



**GROUP 10
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Waterbody Classification Guideline for Pipeline Water Crossings

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DISCLAIMER

Group 10 Engineering Limited is not responsible for, and expressly disclaims all liability for damages of any kind arising out of use, reference to, or reliance on any information contained in this document. This document is presented as a guide for use by pipeline operators to categorize pipeline water crossings and water bodies in proximity of a pipeline based on the general characteristics of each water body. The intent is to support a consistent method of categorization for the purpose of assigning integrity management practices. This classification guide is intended for use in conjunction with corporate risk management processes and is not intended to be the sole method of risk classification. Any application of this document is the sole responsibility of the user.



1. Definitions

AESRD: Alberta Environment and Sustainable Resource Development- Former Government Department, Now Alberta Environment and Parks

AER: Alberta Energy Regulator

CAPP: Canadian Association of Petroleum Producers

CEPA: Canadian Energy Pipeline Association

ERCB: Energy Resources Conservation Board



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2. Overview

This classification system supports risk management practices with respect to pipeline water body crossings and aligns with the objectives and considerations described in the CAPP document “*Guide for Designated Pipeline Sections in High Impact Areas - July 2015*” as well as the CEPA document “*Pipeline Watercourse Management Recommended Practice-Oct 2005 3rd Edition*”.

The classifications also reference established Alberta Environment and Sustainable Resource Development (AESRD) waterbody classifications from the document “*Code of Practice for Watercourse Crossings*” which captures classifications relating to the protection of fish populations in Alberta.

This guide is intended to be adopted into pipeline integrity management systems and adapted as necessary to meet the integrity management practices of the organization using it. Where factors are specific to Alberta, different factors relevant to the jurisdiction where this guide is used can replace the Alberta factors.

Other factors are included in this classification guideline that differentiate significance of waterbodies based on recreational/commercial use and environmental considerations.

3. Background

In 2012 Group 10 Engineering Ltd. was engaged by the ERCB (now AER) to complete a review of pipeline safety in Alberta. The resulting report titled “*Alberta Pipeline Safety Review-2012*” had 17 recommendations for improving pipeline safety. A key area investigated in the report was the safety of pipelines near waterbodies, and four recommendations around waterbody crossings were made, including the need to better define what constitutes a waterbody, and the requirements for design, inspection, mitigation and monitoring at pipeline waterbody crossings.

This classification system was developed to provide a basis from which integrity management activities relating to waterbodies could be prioritized based on the significance of the waterbody.

4. Benefits of Classifying Waterbodies

Classification of waterbody crossings (or proximity to waterbodies) enables pipeline owners to assign weighting factors in risk assessment processes to ensure the appropriate level of attention is paid to each water crossing based on class. This classification system can be adopted by owners for use within their pipeline integrity management systems. Inspection, mitigation and monitoring plans can be adjusted based on the waterbody significance and the established risk. This enables pipeline owners to focus resources on integrity management practices at high impact areas.

This classification system provides a basis for reduction or elimination of low value activities performed in relation to insignificant waterbodies.

The classifications can also be used for the purpose of prioritizing emergency response plans based on the class of each water body.

5. Types of Waterbodies Classified

For this guideline, waterbody types were divided into two distinct groups;

1. River and Stream
 - Dynamic waterbody
 - Potential for:
 - Scour and exposure
 - Hydrodynamic loading/vortex shedding
 - Impacts from foreign objects
 - Spill mobility
2. Lake, Slough, Muskeg
 - Static waterbody
 - Low potential for:
 - Scour and exposure
 - Hydrodynamic loading/vortex shedding
 - Impacts from foreign objects
 - Spill mobility

The user of this guideline should determine which group best describes the waterbody being assessed.

6. Waterbody Significance

This guideline classifies waterbodies based on the *significance* of the waterbody using the following factors:

- Width of waterbody
- Flow energy
- AESRD classification for class of a waterbody based on the sensitivity of fish habitats
 - or equivalent considerations in jurisdiction of use
- Recreational or commercial use of waterbody
- Use for human consumption
- Protected wildlife habitat

The classifications stated in this guide do not consider commodity in the pipeline or other factors that could support probability and consequence of pipeline failure. The classifications establish a method to prioritize and add weighting factors for risk assessment purposes.

