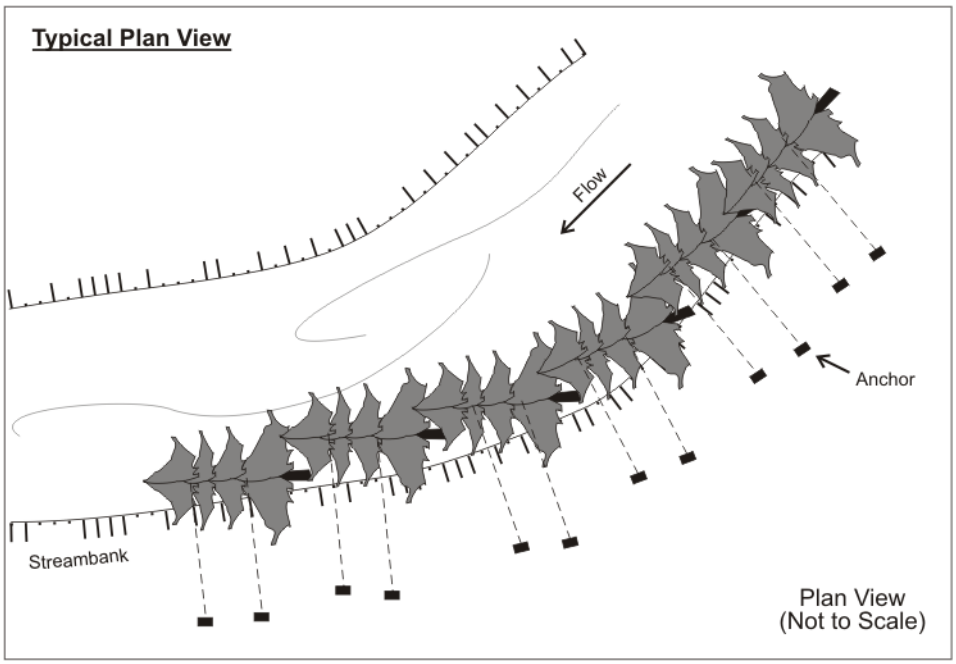


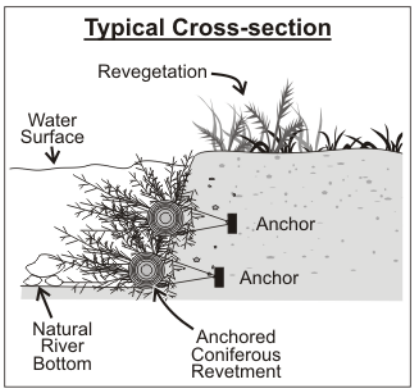
(Not to Scale)

At sites where erosion is a concern and where shrub plantings are required for reclamation, locally salvaged logs may be used to secure slopes and provide planting sites.

1. Sites where staked logs are to be installed will be selected by Trans Mountain's Environmental Inspector(s). When possible, sites will be selected prior to clearing and suitable local logs will be salvaged and stockpiled for later use.
2. Install staked logs during clean-up or reclamation phase. Where possible, use a backhoe to cut a step into the slope and push in a line of wood stakes. Note: take all necessary safety measures when working in proximity to pipeline.
3. With a qualified chainsaw operator, select and cut to fit suitable logs for horizontals. If necessary, the logs may be secured to the stakes using biodegradable rope.
4. Create a pocket behind the horizontally staked logs. The pocket can be used to install live shrub stakes and backfilled with topsoil/root zone material.
5. Where the planting pocket is required for rooted plugs or salvaged plantings, line the pocket with biodegradable fabric (burlap or coir). Bring the fabric over the top log. Fill the lined pocket with topsoil/root zone material or duff and tamp down. Install plants in pockets as directed by Trans Mountain's Environmental Inspector(s).

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	STAKED LOGS/LOG CRIBWALL FOR EROSION CONTROL		
	7894	December 2013	Drawing 11





