

**Lantz Water Transmission Line
Lantz, Nova Scotia**

WETLAND ALTERATION APPLICATION

Prepared for:

DesignPoint Engineering & Surveying

Prepared by:



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EXECUTIVE SUMMARY

The Municipality of East Hants is proposing to install a water transmission line, with associated access road, between the communities of Elmsdale and Lantz, Nova Scotia. The proposed activities are located between Highway 102 and Highway 2, between Elmsdale and Lantz. The proposed activities are planned to start in the summer of 2017.

As part of the planning process associated with the proposed activities, in January, April and June 2017, on behalf of DesignPoint Engineering & Surveying, McCallum Environmental (MEL) completed wetland delineation and functional assessment in land adjacent to the proposed activities (known as the Study Area), to better understand potential environmental constraints that may affect project design, and to collect pertinent information required for the submission of a wetland alteration application. The following tasks were completed as part of this scope of work:

1. Wetland delineation and functional assessment;
2. Watercourse identification; and
3. Confirm the presence/absence of rare and species-at-risk (out-of-growing season).

The Study resulted in the identification of ten wetlands within the Study Area, of which seven (Wetlands 2, 4, 5, 6, 7, 8 and 10) are proposed for alteration. However, in line with the Nova Scotia Wetland Conservation Policy (2011), four of the said wetlands (Wetlands 4, 6, 7 and 8) are exempt from requiring a provincial wetland approval as a result of them consisting as a *“linear development that is less than 10m wide and less than 600m square meters in total area through shrub or wooded swamps, that are not classified as a Wetland of Special Significance”*.

The proposed wetland alteration includes partial alteration within seven wetlands, for the purposes of access road construction (infilling) and installation of the water transmission line. The impact areas associated with the alteration of the wetlands requiring approval is; Wetland 2 (WL2): 55 m², Wetland 5 (WL5): 121m² and Wetland 10 (WL10): 2,218m². The alteration area associated with Wetlands 4, 6, 7 and 8, which are all exempt from requiring an approval are 241m², 81m², 114m², and 13m², respectively.

The objective of this application is to provide the required supporting information as required by the Nova Scotia Wetland Conservation Policy 2011, for approval to alter wetland habitat. In support of this process, the following information is included in this report:

- Desktop review analysis including wetland inventories and species at risk review;
- Wetland delineation methodology and results;
- Watershed evaluation;
- Wetland characteristics;
- Wetland functional assessment results;
- Proposed post construction wetland monitoring; and
- Proposed wetland compensation methods.

The functional assessments completed on Wetland 2, 5 and 10 resulted in the identification of two significant wetland functions (SF) within all three wetlands; SF2: *Predicted wetland cover within the tertiary watershed is <10%*; and SF7: *There are species near, or using the wetland/project area that*

classify as a SAR and/or SOCI. In addition, Wetland 10 also was identified to have the critical wetland function SF1: *Watershed condition*.

In line with the Nova Scotia Wetland Assessment Method (NOVA WET Version 3.0 September 2011) functional assessment tool, due to their location within the Lantz and McGrath Lake Tertiary Watersheds and the proportion of wetland area within that watershed, all three wetlands have been identified to contribute highly to floodwater detention (i.e. <10% wetland cover in watershed). In addition, ACCDC and the NSE Significant Habitat database has confirmed Federal and Provincial species of concern near the Study Area, although none were identified during the field functional assessment evaluations. Wetland 10 is located within the Lantz Tertiary Watershed (1DG-1M), which exhibits significantly modified characteristics. The watershed comprises of >20% impervious surfaces: 18.6% urban, commercial and other development, 12.3% cropland and 4.8% road cover.

Although permits are not required to alter them, Wetlands 6 and 7 lie within the High-Risk Floodplain zone identified in the East Hants Floodplain Mapping Study by (CBCL, 2013). Due to the very small size of alteration, in addition to the measures that will be implemented to ensure hydrological flow is maintained, no impacts to run-off peak flows are anticipated.

During construction, the contractor will be responsible for erosion and sediment control measures. The Proponent will engage in post-construction monitoring in Years 1 and 5 post alteration..

The proponent is seeking approval to alter a total area of 0.23ha (2,394m²) of wetland habitat. As per discussions between the Proponent and NSE, the Proponent will procure the services of a wetland restoration specialist to compensate for the wetland loss associated with the activities discussed in this application.

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1.0 INTRODUCTION

The Municipality of East Hants is proposing to install a water transmission line, with associated access road, between the communities of Elmsdale and Lantz, Nova Scotia (Figure 1, Appendix A). The proposed activities are located between Highway 102 and Highway 2 between Elmsdale and Lantz (Figure 2, Appendix A). The proposed activities are planned to start in the summer of 2017.

As part of the planning process associated with the proposed activities, in January, April and June 2017, on behalf of DesignPoint Engineering & Surveying, McCallum Environmental (MEL) completed wetland delineation and functional assessment in land adjacent to the proposed activities (known as the Study Area), to collect pertinent information required for the submission of a wetland alteration application. The following tasks (known as the Study) were completed as part of this scope of work:

1. Wetland delineation and functional assessment;
2. Watercourse identification; and
3. Confirm the presence/absence of rare and species-at-risk.

The Study resulted in the identification of ten wetlands within the Study Area, of which seven (Wetlands 2, 4, 5, 6, 7, 8 and 10) are proposed for alteration. However, in line with the Nova Scotia Wetland Conservation Policy (2011), four of the said wetlands (Wetlands 4, 6, 7 and 8) are exempt from requiring a provincial wetland approval as a result of them consisting as a *“linear development that is less than 10m wide and less than 600m square meters in total area through shrub or wooded swamps, that are not classified as a Wetland of Special Significance”*.

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The objective of this application is to provide the required supporting information as required by the Nova Scotia Wetland Conservation Policy 2011, for approval to alter wetland habitat. In support of this process, the following information is included in this report:

- Desktop review analysis including wetland inventories and species at risk review;
- Wetland delineation methodology and results;
- Watershed evaluation;
- Wetland characteristics;
- Wetland functional assessment results;
- Proposed post construction wetland monitoring; and
- Proposed wetland compensation methods.

The Study Area is bisected by the Nine Mile River, which drains into the Shubenacadie River. The proposed waterline will be installed beneath the Nine Mile River.

Figures 1 and 2 (Appendix A) present the site location and Study Area respectively.

1.1 Proponent Information

The proponent contact information is summarized in Table 1.

Table 1: Proponent Contact Information

Name of Proponent	Derek Normanton (Project Engineer) Municipality of East Hants
Mailing/Civic Address	230-15 Commerce Court Elmsdale, NS B2S 3K5 Phone: 902 883 7098 (ex 252)
Application Contact	Andy Walter McCallum Environmental Ltd.
Phone Number	902-446-8252
Email Address	andy@mccallumenvironmental.com
Mailing Address	Suite 115, 2 Bluewater Road Bedford, Nova Scotia B4B 1G7

1.2 Project Property Information

Infrastructure associated with the southern extent of the Study Area is directly adjacent to the Elmsdale Shopping Centre, the Study Area then extends to the undeveloped land directly adjacent to the eastern extent of Highway 102. The Study Area crosses the Nine Mile River and then adjoins Evergreen Crescent, Lantz in northern portions (Figure 2, Appendix A). The Study Area comprises of predominantly undeveloped lands, with portions of developed lands, including urban and commercially developed areas.

