

Registration. Also, wetlands are widely recognized as providing a host of ecosystem functions and benefits including, but not limited to, filtering out pollutants and heavy metals, mitigating flood events, and providing habitat to many SAR in New Brunswick such as the wood turtle (*Glyptemys insculpta*), least bittern (*Ixobrychus exilis*), and yellow rail (*Coturnicops noveboracensis*) (NTNB 2018). Project activities have the potential to cause adverse environmental effects through the proposed physical destruction of wetland habitat, as well as terrestrial and aquatic vegetation.

New Brunswick's wetlands have been given specific protection pursuant to the New Brunswick *Clean Environment Act* and the *Clean Water Act*. The New Brunswick Department of Environment and Local Government (NBDELG) requires a permit for any alteration within 30 m of the banks of a watercourse or regulated wetland.

5.5.1.1 Temporal Boundaries

The temporal boundaries for the Project include the following:

- Construction: extending for a period of approximately six months, anticipated to begin in the second quarter of 2019 (subject to the receipt of all approvals and permits required for the Project);
- Operation: beginning in approximately the fourth quarter of 2019, and lasting for approximately 10 years or until the mineral resource has been depleted; and,
- Reclamation and closure: To be initiated following the completion of operations at the site, with decommissioning and reclamation of the surface facilities at the site for an anticipated duration of six months following operation.

5.5.1.2 Spatial Boundaries

The Project Development Area (PDA) is defined as the area of physical disturbance associated with construction and operation of the Project. Specifically, the PDA consists of an area of approximately 61.81 ha (i.e., conservatively assumed to be the entirety of PID No. 00149013) that includes the open pit and all related surface facilities located on the property. The PDA is the area represented by the physical Project footprint.

The Local Assessment Area (LAA) is the maximum anticipated area within which Project-related environmental effects are expected. For vegetation and wetlands, the LAA includes the PDA and any nearby wetlands whose catchment areas would include any portion of the PDA. This is due to the potential for altering the wetlands' hydrological regime as a result of Project-related activities that will occur within the PDA. For vegetation species that rely on wetland habitat, a change in hydrological regime may also result in an adverse effect (i.e., potential stress or loss) of vegetation within the altered wetlands. For upland (terrestrial) vegetation species, the LAA is limited to the PDA (i.e., area to result in loss of vegetation through clearing activities and site development).

5.5.1.3

Significance Threshold

A significant adverse residual environmental effect on wetlands and vegetation is one where Project-related activities result in a net loss of wetland function that cannot be compensated (as per the New Brunswick Wetlands Conservation Policy) or the unauthorized loss of vegetation SOCC/SAR that directly affects the sustainability of the population in New Brunswick.

5.5.2

Existing Conditions

5.5.2.1

Regional Setting

The information regarding the presence and characterization of wetlands and the characterization of vegetation communities within the PDA and LAA was derived from several sources including existing databases and secondary information sources (i.e., desktop analysis) as well as field surveys. The methods conducted during the desktop analysis and field surveys are presented below in the following sections.

The PDA and LAA are located within the Valley Lowlands ecoregion and, more specifically, within the Anagance ecodistrict, which hosts rugged terrain consisting of steep river valleys that bisect rugged hills and mountains (Zelazny 2007). This ecoregion is characterized by dramatic influence of major watercourses and large lakes (Zelazny 2007). The interaction of flood events through these major watercourses with the varied topography of the ecoregion creates a wide spectrum of flood and substrate conditions, with a corresponding diversity of wetland types (Zelazny 2007).

Within this ecoregion, tolerant hardwood stands dominated by American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*) and yellow birch (*Betula alleghaniensis*) sit on ridge tops with fertile soils. On less fertile ridges, hardwoods tend to be dominated by American beech, red maple (*Acer rubrum*), and trembling aspen (*Populus tremuloides*). Softwood forests in the area tend to be associated with lower slopes and shallow soils. The softwood forests are dominated by red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and white spruce (*Picea glauca*), with occasional Eastern hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) (Zelazny 2007).

5.5.2.2

Desktop Analysis

Prior to completing the field surveys, Dillon reviewed readily available information from reputable sources. The information was reviewed to evaluate the potential for vegetation SOCC and/or vegetation SAR within the general area of the Project and to assist in scoping/focussing efforts for the field surveys. Dillon completed a review of the following sources and data lists prior to completing the field surveys:

- A custom Atlantic Canada Conservation Data Centre (AC CDC) report (AC CDC 2018);
- New Brunswick Department of Energy and Resource Development (NBDERD) and NBDELG publications;
- The federal species at risk registry;
- The provincial species at risk registry;

- Publicly-available Geographic Information Systems (GIS) map layers and databases;
- High resolution aerial photography;
- GeoNB wetland and watercourse mapping; and,
- Hammond River Angling Association website/publications.