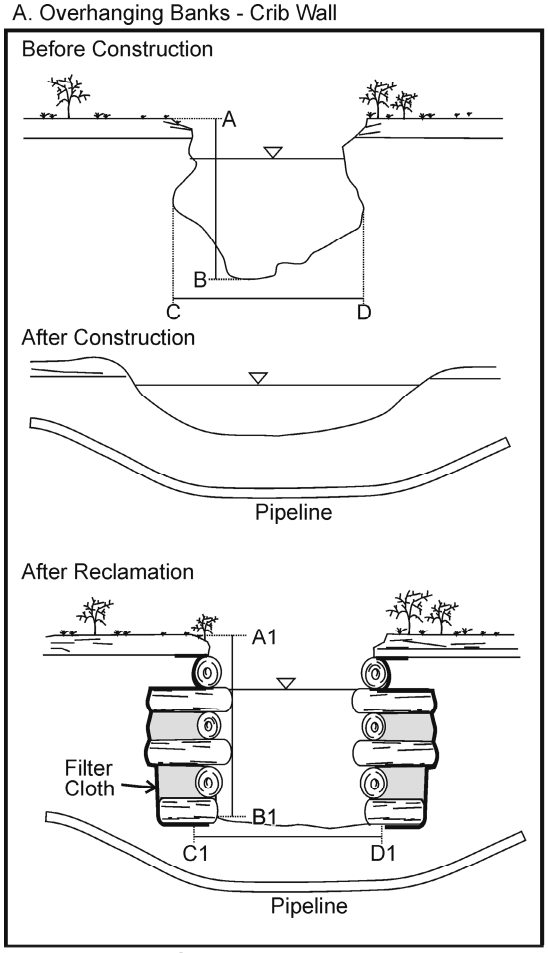
Notes:

1. Proper placement and design is critical and qualified specialists should be involved.
2. Select only good, sound, straight coniferous trees with adequate branches and a minimum length of 10 m.
3. Do not trim any branches and handle with care. Leave root ball intact if possible and transport the trees to the site with a minimum of handling to reduce damage to the branches. To the extent practical, remove soil material from the rootball before placing the tree instream. Place the trees lengthwise along or across the eroding bank to be protected beginning at the downstream end with the tips of the trees pointed in the downstream direction.
4. Begin assembly of the tree revetment at the downstream end and place tie back cable on the tree butt (largest end). Attach the cable to a suitable deadman or large armour rock with a drilled hole. Bury the anchor securely in the adjacent bank.
5. Place the butt of the next tree one-half the length of the previous tree or less upstream along the bank, so there is an overlap of the trees. If possible, cable the trees together in addition to cabling to an anchor buried in the bank.
6. Rock armour may be added along the toe of the slope, beneath the trees to reinforce the level of protection provided.
7. Maintenance, consisting of replacing severely damaged trees, will extend the life span.
8. Coniferous tree revetments also may be used as instream cover.

Adapted from CAPP *et al.* (2005)

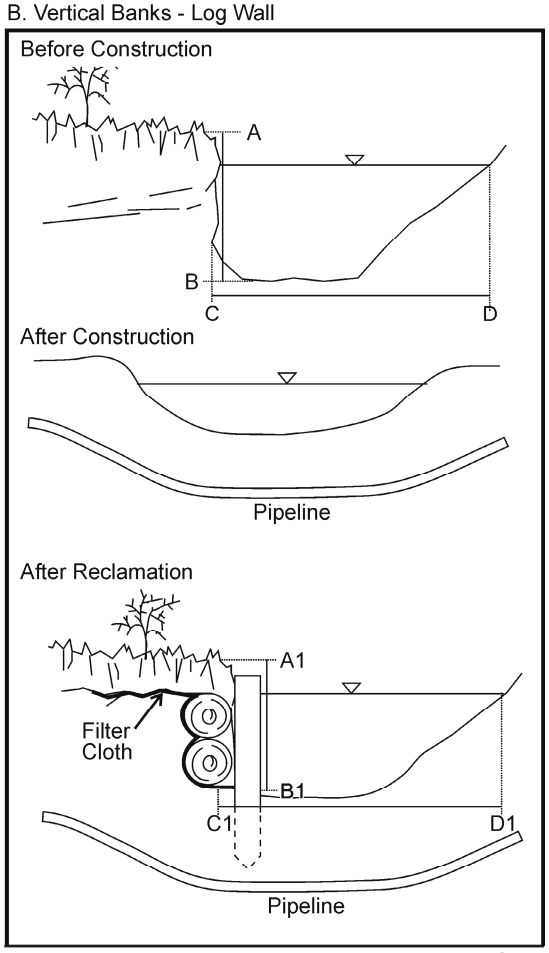
tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	STREAMBANK PROTECTION – CONIFEROUS TREE REVETMENT		
	7894	December 2013	Drawing 12

A. Overhanging Banks - Crib Wall



Representation Only

B. Vertical Banks - Log Wall



Representation Only

Profile View
(Not to Scale)

Notes:

1. Install overhanging bank cribwalls as directed by Trans Mountain's EI(s).
2. Proper placement and design is critical and qualified specialists should be involved.
3. Install log overhang greater than 30 cm.
4. Install native timber (coniferous, where possible).
5. Compare crossing with adjacent undisturbed up and downstream locations to ensure A1-B1 is not less than A-B.
6. Compare crossing with adjacent undisturbed up and downstream locations to ensure C1-D1 is not greater than C-D.
7. Backfill with coarse, non-erodible material.
8. Replace subsoil and topsoil/root zone material.
9. Transplant native vegetation. Sow appropriate seed mix.
10. Live willows may be laid perpendicularly to streamflow within and projecting from the cribwall above the water line. This will create a live cribwall.