Property details related to the alteration of the Wetlands 2, 4, 5, 6, 7, 8 and 10 are provided in Table 2 below. The wetlands requiring an alteration permit (WL's 2, 5 and 10) are highlighted.

Table 2: Property Details

Wetland ID	PID	Property Owner	Civic Address
WL2	45282662	Sobeys Capital Incorporated	269 NO 214 Highway, Elmsdale, NS
WL 4	45084878	Elmsdale Sod Farms Limited	229 Highway 214 Elmsdale, NS Lot 16-1A
	45282662	Sobeys Capital Incorporated	269 NO 214 Highway, Elmsdale, NS
WL 5	45084878	Elmsdale Sod Farms Limited	229 Highway 214 Elmsdale, NS Lot 16-1A
WL 6	45084878	Elmsdale Sod Farms Limited	229 Highway 214 Elmsdale, NS Lot 16-1A
WL7	45086931	Shaw Group Limited	NO 2 Highway Lantz, NS Lot S-5
WL 8	45086931	Shaw Group Limited	NO 2 Highway Lantz, NS Lot S-5
WL 10	45086931	Shaw Group Limited	NO 2 Highway Lantz, NS Lot S-5
	45334455	NS Transportation and Public Works	NO 2 Highway Lantz, NS Parcel G

Landowner permissions for the Municipality of East Hants to perform the proposed wetland alterations in Wetlands 2, 5 and 10 is provided in signed letters from the applicable landowners noted in Table 2 (Appendix B).

1.3 Project Team

A project team was assembled for the completion of this study. The team was selected based on level of proficiency in their respective roles. The team members and their individual roles are presented in Table 3.

Table 3: Project Team

Team Member	Role
Andy Walter, BSc. (Hort)	Project Manager
John Gallop, BSc (Biology)	Wetland Delineator, Species at Risk Evaluator.
Tessa Giroux, B.NRS (Natural Resources)	Wetland Delineator, GIS, reporting, Watershed and Species at Risk Evaluator.
Melanie MacDonald, BSc. (Bio & ISAR), MREM	Biologist and Species at Risk Evaluator

Curriculum Vitae for the above mentioned team members are provided in Appendix C.

2.0 METHODOLOGY

The Study Team completed the scope of work via the completion of desktop review analysis and implementation of a field assessment.

2.1 Desktop Review

A background information review of wetlands and watercourses was completed using the Nova Scotia Topographic database (NSTDB), the Nova Scotia Department of Natural Resources (NSDNR) Wetlands database, Nova Scotia Wet Areas Mapping (WAM) database and the Tertiary Watershed database for the province. In addition, the provincial “Wetlands of Special Significance” (WSS) database was reviewed as part of this process.

Aerial photographs were consulted (both current and historical) to assess for wetland and watercourse habitat. Several areas were also identified during the aerial photograph review that suggest wetlands occur. Notably, lands that exhibit a natural lack of tree cover (outside of cleared areas), especially when in close proximity to watercourses, can indicate possible wetland communities.

An assessment of wildlife, vegetation, and overall habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, 2009).

For the purposes of this screening, a SAR is a species listed as endangered or threatened under provincial or federal endangered species legislation (Nova Scotia Endangered Species Act and Species at Risk Act, respectively). The development of a list of priority species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern;
2. Nova Scotia Endangered Species Act (NESA 1999). All species listed as Endangered, Threatened, or Vulnerable; and,
3. Atlantic Canada Conservation Data Center (ACCDC 2015) S1, S2, S3 species.

This list of priority species was narrowed as follows:

1. By broad geographic area, which in the case of our Study Area, was central mainland Nova Scotia.
2. The list of priority species was then further narrowed through the identification of specific habitat requirements for each species. For example, if a listed NESA species requires open water lake habitat, and no open water lake habitat is present inside the Study Area, this species was not carried forward to the final list of priority species for field assessments within the Study Area.

The final list of priority species used to guide the field evaluation is attached in Appendix D.

A review of Atlantic Canada Conservation Data Centre (ACCDC) findings confirms the presence of several priority species in and around the Study Area (see report in Appendix D).

A review of Nova Scotia's Provincial Landscape Viewer, identified Significant Habitats (as indicated by the presence of species at risk), located in proximity to the Study Area.

2.2 Field Assessment

During the field assessment, the Study Team surveyed the Study Area to confirm presence of mapped wetlands and watercourses.

Wetlands are:

Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions.

Watercourses are:

The bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and all groundwater.

Wetland delineation and watercourse identification field evaluations were completed on January 27, 2017 and April 27, 2017. Confirmation of wetland boundaries and SAR and botanical surveys were completed on June 1, 2017.

Wetland boundaries were determined as described by the US Army Corps of Engineers, adapted for the Northcentral and Northeast Regions of the US (US Army Corp of Engineers, 2012) based on topography, soil and hydrology properties, and vegetation.

All watercourses encountered during the assessment were also identified, walked and general biophysical characteristics were recorded.

Wetland boundaries and watercourse routes were recorded on an SXBlue GPS receiver capable of sub 1m accuracy. The delineated wetlands were flagged with pink flagging tape.

Wetland functional data sheets were completed for wetlands identified in the field assessments.

3.0 LANDSCAPE CHARACTERISTICS

3.1 Geological Conditions

The northern extent of the Study Area sits within the Wentworth Station, Miller Creek, MacDonald Road and Elderbank Formations within the Windsor Group. Whereas the southern extent of the Study Area sits within the White Quarry, Stewiacke, Carrolls Corner, Macumber and Gays River Formation within the Windsor Group (NSDNR 2012).

3.2 Surface Water

Results of the desktop review (in addition to field observations) indicates that water predominantly flows south/southeast/east via watercourses, drainage ditches and wetlands towards the Nine Mile River.

The Study Area is bisected by the Nine Mile River and is therefore situated within two tertiary watersheds. Some of the water within the Study Area is sourced via culverts draining beneath Highway 102 which connects to other mapped wetlands and watercourses northeast of the highway. However, it should be noted that the majority of the water into the Study Area is supplied by surface water run-off from the highway itself, and its associated roadside ditches. Therefore, the highway resembles a watershed boundary as it has altered natural flows draining into the Study Area..

3.3 Subregion Information

The Study Area lies within the Valley and Central Lowlands Ecoregion (600) and the Central Lowlands Ecodistricts (630), as described by Neily et al. (2005).

The Valley and Central Lowlands Ecoregion extends from along the Annapolis Valley from the southern portion of the Digby neck to Musquodoboit Valley. The ecoregion is underlain by Triassic sandstones within the Annapolis Valle and Minas Shore portions and Carboniferous shale, sandstone, gypsum and limestone underlie the lowlands.