7. Classification Levels

River & Stream

- R0 – Insignificant
 - *Very Low potential of spill spreading beyond local area*
 - *Risk equivalent to remaining right of way*
- R1 – Low Significance
 - *Low potential of spill effects beyond local area*
 - *Low flow energy levels*
 - *Low potential impact to wildlife and people*
- R2 – Moderate Significance
 - *Moderate potential of spill effects beyond local area*
 - *Moderate flow energy levels*
 - *Moderate potential impact to wildlife and people*
- R3 – High Significance
 - *Spill effects likely to extend beyond local area and have high impact*
 - *Hydrodynamic and impact load potential is high*
 - *High potential impact to wildlife and people*
- R4 – Very High Significance
 - *Spill effects very likely to extend beyond local area and have very high impact.*
 - *Hydrodynamic and impact load potential is very high*
 - *Very High potential impact to wildlife and people*

Lake, Slough, and Muskeg

- L0 – Insignificant
 - *Very Low potential of spill spreading beyond local area*
 - *Risk equivalent to remaining right of way*
- L1 – Low Significance
 - *Low potential for spill effects beyond limits of waterbody*
 - *Low potential for impact to wildlife or people*
- L2 – Moderate Significance
 - *Moderate potential for spill effects beyond limits of waterbody*
 - *Moderate potential impact to wildlife and people*
- L3 – High Significance
 - *High potential for spill effects beyond limits of waterbody*
 - *High potential impact on wildlife and people*
- L4 – Very High Significance
 - *Spill could have very high impact on humans and fish/wildlife*
 - *Very High environmental impact*

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8. Classification Descriptions

Table 1.0 describes classifications assigned to Rivers and Streams crossed by or in proximity of pipelines:

Class	Water Body Description
R0	Water only present seasonally and not classed as per AESRD. Considered seasonal drainage. No risk of hydrodynamic and impact loads should pipe become exposed.
R1	Full time water flow and does not exceed 2 meters in water width at maximum flow and is AESRD Class D or un-classified. Low risk of hydrodynamic and impact loads should pipe become exposed.
R2	Full time water flow and exceeds 2 meters in water width at maximum flow, but is not greater than 8 meters in width, and is AESRD classed B, C, D or unclassified. Moderate risk of hydrodynamic and impact loads should pipe become exposed.
R3	Exceeds 8 meters in water width at maximum flow but not greater than 20 meters, or is normally used for recreational/commercial purposes, or is AESRD Class A. High risk of hydrodynamic and impact loads should pipe become exposed.
R4	Greater than 20 meters in water width at maximum flow and is considered a major tributary or river, or is a source of fresh water for human consumption, irrespective of AESRD classification or width. High risk of hydrodynamic and impact loads should pipe become exposed.

Table 1.0: River & Stream Classification

Note(s):

1. When assessing a waterbody, the user should consider the potential downstream impact for a distance of 2km. If a pipeline right of way is within 100m meters of a water body, but does not cross it, the classification of that waterbody should be adopted to associate the impact of pipeline failure in conjunction with risk assessment models.
2. Class A, B, C & D are referenced from Alberta ESRD “Code of Practice for Watercourse Crossings” which classifies water bodies based on the sensitivity of fish populations. Appropriate classifications in the jurisdiction of use can replace AESRD classifications as deemed appropriate by the user.
3. If the water crossing is **high energy** and/or **risk of scour and pipeline damage** is high, assign the appropriate class to reflect the significance as it relates to this hazard.

Table 2.0 describes classifications assigned to Lake, Slough and Muskeg crossed by or in proximity of pipelines:

Class	Water Body Description
L0	No in or out flow of water, and is considered trapped water, seasonally dry.
L1	Never dry and is less than 100 meters at its widest point. Has no in or out flow of water, or is muskeg with no visible flow or channel*. Not a protected wildlife habitat and not used by humans for recreation or commercial purposes. <i>*If visible channel treat as river or stream</i>
L2	Greater than 100 meters in width but not greater than 300 meters at its widest point. Has in and outflow, is not a water supply for human consumption and is not considered a protected wildlife habitat. Rivers or streams associated with waterbody are AESRD classified B, C, D or unclassified.
L3	Greater than 300 meters in width but not greater than 800 meters at its widest point. Has in and outflow or is a protected wildlife habitat, or is normally used for recreational/commercial purposes or river/streams associated with waterbody are AESRD class A. Is <u>not</u> used for human consumption.
L4	Greater than 800 meters in width at its widest point. Has inflow and outflow, or is a source of water for human consumption, or is a protected wildlife habitat, or is normally used for recreational/ commercial purposes, irrespective of AESRD classification of rivers/streams associated with waterbody.

Table 2.0: Lake, Slough and Muskeg Classification

Note(s):

1. When assessing a waterbody, the user should consider the potential downstream impact to the waterbody and surrounding area for a distance of 2km. If a pipeline right of way is within 100m meters of a water body, but does not cross it, the classification of that waterbody should be adopted to associate the impact of pipeline failure in conjunction with risk assessment models.
2. Class A, B, C & D are referenced from AESRD “Code of Practice for Watercourse Crossings” which classifies water bodies based on the sensitivity of fish populations. Appropriate classifications in the jurisdiction of use can replace ESRD classifications as deemed appropriate by the user.

9. References

- 1) “Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body” – Government of Alberta- Amended June 24,2014, made under the Water Act and Water Regulation
- 2) “Guide for Designated Pipeline Sections in High-impact Areas”- Best Management Practice- July 2015-Publication 2015-0011- Canadian Association of Petroleum Producers(CAPP)
- 3) “Pipeline Associated Watercourse Crossings-4th Edition -2012 -CAPP, CEPA., CGA