Adapted from CAPP *et al.* (2005)

Notes:

1. Install vertical bank logwalls as directed by Trans Mountain's EI(s).
2. Proper placement and design is critical and qualified specialists should be involved.
3. Install pressure treated vertical posts three times the length of exposed height.
4. Utilize native timber or lumber for horizontal structure.
5. Compare crossing with adjacent undisturbed up and downstream locations to ensure A1-B1 is not less than A-B.
6. Compare crossing with adjacent undisturbed up and downstream locations to ensure C1-D1 is not greater than C-D.
7. Anchor posts as required.
8. Backfill with coarse, non-erodible material.
9. Replace subsoil and topsoil/root zone material.
10. Transplant native vegetation. Sow approved seed mix.
11. Live willows may be laid perpendicularly to streamflow within and projecting from the cribwall above the water line. This will create a live cribwall.

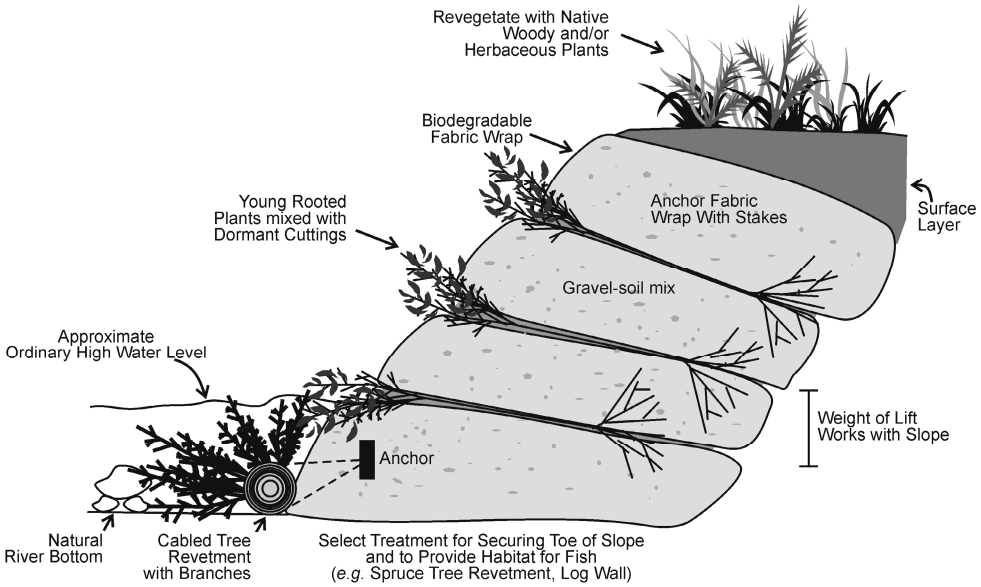
ENVIRONMENTAL CONSULTANTS

TRANS MOUNTAIN EXPANSION PROJECT

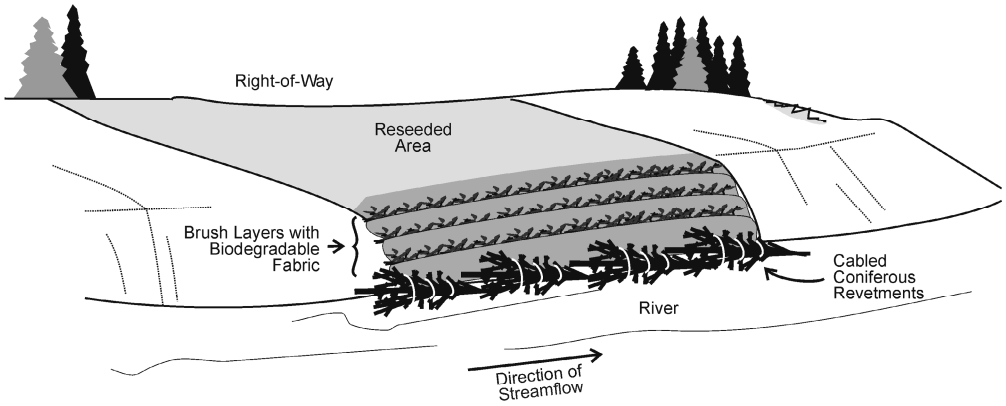
TRANSMOUNTAIN

STREAMBANK PROTECTION – CRIBWALLS

7894	December 2013	Drawing 13



Profile
(Not to Scale)