The Central Lowlands ecodistrict encompasses Hants and Colchester counties. The ecodistrict is drained by several large rivers, all of which drain into the Bay of Fundy, with the exception of the Musquodoboit River which drains into the Atlantic Ocean.

For the most part, the soils are fine textured soils comprised of loams, silt and clays and the presence of deep, reddish-brown soils are characteristic of the underlying Carboniferous rock. Approximately 1.5 % or 3,976 hectares of the ecodistrict is comprised of lakes and rivers.

The forests of the ecoregion are predominantly softwood, however on well-drained hills, pure stands of hardwood can be found. On well drained hummocks, yellow birch dominates. On the better drained sites, red spruce, white pine and hemlock dominate, whereas on imperfectly and poorly drained soils red pine and black spruce dominate.

3.4 Watershed Evaluation

The Study Area lies within two tertiary watersheds; the Lantz Tertiary Watershed (1DG-1M) and the McGrath Lake Tertiary Watershed (1DG-1N), which are discussed in this section. Both tertiary watersheds are located within the Shubenacadie River Secondary Watershed (1DG-1). The Lantz Tertiary Watershed (1DG-1M), the McGrath Lake Tertiary Watershed (1DG-1N) and land use cover within the watersheds are described in Table 4.

Table 4: Land Use Cover Within the Two Tertiary Watersheds

Category	Lantz Tertiary Watershed (1DG-1M)		McGrath Lake Tertiary Watershed (1DG-1N)	
	Total area (ha)	Percent of Watershed	Total area (ha)	Percent of Watershed
Forested	579.30	56.6%	21654.83	79.7%
Open Natural Land/Old Fields	21.77	2.1%	464.29	1.7%
Cropland	125.80	12.3%	2281.99	8.4%
Urban Development	182.22	17.8%	694.41	2.6%
Roads	48.92	4.8%	168.02	0.6%
Other development	7.93	0.8%	301.01	1.1%
Wetlands	43.22	4.2%	1242.70	4.6%
Water	17.02	1.7%	369.7	1.3%
Total	1026.19	100.0%	27176.94	100.0%

The Lantz Tertiary Watershed is 1026.19 hectares in size. Land use consists of natural and forested lands 58.7%, water 1.7% and wetlands 4.2%. Urban, cropland, other and secondary road development account for 35.4%. The Lantz Tertiary Watershed has been evaluated to have 25.9% impervious surfaces (calculated using the paved roads land cover value [4.8%], cropland cover [12.3%], and 50% of the urban development land cover value [17.8%]) and, therefore, watershed conditions are considered significantly modified (>20%). Wetland 10 is identified to exist within both, the Lantz and the McGrath Lake Tertiary Watersheds. However as indicated by the NSE flow accumulation modeling, WL10 in reality drains southeast through the Lantz Tertiary Watershed. Wetlands 1 to 9 are located within the McGrath Lake Tertiary Watershed.

The McGrath Lake Tertiary Watershed is 27176.94 hectares in size. Land use consists of natural and forested lands 81.4%, water 1.3% and wetlands 4.6%. Urban, cropland, other and secondary road development account for 12.7%. The McGrath Lake Tertiary Watershed has been evaluated to have 10.3% impervious surfaces (calculated using the paved roads land cover value [0.6%], cropland cover

[8.4%], and 50% of the urban development land cover value [2.6%]) and, therefore, watershed conditions are considered modified (5-20%). Wetlands 1 to 9 are located within this tertiary watershed.

The Nova Scotia Wetland Assessment Method (NOVAWET), Significant Function 2 (SF2) requires wetland cover to be assessed based on wetland cover alone (and not to include lakes and open bodies of water). Wetland cover alone accounts for only 4.2% and 4.6% of cover within the Lantz and McGrath Lake tertiary watersheds, respectively, which according to NOVAWET, suggests that wetlands contribute highly to floodwater protection within the respected catchment area (<10). However, wetland cover is very likely underrepresented in the NSDNR Wetland Inventory used for these calculations, due to lack of field verification.

The identified wetland areas in both the Lantz and the McGrath Lake tertiary watersheds are predominantly represented by general unclassified wetland habitat (70.3% and 36.8% respectively). The remaining portion of identified wetland habitat within the Lantz Tertiary Watershed is comprised of Treed bog (17.1%) and Open bog (12.6%). The remaining portion of identified wetland habitat within the McGrath Lake Tertiary Watershed is comprised of Open bog (34.3%) and Treed bog (28.9%).

3.5 Nine Mile River Floodplain Database

In 2013 the Municipality of East Hants engaged CBCL Limited to complete a mapping study to improve previous endeavors to delineate floodplain areas in land surrounding the Nine Mile River. Since the Nine Mile River intersects the Study Area the “high risk” floodplain digital data was obtained from the Municipality of East Hants considered in this application.

4.0 RESULTS

The below sections describe the results of the desktop review and the field surveys.

4.1 Desktop Review

4.1.1 Aquatic Features

A review of the NSTDB watercourse and NSE wetland layers did not identify any mapped wetlands, however, two mapped watercourses were identified within the Study Area (Figure 3, Appendix A). Field surveys identified 10 wetlands. One of two of the mapped watercourses were verified to exist (Nine Mile River), whereas the second, located within the southern extent of the Study Area) was determined to be a man-made drainage ditch. Additional drainage ditches were identified through the field surveys.

According to the provincial Wetland of Special Significance (WSS) shapefile, there are no WSS present within the Study Area. The closest WSS to the Study Area is approximately 2.8km to the southeast.

4.1.2 Species At Risk and Species of Conservation Interest

The ACCDC identified the following records of SAR, SOCI and Special Areas within 5 km of the Study Area including:

- 1 managed area (East Hants Regional Municipal Water Supply);
- 2 location sensitive SAR: Wood Turtle and Bat Hibernaculum;
- 13 records of 9 vascular flora;
- no records of nonvascular flora;
- 10 records of 9 vertebrate; and,

- 6 records of 4 invertebrates.

Of these identified records, the following species were identified to be present or have potential habitat within or directly adjacent to the Study Area:

- Three SAR: the Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered); Monarch (SARA Special Concern) and Snapping Turtle (SARA Special Concern)
- One location sensitive SAR: Wood Turtle (SARA Threatened);
- Other Priority Species (not considered SAR) in close proximity to the Study Area;
 - American Eel (COSEWIC Threatened);
 - Barn Swallow (COSEWIC Threatened)
 - Canada Lily (S2)
 - Eastern Pearlshell (S2)
 - Brook Trout (S3)

The NS Provincial Landscape Viewer identified Significant Habitat within 5km of the Study Area, which were confirmed to be the following (F. MacKinnon, NSE, personal communication, February 7 and March 7, 2017):

- Wood Turtle;
- Snapping Turtle;
- Brook Floaters; and,
- Triangle Floaters.

4.1.3 Managed Areas

The Study Area is located 2.5km to the east of the East Hants Regional Municipal Water Supply which is listed as Managed Areas under the ACCDC report.