Oblique View
(Not to Scale)

Notes:

1. Proper placement and design is critical and qualified specialists should be involved.
2. Secure the toe of the slope with appropriate technique (coniferous tree revetments, log wall, riprap, etc.).
3. Begin layering at the bottom of slope with first hedge/brush layer situated at the approximate ordinary high water level or lower. Select plant species suitable for site conditions.
4. To establish banks, install layers of soil filled biodegradable fabric (coir or equivalent) wraps. To make each layer, roll out the fabric parallel with the bank with one-third into the bank and two-thirds out (streamside). Form a step of soil approximately 30-40 cm (1-1.3 feet) high over the bank side fabric. Fold the stream side fabric over the soil step and firm into place.
5. Over the fabric wrap, arrange locally salvaged live shrubs with roots (alder, rose ssp., etc.) with live stake material (willow, poplar, red osier dogwood) at 20 stems per metre, incorporate topsoil and firm into place.
6. Continue building layers of fabric soil wraps and live shrubs until original bank height is reached.

   Use only live shrub material during plant dormancy. Keep transplants moist and install as soon as feasible following salvage. A mixture of plant species can mimic adjacent undisturbed vegetation.

Adapted from CAPP *et al.* (2005)

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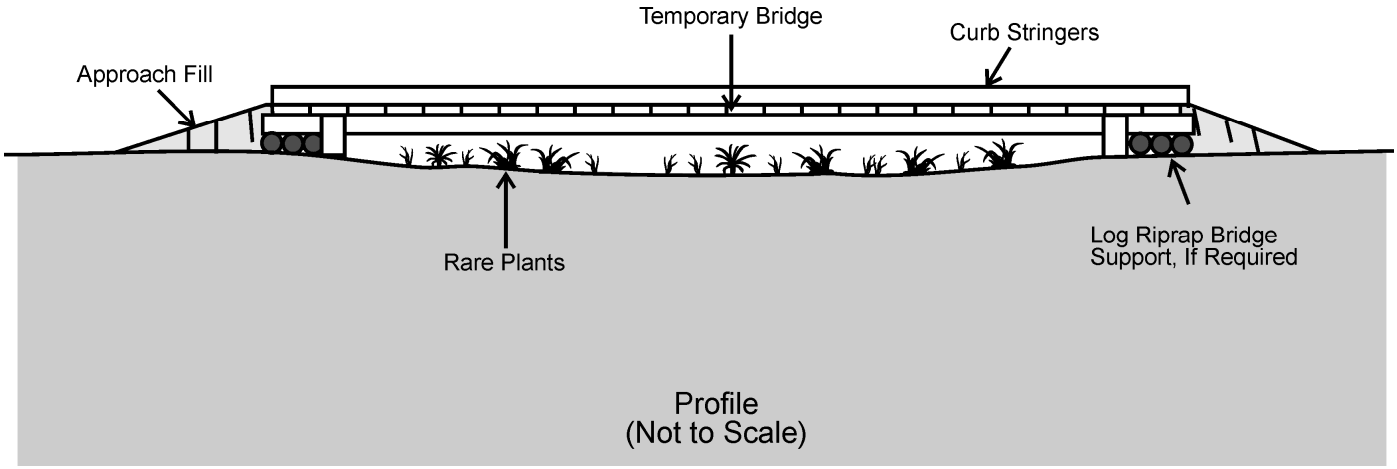
TRANS MOUNTAIN EXPANSION PROJECT

TRANSMOUNTAIN

STREAMBANK PROTECTION – HEDGE/BRUSH LAYERING

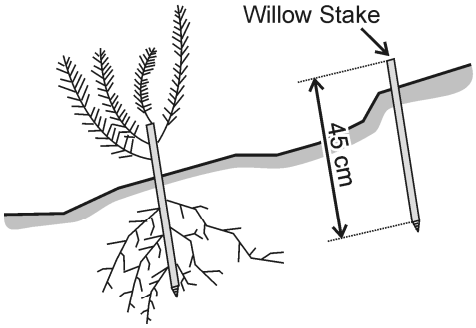
7894	December 2013	Drawing 14



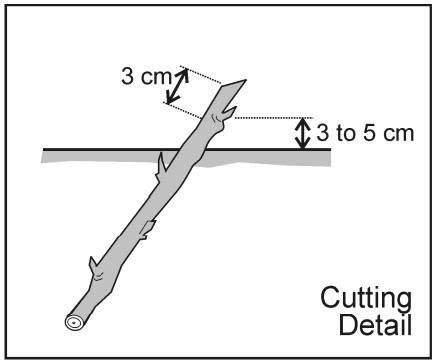
Notes:

1. Install a temporary bridge (*e.g.,* log, pre-fabricated span) to allow vehicles to cross over rare plants. Bridge length is generally limited to areas less than 30 m in length.
2. Utilize approach fills rather than cuts to minimize ground disturbance. Use a geotextile liner to prevent fine material accumulating onto rare plants.
3. Install curb stringers of logs or plywood to ensure that fill material does not spill onto surrounding area, if required.
4. Notify Trans Mountain's Environmental Inspector(s) prior to removal of bridge. Remove bridge at completion of final clean-up. Remove support structures and approach fills. Fence and flag the rare plant population.

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	TEMPORARY BRIDGE/RARE PLANTS		
	7894	December 2013	Drawing 15

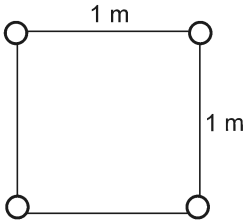


Profile
(Not to Scale)



Profile
(Not to Scale)

Staking Pattern Detail

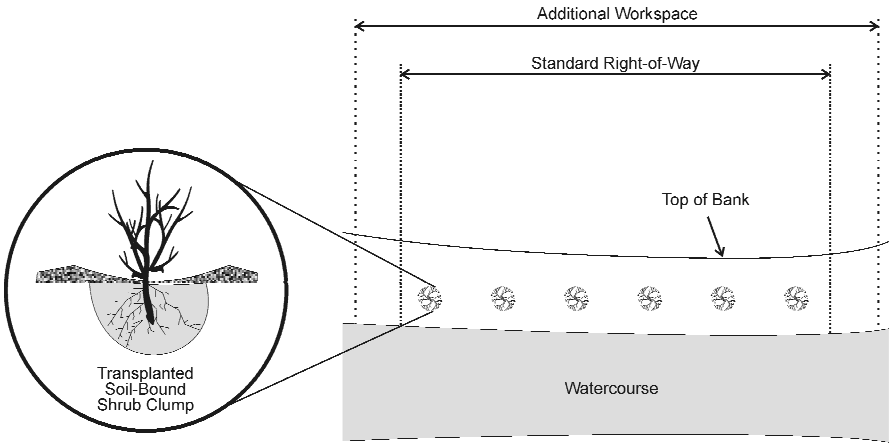


Plan View
(Not to Scale)

Representation Only

Notes:

1. Install dormant stakes of suitable species (*e.g.*, willow, dogwood) on watercourse banks.
2. Make clean cuts with unsplit ends using pruning shears, a hand saw or chain saw.
3. Select stock from the bottom of branches, not tips.
4. Mark basal ends to ensure correct installation.
5. Ensure at least one lateral bud is above surface and three are below. Plant cutting at an angle.
6. Protect material from drying out. Install as quickly as practical after being salvaged.
7. Trim side shoots close to main stock.
8. Use frost pin to make pilot hole. Minimize damage to stake when driving by using a neoprene lined post hole pounder or rubber mallet.
9. Install live stakes on banks 1.5 m (approximately) back from banks for entire disturbed width of right-of-way.



Profile
(Not to Scale)

Plan View
(Not to Scale)

Representation Only

Notes:

1. Salvage and replace dormant shrubs on all watercourse banks where shrubs are present on the right-of-way.
2. Salvage whole bushes from the right-of-way during grading of banks. Ensure bulk of root mass is surrounded by soil.
3. Store salvaged shrubs on edge of right-of-way, cover with soil and do not let dry out.
4. Transplant as quickly as practical when reconstructing watercourse banks.
5. Soak the ground around the transplant with water.

Adapted from CAPP *et al.*(2005)