4.1.4 Nine Mile River Floodplain Database

In the 2013 reports, CBCL recommended that due to a lack of lakes to regulate peak flows, development within close proximity to the Nine Mile River (*i.e.* within the high-risk floodplain area) should be carefully regulated to ensure that development doesn't increase runoff peak flows.

Review of the digital high-risk floodplain information suggests that it is apparent that proposed water line infrastructure extends adjacent to Nine Mile River and intersects two very small portions of the high-risk floodplain areas. These areas are present within WL6 and WL7 (Figure 4B, Appendix A).

4.2 Field Assessment

The field evaluation confirmed the presence of ten wetlands and two watercourses (one of which is the Nine Mile River), within the Study Area. In addition, drainage ditches (not regulated features) were identified within the Study Area. Locations of the drainage ditches, watercourses, wetlands are provided on Figures 4, 4A-C (Appendix A). Representative photos are provided in Appendix E.

4.2.1 Wetlands

Ten wetlands were observed within the Study Area. Wetland 1 is an isolated marsh to the west of the Nine Mile River and lies adjacent to a steep anthropogenic bank associated with commercial development to its West. It appears that Wetland 1 receives surface water runoff from the commercial

development, however it is also likely that agricultural practices located adjacent to the east, influence the characteristics within this feature. Wetlands 2 and 3 are both cattail marshes. Wetland 2 has an ephemeral drainage ditch outlet, whereas Wetland 3 is an isolated wetland. Wetlands 4 and 5, both shrub swamps, are part of the same aquatic system in that they connected via surface drainage. Wetland 6 exists as a riparian shrub swamp on the floodplain of Nine Mile River. Wetland 7 is a throughflow mixed wood swamp as Watercourse 1 flows into and out of it. Wetlands 8 and 10 are anticipated to exist as isolated swamps although they were not fully delineated beyond the Study Area boundaries. Wetland 8 is a conifer treed swamp whereas Wetland 10 is a mixed wood swamp. Wetland 9 is an outflow mixed wood swamp, which drains into the Highway 102 ditch (Figures 4A-C, Appendix A).

Wetland 1 exists on the eastern extent of the Study Area and will not be affected by proposed Project activities. Wetland characteristics for Wetland 2 to 10 are provided in Appendix F.

Hydrology and surface water flows within southern portions of the Study Area have been altered over time. Anthropogenic drainage ditches are present within the Study Area including those present in Wetlands 4, 5 and 9.

The following sections provide characteristics for Wetland 2 to 10 identified during the field evaluation. Descriptions have been grouped as per their water flow path classifications.

Representative photographs of Wetland 2 to 10 are provided in Appendix E. A full list of vegetation species identified within wetlands requiring approval are presented in Appendix F.

Isolated Wetlands

Three isolated wetlands, Wetland 3, 8 and 10, were identified within the Study Area. All three wetlands receive water by overland flow, however Wetlands 3 and 8 receive runoff from Highway 102. Wetlands 3 and 8 contain standing water within the central portion, whereas Wetland 10 contains surface water within the southwest extent.

Outflow Wetlands

Three outflow wetlands, Wetland 2, 4 and 9, were identified within the Study Area.

Wetland 2 is a cattail marsh, Wetland 4 is shrub swamp and Wetland 9 is a mixed wood treed swamp. All three wetlands exhibit similar characteristics: the outlets for the wetlands are drainage ditches and receive passive overland drainage, however Wetland 4 and 9 also receive runoff from Highway 102. Wetland 2 drains towards the floodplain of Nine Mile River, Wetland 4 drains into Wetland 5 to the east, whereas Wetland 9 drains north towards the ditch of Highway 102. In all instances, surface water eventually drains into the Nine Mile River. No standing water is present in Wetland 4. Wetland 2 and Wetland 9 contains standing water within the central portion of the wetlands, at an average depth of 5cm covering approximately 50% and 30 cm covering approximately 5%, respectively. Other hydrologic conditions encountered by the three outflow wetlands are indicated by evidence of a high water table and saturated soils at surface.

Throughflow Wetlands

Wetlands 5, 6 and 7 are identified as throughflow wetlands.

Wetland 5 is a shrub swamp, with a drainage ditch inlet and outlet, that eventually drains eastward into the floodplain of Nine Mile River. Water is provided by the drainage ditch inlet from Wetland 4. Surface water is present within the eastern portion Wetland 5 at an average depth of 5cm covering approximately 10% of the wetland. The drainage ditch is continuous through Wetland 5, and is approximately 0.7m wide and approximately 0.1m deep with a muck and mud substrate. The drainage ditch comprises a low slope, so flow is slow through the ditch.

Wetland 6 exists as a riparian shrub swamp on the floodplain of Nine Mile River. Standing water is present in pools throughout the wetland at an average depth of 3cm covering approximately 7% of the wetland area. Hydrologic condition encountered within WL6 is indicated by surface water, a high water table, and saturated soils at surface. The Canada Lily (S2) was identified by the ACCDC report within Wetland 6, however it was not identified within the proposed alteration area during June 2017 botanical surveys. The Canada Lily is not a SAR or listed as Endangered or Threatened by NSESA, hence Wetland 6 is not a WSS.

Wetland 7 is a shrub swamp, in which an intermittent watercourse (Watercourse 1) flows through. Standing water is present within the central portion at an average depth of 5cm covering 15% of the wetland area. Hydrologic condition encountered within WL7 is indicated by surface water, a high water table, and saturated soils at surface. Water is provided to WL7 by Watercourse 1, which initiates from a drainage ditch.

4.2.1.1 Wetlands and Fish Habitat

The only wetlands which present a direct hydrological surface water connection to the Nine Mile River are Wetlands 2 and 7. Wetland 2 is contiguous via an ephemeral anthropogenic drainage channel which extends down a steep bank towards the Nine Mile River. Water typically only flows from WL2 to the Nine Mile River during periods of high flow, and the steep topographical gradient from WL2 (higher) to the Nine Mile River (lower) acts as a barrier to fish passage.

Wetland 7 is contiguous with Watercourse 1 (see Section 4.2.2), which is sourced from an up-gradient drainage channel and flows through WL7 in a braided fashion. Intermittent surface water was observed within eastern portions of WL7 as it exists within the Study Area, however the connection to the Nine Mile River is ephemeral in nature, and does not provide suitable fish habitat. Furthermore, conditions within WL7 proposed for alteration (i.e. western extent) indicate drier surface conditions with a lack of a contiguous surface water component. As such WL7 at the alteration location is not considered to provide suitable fish habitat.

4.2.2 Watercourses

As described above, one watercourse, labelled WC1, and Nine Mile River were identified during field evaluations within the Study Area as indicated on Figures 4A-C (Appendix A).

The Study Area is intersected by Nine Mile River, which drains into the Shubenacadie River. Within 5km of the Study Area, the Nine Mile River has confirmed occurrences of the American Eel (COSEWIC Threatened), Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered), Brook Trout (S3), Eastern Pearlshell (S2), Snapping Turtle (SARA Special Concern), Triangle Floater (S2S3) and Wood Turtle (SARA Threatened). The proposed water line will be bored beneath the Nine Mile River (see Section 5.1.1 for construction details).