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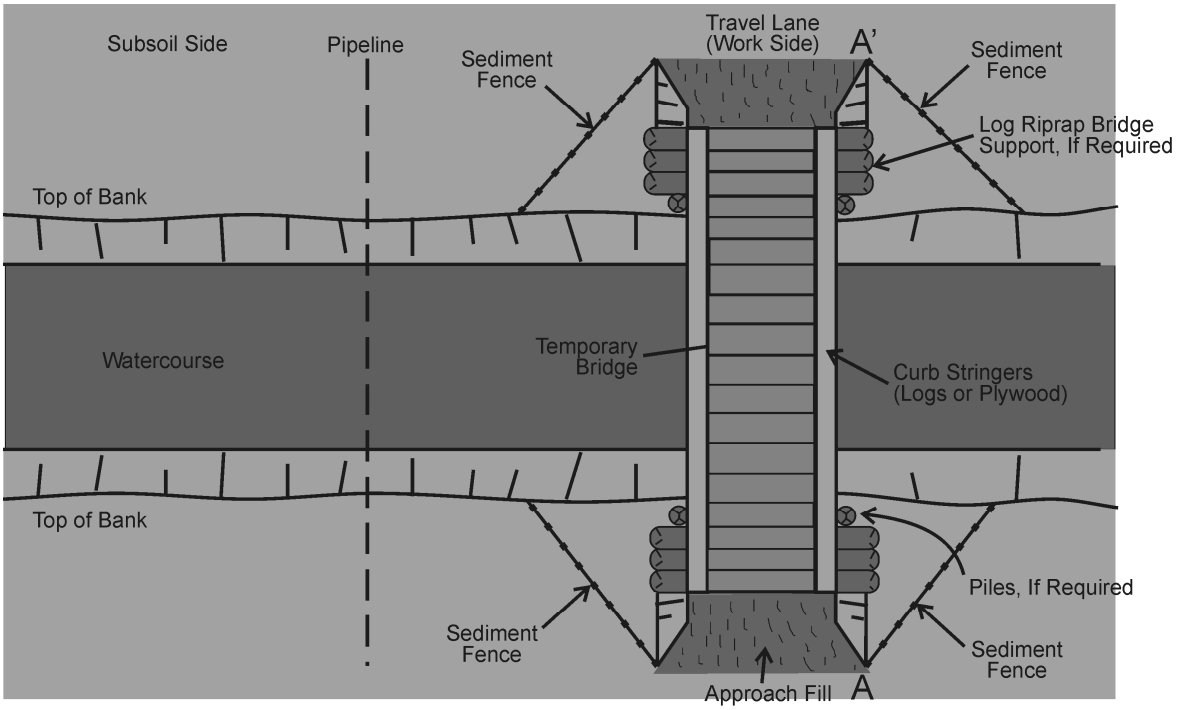
TRANS MOUNTAIN EXPANSION PROJECT

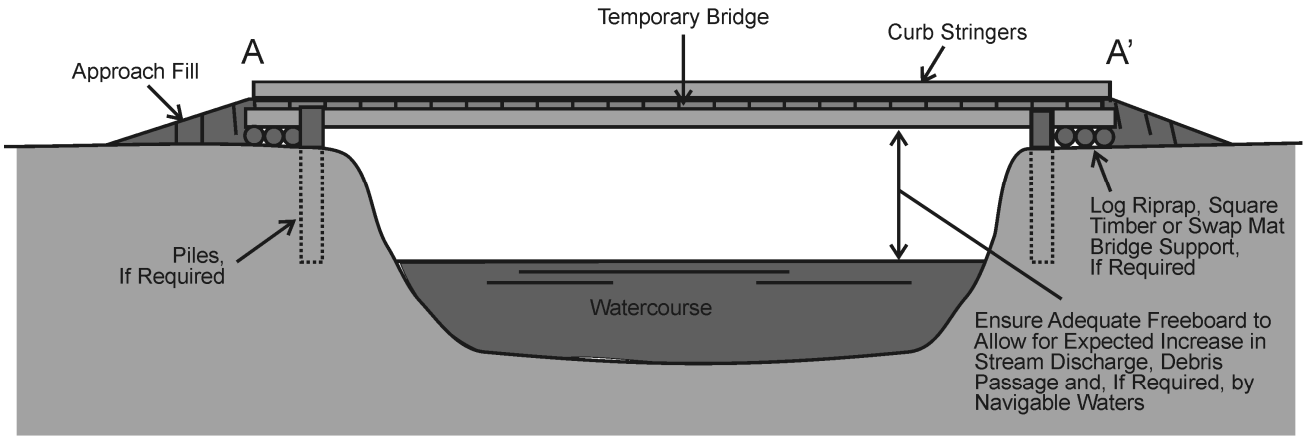
TRANSMOUNTAIN

SHRUB STAKING AND TRANSPLANTING

7894	December 2013	Drawing 16



Plan View
(Not to Scale)



Profile View
(Not to Scale)

Bridge Travel Surface Profile View
(Not to Scale)

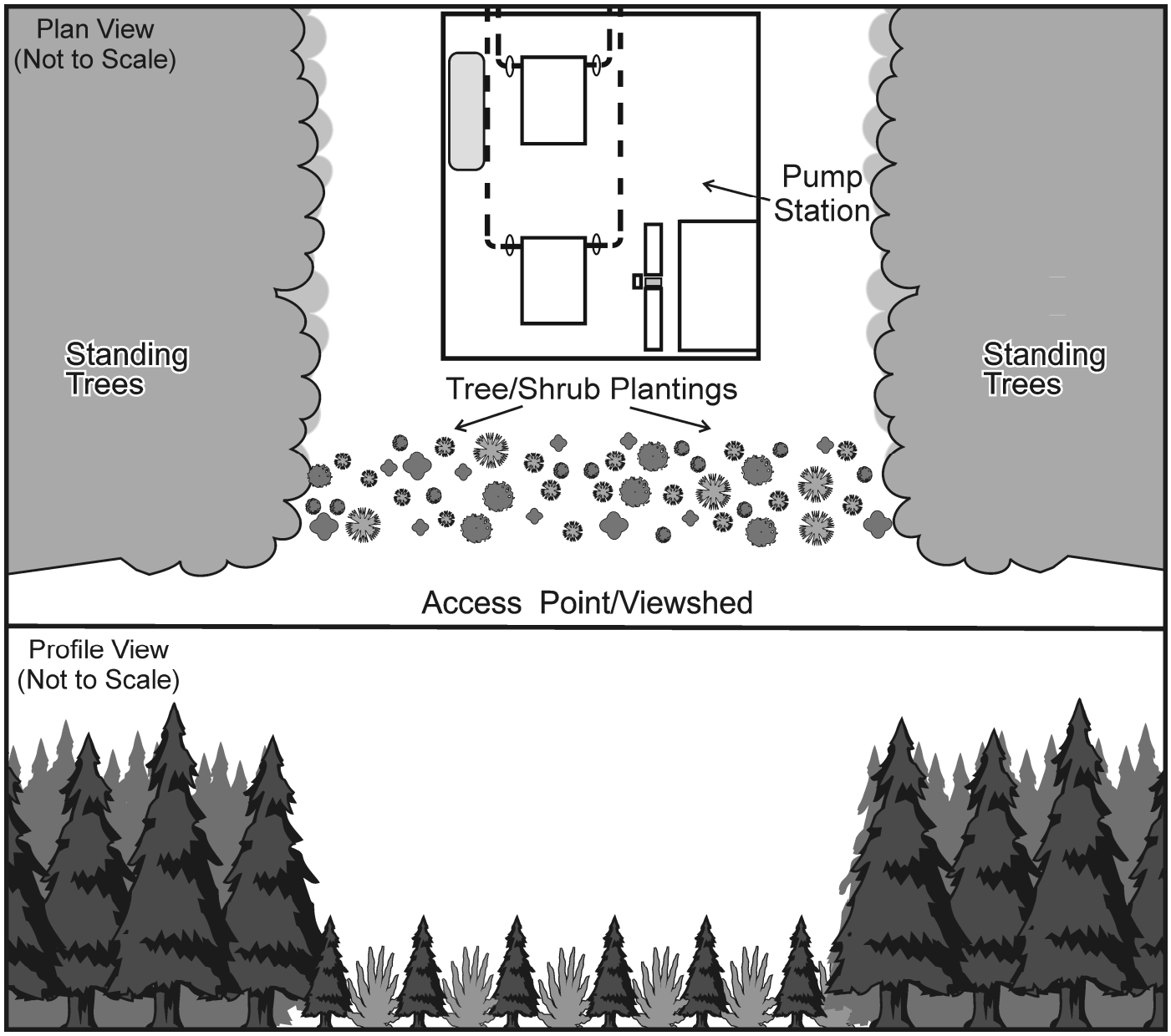
Representation Only

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN	
	VEHICLE CROSSING - TEMPORARY BRIDGE	
7894	December 2013	Drawing 17 Page 1 of 2

Notes:

1. Adhere to all measures as outlined in the DFO Central and Arctic Region *Operational Statement for Temporary Stream Crossings* (DFO 2008n) (DFO 2008o), the DFO Pacific Region *Operational Statement for Clear Span Bridges* (DFO 2007a) and the *Code of Practice for Watercourse Crossings* (Alberta Only) (AESRD 2001).
2. Install a temporary bridge (*e.g.,* log, pre-fabricated span) to allow vehicles to cross watercourses that are sensitive or that have unstable bed and banks. Bridges are also used where watercourses are too deep, wide or fast to permit an alternative crossing structure. This method minimizes sedimentation of the watercourse, and bank and bed restoration work. It is generally limited to watercourses less than 30 m in width.
3. Utilize approach fills rather than cuts in banks to minimize erosion potential. Do not constrict flow with approach fill or support structures. Ensure adequate free-board to handle anticipated streamflows. Use a geotextile liner to prevent fine material from entering watercourse.
4. Install curb stringers of logs or plywood to ensure that fill material does not spill into the watercourse, where required.
5. Remove bridge immediately after use. If bridge is to remain in place through spring break-up to access final clean-up, it must be designed for spring floods and ice jams. Remove support structures and approach fills. Restore and stabilize banks.