Watercourse 1 (WC1) originates from a drainage ditch and is not a NSE mapped watercourse. WC1 flows southwest into Wetland 7, where it disperses within the wetland. WC1 flows out at the east margin of Wetland 7 and continues to drain southward beyond of the Study Area boundary toward the Nine Mile River. In its upper extent, the watercourse ranges from 0.2m to 0.5m wide (wetted width) with a depth of 0.1m. As it extends out of WL7, WC1 exhibits a wetted width of 2-4m, a depth of 0.3m and a substrate entirely comprised organics (leaf litter and organic soil).

No barriers to fish passage were observed along WC1 within the Study Area.

4.2.3 Species at Risk

SAR and SOCI that have been identified through review of the ACCDC report, have been identified in proximity to Study Area, and their likelihood to be present within the wetlands proposed for alteration are discussed below. All other SAR and SOCI are listed in the Priority Species List (Appendix D).

Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered)

The freshwater habitat requirement for Atlantic Salmon- Inner Bay of Fundy pop. is clean, cool, flowing water free from chemicals and organic pollution within natural stream channels with rapid and pools. The species also require a gravelly bottom with water temperature between 15 and 25°C in the summer. This species has been observed within the 5km of the Study Area within the Nine Mile River. No other potential habitat for this species was identified within the Study Area, other than the Nine Mile River.

Wood Turtle (SARA Threatened)

The Wood Turtle requires sandy or gravelly-sandy bottoms and prefers clear meandering watercourses. They also are found within bogs, marshy pastures, beaver ponds, shrubby cover, meadows, coniferous and mixedwood forests, hay and agricultural fields and pastures. Wood Turtles have been observed within 5km of the Study Area within the Nine Mile River. In addition to the Nine Mile River, there is potential habitat for the Wood Turtle within the wetlands, watercourses and cleared areas within the Study Area. No Wood Turtles were observed during field surveys however.

American Eel (COSEWIC Threatened)

Preferred habitat for the American Eel includes lakes and river habitats with rock, sand and mud substrate, woody debris and submerged vegetation. The American Eel has been observed within 5km of the Study Area within the Nine Mile River. In high water events, there is a potential for American Eel to access Wetland 6, and Wetland 7 via WC1 which is contiguous to the Nine Mile River. No evidence of American Eel were identified during field surveys.

Barn Swallow (COSEWIC Threatened)

Preferred habitat for the Barn Swallow includes areas where there are buildings and other structures that provide shelter. Habitat for the Barn Swallow was identified in the northern and southern extents of the Study Area near the urban/commercial development. These habitats will not be impacted by the proposed Project.

Snapping Turtle (SARA Special Concern)

Preferred habitat for the Snapping Turtle includes ponds, lakes, slow-moving streams with soft mud bottoms and abundant aquatic vegetation. Snapping Turtles have been observed within 5km of the Study Area within the Nine Mile River. No potential habitat, for the Snapping Turtle, other than Nine Mile River exists within the Study Area.

Brook Floater (SARA Special Concern)

Preferred habitat for the Brook Floater includes flowing rivers and creeks with stable sand or gravel substrate. No other potential habitat for this species was identified within the Study Area, other than the Nine Mile River.

Monarch (SARA Special Concern)

The Monarch can be found almost anywhere, however the monarch prefers areas that support milkweed species. Vegetation surveys completed within the growing season of 2017 confirmed that this habitat type is not present.

Triangle Floater (S2S3)

Preferred habitat for the Triangle Floater includes streams and rivers with sand and gravel substrate. Triangle Floater have been observed within 5km of the Study Area within the Nine Mile River. No other potential habitat for this species was identified within the Study Area, other than the Nine Mile River.

Canada Lily (S2)

Preferred habitat for the Canada Lily is meadows, floodplains and streamsides. The ACCDC report identified an occurrence of the Canada Lily within Wetland 6 although none were identified during 2017 field surveys. Preferred habitat for the Canada Lily exists on the floodplain of the Nine Mile River.

Brook Trout (S3)

Brook Trout prefers cold slow-moving water in streams and rivers with gravel substrate. Brook Trout has been observed within 5km of the Study Area within the Nine Mile River. No other potential habitat for this species was identified within the Study Area, other than the Nine Mile River.

4.3 Functional Assessment Overview

During the field study, functional assessment (FA) analysis was completed within the wetlands proposed for alteration (WL's 2, 5 and 10) using the Nova Scotia Wetland Assessment Method (NOVA WET Version 3.0 September 2011). As previously discussed, WL 4, 6, 7 and 8 are exempt from requiring an alteration permit, therefore the following functional assessment relates only to Wetland 2, 5 and 10 for which a wetland alteration approval is sought.

NOVA WET addresses 11 specific categories by which the functional value of the wetland can be evaluated. Functions were evaluated within each category for the wetland subject to alteration during field evaluations. The Functional Assessment forms for each of the wetlands are provided in Appendix F. Tables 5-7 provide an overview of results of the functional assessment completed for Wetlands 2, 5 and 10.

Table 5: Wetland 2: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered modified (10-20%). - Wetland cover is estimated at 4.6% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Outflow, via drainage ditch outlet. - Stressors present (drainage ditch, garbage). - Standing water and saturated areas. - Limited natural/forested buffer (cleared area) <p><u>MODERATE wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land is cleared grassy area (<100m). - Supports water quality (>15m vegetated buffer). - High wildlife quality. - Vegetation condition and diversity is moderate to high. - Gentle sloping boundaries. <p>HIGH adjacent land integrity</p>	<ul style="list-style-type: none"> - <u>Yes</u> -ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is an outflow (drainage ditch outlet) - Lack of surface channels present, therefore water flows through wetland via sheet flow and is hence retarded, subsequently reducing downstream flooding. - Comprises standing water and multiple other water retention indicators. <p>Therefore, its ability to detain surface water is <u>MEDIUM</u> and its ability to maintain streamflow is <u>LOW</u>.</p>	
Significant Functions Present?	YES- SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water is sourced by overland flow from surrounding uplands therefore, it provides water quality functions. - Wetland comprises high vegetative density to reduce water energy and allow settling of suspended materials. - As a result of its type (sheetflow) the wetland holds and filters surface water run-off. <p><u>Wetland therefore determined to provide a HIGH function for contributing to downstream water quality.</u></p>	<p>WL 2 presents indications of being both a “discharge” and a “recharge” site.</p>	<p>None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.</p>	<ul style="list-style-type: none"> -Vegetation diversity is medium. -Wetland does not include dominant non-native, or invasive species. -Vegetation has experienced medium disturbance (evidence of drainage ditches) but presents high integrity. -No rare or endangered plant species present. <p><u>Overall integrity/quality of plant species is MODERATE.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of highway infrastructure. - No fish habitat potential. - No evidence of wildlife including birds. <p><u>Overall wildlife habitat quality is considered LOW.</u></p>	<p>Low-Visible from vantage points.</p>
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcerous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest.