Adapted from CAPP *et al.* (2005)



Representation Only

Notes:

1. Plant suitable early and late seral trees and shrubs together along the temporary access points/viewsheds to the facility site.
2. Do not plant trees and shrubs in drainages.
3. Transfer dormant, woody plant material < 1 m in height from adjacent areas to the area requiring the vegetation screen at a density of 1 plant / 3 m^2.
4. Plant seedling material in the area requiring the vegetation screen at a density of 1 plant / m^2.

tera ENVIRONMENTAL CONSULTANTS	**TRANS MOUNTAIN EXPANSION PROJECT** TRANSMOUNTAIN		
	VISUAL SCREEN – FACILITY SITE		
	7894	December 2013	Drawing 18

CRITERIA FOR IMPLEMENTATION:

Management of weeds and non-native plant species is of paramount concern to Trans Mountain. The goal of non-native species management for the Trans Mountain Expansion Project is to prevent the introduction and spread of non-native plants to control them, to the extent feasible, along the existing TMPL system. Accurate records of weed infestations, control measures undertaken and the success of control measures will be maintained so that weed management and control plans can be modified as necessary to ensure an effective program of ongoing weed monitoring and control.

Following are measures to be implemented during the reclamation and post-construction monitoring of the Trans Mountain Expansion Project.

1. All reclamation equipment shall arrive for project work in a clean condition to minimize the risk of weed introduction. Any equipment which arrives in a dirty condition will not be allowed to work until it has been cleaned off at a suitable location.
2. Equipment passing through areas identified as having a weed problem will be cleaned prior to continuing work on the right-of-way.
3. Equipment clean-off stations will be established by the main pipeline contractor under the direction of the Trans Mountain's Environmental Inspector(s). The preferred method of clean-off will be pressurized water, weather permitting.
4. Weed growth will be specifically monitored by personnel trained in weed identification walking the right-of-way and recording the density and species of all weeds observed. Weed monitoring will be conducted by teams in a timely manner so that weed control plans can be developed.
5. Monitoring will be conducted prior to, during and as per PCEM requirements.
6. Frequency of monitoring may be increased where: high potential for weeds of management concern was identified prior to, during or following construction. Weeds will generally be monitored in the spring when weed seedlings can be identified and subsequently controlled, if warranted. Additional weed monitoring in the late summer prior to setting seed will be conducted where high weed concerns exist or where spring surveys identify the need for follow-up.
7. Areas of poor plant cover will be reseeded and weed control measures applied as required.
8. The equipment cleaning station will be assessed in fall, late spring and mid-summer for at least three growing seasons following construction. Subsequent monitoring will be at least once per season, depending on weed issues identified during previous years. Weed species of concern that are identified at the sites will be treated. Manual removal of plants or chemical treatment will occur. If weeds are manually removed when in flower, the weed material will be disposed of in an approved land-fill facility.

CRITERIA FOR IMPLEMENTATION:

Where wind erosion is observed, employ one or more of the following control measures:

- apply erosion matting ;
- seed a cover crop;
- install wind fencing;
- apply tackifier and mulch;
- install brush wind barrier;
- install staked logs; and
- spread woody debris.

Tackifier and fiber mulch and/or erosion matting will be used for interim control where erosion events are evident. Seeding of a cover crop will be considered following construction in areas identified as having an extremely high potential for wind erosion.

Notes:

1. Monitor the right-of-way for wind erosion at areas identified on the Environmental Work Sheets following seeding and reclamation until vegetation cover is re-established.

2. Tackifier and mulch mixture will be applied using methods and rates recommended by the supplier and approved by the land authority. All products will be biodegradable, nontoxic and of organic origin (*i.e.*, calcium or ammonium lignosulfonate, or an equivalent product).

3. Apply tackifier mulch mixture on specified slopes immediately following seeding. Do not mix seed into the tackifer as a substitute for seeding operations.

4. Avoid further disruption of the slope surface following tackifer application.

5. Where disruption of the erodible surface occurs, reseed and reapply tackifier mulch mixture.

6. Where trampling and grazing pressures from ungulates or livestock will jeopardize reclamation efforts on erosion-prone slopes, the use of temporary fencing (including electric) around the reclaimed site will be discussed with the land authority and implemented where advised. The fencing will be removed once a stable vegetation cover becomes established.

APPENDIX S

DETAILS

Detail Seed Installation and Seed Mixes

To be developed prior to construction.