Table 6: Wetland 5: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered modified (10-20%). - Wetland cover is estimated at 4.6% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Throughflow, via drainage ditch outlet and inlet. - Stressors present (highway infrastructure, drainage ditch, garbage). - Standing water and saturated areas. - Limited natural/forested buffer (highway infrastructure to the northwest and cleared area) <p><u>LOW wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land is forested for a limited width prior to highway infrastructure and cleared area (<80m). - Supports water quality (>15m vegetated buffer). - Medium wildlife quality. - Vegetation condition and diversity is low to high. - Moderate to gentle sloping boundaries. <p><u>MODERATE adjacent land integrity</u></p>	<ul style="list-style-type: none"> - <u>Yes</u> -ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is a throughflow (drainage ditch inlet and outlet) - Lack of surface channels present, therefore water flows through wetland via sheet flow and is hence retarded, subsequently reducing downstream flooding. - Comprises standing water/flooding and multiple other water retention indicators. - Wetland receives minor run-off from adjacent highway infrastructure. <p>Therefore, its ability to detain surface water is <u>MEDIUM</u> and its ability to maintain streamflow is <u>LOW</u>.</p>	
Significant Functions Present?	YES- SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water is predominantly sourced by overland flow from surrounding uplands and minor runoff from adjacent highway infrastructure; therefore, water quality functions are not significant. - Wetland comprises medium vegetative density to reduce water energy and allow settling of suspended materials. - As a result of its type (sheetflow) the wetland holds and filters surface water run-off. <p><u>Wetland therefore determined to provide a LOW function for contributing to downstream water quality.</u></p>	WL 5 presents indications of being a “discharge” site.	None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.	<ul style="list-style-type: none"> - Vegetation diversity is medium. - Wetland does not include dominant non-native, or invasive species. - Vegetation has experienced low disturbance (evidence of drainage ditches) but presents high integrity. - No rare or endangered plant species present. <p><u>Overall integrity/quality of plant species is MODERATE.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of highway infrastructure. - No fish habitat potential. - No evidence of wildlife including birds. <p><u>Overall wildlife habitat quality is considered LOW.</u></p>	Low-Visible from vantage points.
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcareous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest.

Table 7: Wetland 10: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered highly modified (>20%). - Wetland cover is estimated at 4.2% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Isolated basin. - Stressors present (Highway 102 and trails). - Standing water and saturated areas. - Limited natural/forested buffer (highway infrastructure to the northwest and cleared area, trails) <p><u>MEDIUM wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land is forested for a limited width prior to highway infrastructure and cleared area (<80m). - Supports water quality (>15m vegetated buffer). - Medium wildlife quality. - Vegetation condition and diversity is Medium. - Gently sloping boundary. <p><u>MODERATE adjacent land integrity</u></p>	<ul style="list-style-type: none"> - <u>Yes</u> -ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is isolated. - Water flows through wetland via sheet flow and is hence retarded. - Wetland receives minor run-off from adjacent highway infrastructure. <p><u>Therefore, its ability to detain surface water is HIGH its ability to maintain streamflow is LOW.</u></p>	
Significant Functions Present?	YES - SF1 and SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water is sourced by overland flow from surrounding uplands and minor runoff from highway infrastructure; therefore, water quality functions are not significant. - Wetland comprises medium vegetative density to reduce water energy and allow settling of suspended materials. - As a result of its type (sheetflow) the wetland holds and filters surface water run-off. <p><u>Wetland determined to provide a MEDIUM function for contributing to downstream water quality.</u></p>	<p>WL10 presents indications of being both a “discharge” and a “recharge” site.</p>	<p>None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.</p>	<ul style="list-style-type: none"> - Vegetation diversity is moderate. - Wetland does not include dominant non-native, or invasive species. - Vegetation has experienced low disturbance (evidence of drainage ditches) but presents high integrity. - No rare or endangered plant species present. <p><u>Overall integrity/quality of plant species is MODERATE.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of highway infrastructure. - No fish habitat potential. - Deer and Golden-crowned Kinglet were observed within the wetland. <p><u>Overall wildlife habitat quality is considered MEDIUM</u></p>	<p>Low-Visible from vantage points.</p>
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcerous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest

4.4 Functional Assessment Summary

The functional assessment completed for WL's 2, 5 and 10, has resulted in the following outcomes:

WL 2, 5 and 10 has been identified to comprise the same two critical wetland functions, those being:

- *Significant Function (SF)2: Predicted wetland cover within the tertiary watershed is <10%; and*
- *SF7: There are species near, or using the wetland/project area that classify as a SAR and/or SOCI.*

In addition, Wetland 10 also was identified to have the critical wetland function SF1: *Watershed condition.*

These significant functions, and the predicted association with the proposed alterations being proposed are discussed below.

4.4.1 Significant Function 1

Wetland 10 is located within the Lantz Tertiary Watershed (1DG-1M), which exhibits significantly modified characteristics. The watershed comprises of >20% impervious surfaces: 18.6% urban, commercial and other development, 12.3% cropland and 4.8% road cover.

4.4.2 Significant Function 2

All three wetlands are likely to contribute to floodwater detention within their tertiary watersheds. However, wetland area within the tertiary watershed is presumed underrepresented due to lack of field verification, and in our experience delineating beneath forested canopies in Nova Scotia over the last ten years, actual treed and shrub wetland cover within the watershed is likely to exceed the 2.0% predicted via desktop data sources.

The nature and extent of alteration (which is discussed in detail in the following sections) in addition to the wetland characteristics at the alteration location is not expected to impact the floodwater detention abilities of either wetland. The footprint of the infrastructure (~3m wide for access road), and construction methods being employed negates the potential for any impacts to floodwater detention functions. Excavation of the water line trench will be reinstated with gravel around the water line and originally excavated material and organic wetland soils, whereas the access road will comprise coarse, free draining material which is suitable for maintaining any water flow that may occur. To that end, conditions within the wetlands proposed for alteration comprise no standing/flowing water likely to be interrupted by access road and water line trench construction, and hence supports the prediction that no impacts to flood detention functions will occur.

4.4.3 Significant Function 7

Although no evidence of SAR or SOCI were identified during field surveys, ACCDC and the NSE Significant Habitat database has confirmed Federal and Provincial species of concern near the Study Area). The Nine Mile River, which drains through the middle of the Study Area provides habitat for the Atlantic Salmon (Inner Bay of Fundy pop), American Eel, Wood Turtle, Snapping Turtle, Triangle and Brook Floaters, Eastern Pearlshell and Brook Trout. Of these species, it has been determined that there is potential habitat for the Wood Turtle, and Monarch butterfly within Wetlands 2, 5 and 10. The above species are considered transient, and as such, unless they are utilizing a specific habitat for breeding purposes (which these species are not), they will relocate themselves across the landscape regularly. The

Canada Lily was also identified, by the ACCDC report, within the Study Area (Wetland 6), however floodplains are its preferred habitat and Wetland 2, 5 and 10 are not floodplain wetlands not was it observed during field surveys.

4.5 Nine Mile River High Risk Floodplain

As discussed in Section 4.1.4, small portions of Wetlands 6 and 7 lie within the High-Risk Floodplain zone identified by CBCL (2013). Although approval to alter these wetlands is not being sought (due to the exemption policy), it is valid to recognize that for the same reasons discussed in Section 4.4.2 above, the proposed activity and measures to ensure hydrological flow through project infrastructure is not expected to impact run-off peak flows. In addition, the small size of the proposed infrastructure also limits potential impacts.

5.0 PROPOSED WETLAND ALTERATION

5.1 Wetland Alteration

Construction activities are proposed to initiate in summer 2017, pending approval. Wetland alteration is required for the installation of a sub-surface water line and associated service access road (known as the Project footprint) which will be situated upon, and directly adjacent to the water line along its alignment. The proposed water transmission line and associated access road is proposed to alter approximately 0.28 hectares/2,816 m² of seven wetlands (WL's 2, 4, 5, 6, 7, 8 and 10). However, approval is only required for alteration of Wetland 2, 5 and 10 (total wetland impact area of 0.23ha (2,394m²). Anticipated wetland impact areas and approximate footprint details within each wetland proposed for alteration are provided in Table 8.

Table 8: Wetland Alteration Areas

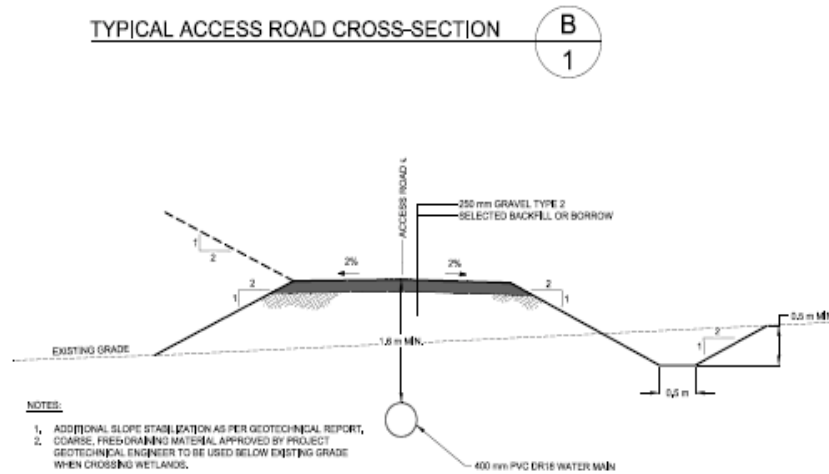
Wetland ID	Total Wetland Size (m ²)	Anticipated Alteration Area (m ²)	Maximum Footprint Width Through Wetland (m)	Footprint Length Through Wetland (m)	Exempt (Y/N)
2	341	55	7	8.4	N
4	2,290	214	9.1	39.1	Y
5	529	121	10.8	12	N
6	2,532*	81	9.1	9.2	Y
7	711	114	9.1	14.8	Y
8	2,401*	13	3.2	4.4	Y
10	18,161*	2,218	9.1	257.9	N

* Indicates that this is the delineated portion of wetland only (wetland continues beyond study area boundary)

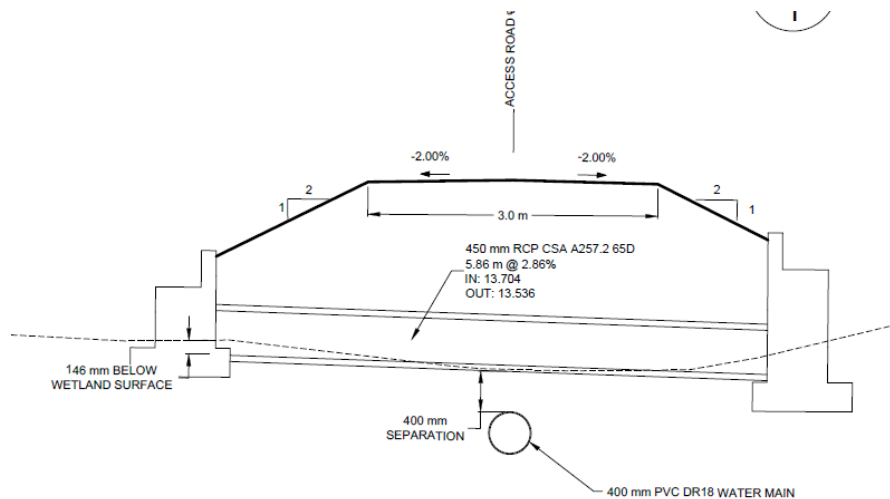
5.1.1 Construction Activities

On average, the proposed Project footprint will consist of a trench approximately 2m deep by 1.2m wide which will be excavated to lay the new water line. Type 1 and Type 2 bedding material will be used to backfill the trench to approximately 1.2m, at which point coarse rock will be used to build up to original grade and will facilitate subsurface water flows. The service access road will be constructed upon the water line and shall include the service road surface, and toe of slope (width varying 3.0-10.8m). Free draining material will also be used as the base layer for the service access road to ensure hydrological connectivity from one side of the wetland to the other. This will prevent the back up of water on the up-

gradient side of the road from occurring and maintain wetland functions. Image 1 (below) is a typical cross section through wetland habitat of the Project infrastructure discussed above.



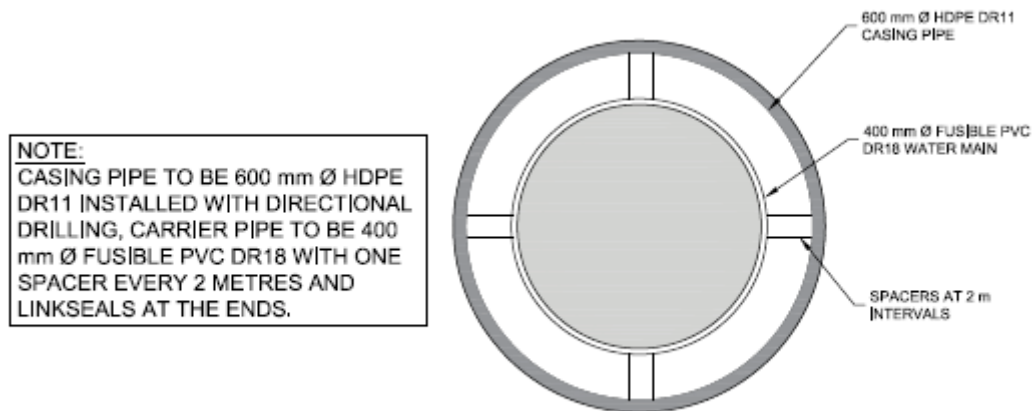
Wetland 5 will also incorporate a culvert to maintain hydrological connectivity through the proposed access road. Image 2 (below) is a culvert crossing cross section through wetland habitat.



5.1.1.1 Sub-surface Water Line

The water transmission line will be bored under the Nine Mile River (Figure 4A-B, Appendix A). Prior to drilling, a pit, which the pipe will emerge from, will be excavated outside of the high-water mark of Nine Mile River. A drill will be located on the other side of the river, which will bore a hole below the river bottom and pull a casing pipe along with the drill to maintain structural integrity of the bore hole. Drilling will continue until the pipe emerges in the pit on the other side of the river. The pipe will be a minimum of three meters below the river bed, which has been surveyed. Once the boring is complete, the water main pipe, which will have supports and hold it clear of the casing pipe, will be pulled through the casing pipe. Both ends of the casing pipe will be sealed to prevent water and soil from entering the

carrier pipe. Image 3 (below) provides the river crossing cross section of Project infrastructure discussed above.



5.1.2 Potential Impacts

When infilling and intersecting a portion of a wetland during road development, there is potential of alteration of flow into, through, or out of wetland habitat. These flow interruptions might result in drier conditions or deeper/more prolonged inundation in remaining wetland habitat.

Sedimentation and erosion can occur during construction activities which when exposed to surface water, can transport suspended sediments to down-gradient aquatic receptors.

Potential impacts to unaltered wetland as a result of the Project are not expected for the following reasons:

- Minimal hydrological impacts will occur: Wetland 2, 4, 5, 6 and 8 all have minimal surface water (3-5cm deep covering approximately 2 - 50% wetland area) and WL10 has the deepest surface water at an average depth of 10cm within approximately 30% of the wetland habitat. Areas of standing water within WL2, WL4, and WL8 are located within its lower lying, central portions, WL5 has areas of standing water within its eastern portion, WL6 has standing water present throughout the wetland, WL7 consists of a standing/flowing water within its eastern portion as a result of WC1 and WL10 has standing water present within the southwest portion;
- The proposed Project footprint is small (not exceeding 10.8m in width to accommodate the access road, but 9.1m wide applied for as part of this application to accommodate construction activities and equipment access);
- Coarse rock (and occasional culverts) will be used in the construction process to maintain subsurface flow of water through Project infrastructure; and
- Sediment and erosion controls will be installed as discussed in Section 5.1.3 to further mitigate this potential impact.

5.1.3 Mitigation

In order to maintain a similar hydroperiod across the remaining wetland habitat, and to minimize direct and indirect impacts from construction activities, some general guidelines are provided for the wetland that will be partially impacted, but preserved following project construction.

To manage erosion and sedimentation control during construction and operation, erosion control systems will be developed by the Proponent's contractor. These systems will be in place to manage runoff from the construction area, especially into remaining adjacent wetland habitat. The preferred approach is to focus on the prevention of erosion. This can be achieved by minimizing the time, slope and area of exposed soils.

Best management practices will be implemented during the construction process, with a focus on adjacent habitats and wetlands that lack a provincial alteration approval. Best management practices are provided below:

- The length of time during construction that the wetland topsoil is exposed will be minimized;
- Clean, pH neutral, coarse fill materials will be used within the wetland area;
- Any constructed drainage ditches will be graded such that they do not directly discharge into the wetland;
- The post-construction flow (in and out) from the wetland should be maintained at the same elevation as pre-construction flow (in and out);
- Machinery and personnel will be instructed not to enter the wetland outside of the road right-of-way;
- Vegetation control on road shoulders will be conducted, as necessary, by manual and mechanical clearing during operation; and,
- The slope between the edge of the road surface or ditch and the adjacent wetlands will be re-vegetated to stabilize the slope and limit erosion and sedimentation into each wetland.

Additional mitigation measures that will be implemented during the construction period include:

- Silt laden water is not to be drained or pumped directly into wetlands or watercourses (unless for the purposes of maintaining hydrological inputs). Instead water should be directed to heavily vegetated areas, settling ponds trenches, or similar area, with erosion control at the outlet, and the outlet must be monitored regularly by the contractor;
- Maintain existing vegetation cover whenever possible and minimize overall areas of disturbance. Also, ensure contractors minimize travel across areas of exposed soils. Maintaining existing vegetation cover is the best and most cost-effective erosion control practice;
- All construction site and roadway runoff shall be directed through natural vegetation or through erosion and sediment control devices before it reaches watercourses or wetlands
- Erosion control materials shall be clean, non-ore-bearing, non-watercourse derived and non-toxic materials; and,
- Install all erosion and sediment control practices prior to any soil disturbing activities, when applicable;
- Drainage structures will be incorporated, where necessary, to dissipate hydraulic energy and maintain flow velocities sufficiently low to prevent erosion of native soil material. Examples include:
 - Avoid frequent or unnecessary travel over erosion prone areas;

- Holding/sediment retention ponds
- Silt fencing
- Grubbing berms
- Cut off drainage channels
- Rock berms and hay bales to filter water
- Rock lined channels
- Covering of exposed soils

Other best management techniques and practices when working adjacent to aquatic receptors include:

- Construction monitoring audits will be completed to ensure protection measures are in place and effective.
- In order to protect wetland habitat from accidental spills, ensure that a spill control and contingency planning is in effect, and its procedures fully communicated to staff; and,
- Ensure all development related activity (*i.e.* construction areas, access roads etc) are located within areas where biophysical field evaluations have been completed and approvals/written authorizations are in place as required, including work within 30m of a wetland or watercourse; and
- Limit clearing within wetland habitat outside of approved wetland alteration areas.

5.2 Monitoring

The following outlines the scope for proposed monitoring based on expected requirements from NSE, and our experience with other similar projects.

5.2.1 Construction Monitoring

During construction, MEL understands that the contractor will be responsible for erosion and sediment control measures to ensure that the remaining undisturbed wetland habitat within partially altered wetlands is not impacted by construction activities. General mitigation and erosion and sediment control practices that are outlined in this document must be adhered to, along with any requirements outlined in the pending wetland alteration approval.

Monitoring should continue during the construction period as is needed to ensure remaining wetland habitat is maintained in its natural state.

5.2.2 Post Construction Monitoring

Based on the proposed activity, post construction monitoring will include the following:

- Year 1: Visual Assessment and photos adjacent to project infrastructure to evaluate hydrological/vegetation and surface conditions, and brief update to NSE; and
- Year 5: Visual Assessment and photos adjacent to project infrastructure to evaluate hydrological/vegetation and surface conditions, and post construction report submitted to NSE.

5.3 Proposed Compensation

The proponent is seeking approval to alter a total area of 0.28 hectares/2,816 m² of seven wetlands (WL's 2, 4, 5, 6, 7, 8 and 10). However, as discussed previously, alteration of WLs 4, 6, 7, 8 and 9 do not require an approval nor wetland compensation. Therefore, wetland compensation requirements

associated with the alteration of WL 2, 5 and WL10 is 0.23ha (2,394m²). Wetland loss will be satisfied at a replacement ratio of 2:1 (total area 0.46ha / 4,788m²).

A LOU (Letter of Understanding) between the proponent and a wetland restoration specialist will be signed and provided to NSE prior to the alteration of wetland habitat taking place.

A letter detailing this commitment is provided in Appendix H.

We look forward to your attention to this application. Please don't hesitate to contact the undersigned with any questions you might have.

Sincerely,



Andy Walter
Senior Project Manager
McCallum Environmental Ltd.

6.0 REFERENCES

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