A custom AC CDC report was obtained for a 5 km radius around the PDA. The report lists historical observations of species of flora and fauna, including rare species, SOCC (S1, S2, and S3) and SAR within a 5 km radius from the Project site (refer to **Appendix A**). Based on the review of the AC CDC report (AC CDC 2018), there were no records of vascular or non-vascular plant species, including SAR or SOCC historically observed within a 5 km radius of the PDA. The lack of AC CDC data suggests a data gap for this area. Although there were no historical records of vegetation, including SOCC or SAR within the PDA, there is potential for their occurrence within the PDA, especially within more high value (i.e., less altered) habitats such as wetlands.

According to the New Brunswick forest inventory (i.e., publicly available GeoNB GIS database) the forest types within the LAA consist of typical forest types including softwood forests consisting of primarily balsam fir (*Abies balsamea*), and spruce (*Picea* spp.), within stands of tolerant hardwoods, intolerant hardwoods and mixedwood. There was no publicly available forest inventory data for the PDA. The upland habitats within the PDA consist of mainly areas of regenerating softwood and hardwood forest, as the property was cut-over in 2010.

5.5.2.3 Wetland Determination, Delineation, and Functional Assessment

Vegetation and wetlands in the PDA were surveyed by Dillon biologists certified in wetland delineation and functional assessments in New Brunswick from August 14 to 16, 2018. Following a desktop analysis for the PDA and LAA, vegetation (including both wetland and upland vegetation communities, with a primary focus on vegetation SOCC and SAR) and wetlands were assessed within the PDA by the implementation of the field methodologies, described below.

Field Wetland Determination and Delineation

The field wetland determination and delineation methods described herein are based upon established protocols for wetland delineation, as outlined by the US Army Corps of Engineers Wetland Delineation Manual (USACE 1987). Wetland determination and delineation is focused on establishing the wetland-upland edge, and is based upon the presence of positive indicators for three parameters:

- hydric soils;
- hydrophytic vegetation; and,
- wetland hydrology.

A positive indicator must typically be present for all three parameters in order to definitively identify the boundary (edge) of a wetland. Sample points for these three parameters were established at representative locations within the wetlands.

Upon positive wetland determination (i.e., positive indicators identified for soils, hydrology and vegetation), a wetland edge condition was established based on the indicators identified at the three-parameter sample points. This edge condition was used to navigate around the perimeter of the wetland, which was in turn georeferenced with a Garmin Map64S handheld Geographical Positioning System (GPS) unit (3 to 5 m accuracy).

In order to assure the accuracy of the boundary being delineated, additional soil samples were made using a soil auger at regular intervals during the delineation. In so doing, the presence of hydrology and soil indicators were able to be confirmed, and corroborated with the observation of wetland vegetation and topographic relief, all of which assist in the definition of the wetland edge condition.

Hydric Soils

Hydric soil conditions are formed when an area is exposed to flooding or saturation for a sufficient length of time during the growing season such that an anaerobic (oxygen free) environment is formed in the soil. These anaerobic conditions may manifest themselves in a variety of ways, such as through the formation of redox features (reduction-oxidation), organic soils (i.e., peat), or formation of hydrogen sulphide (rotten egg odour), among many other indicators. Interpretation of soil profiles, their associated colour, texture and presence/absence of any hydric soil indicators provides the basis for judgement of whether or not any given soil is a hydric soil (USDA 2010).

Soil sampling was performed to a depth of approximately 50 cm (or to point of refusal) to identify conditions in both wetland and upland soils. Soil horizons were documented in terms of their texture, thickness, color (Munsell value/chroma/hue) and presence of hydric soil indicators (where applicable). Hydric soil indicators were determined as per the document titled *Field Indicators of Hydric Soils in the United States* (USDA 2010). Wetland Delineation Data Sheets were used to record data collected in the field. The data sheets provide the detailed soil information for each sample point, as well as list the various possible hydric soil indicators.

Hydrophytic Vegetation

Hydrophytic vegetation arises in areas where saturation or inundation by water is of duration sufficient to exert a controlling influence on the plant community assemblage. In such areas, plant species which are adapted to high-moisture environments tend to dominate. In order for a given area to classify as a wetland, hydrophytic vegetation should account for the majority (>50%) of the sample sites' total vegetation (USACE 1987).

For every plant species, there is a wetland indicator status, which may be interpreted as that species' estimated probability of occurring within a wetland (USACE 1987). If the majority of plant cover in the sample area is comprised of species with facultative (FAC), facultative wetland (FACW), or obligate (OBL) statuses, then the positive indicator for hydrophytic vegetation is met. Wetland indicator statuses for plant species were determined as per USDA Region 1 (Nova Scotia and New Brunswick) listings for interpreting USDA Wetland Indicator Statuses).

Species encountered at each of the sample locations were analysed at three strata (tree, shrub, and herbaceous) and were documented in terms of their percent (%) cover within a given plot size (10 m, 5 m and 2 m radius, respectively) and their wetland indicator status (FAC, FACW, and OBL).

Wetland Hydrology

Both in the soil pits prepared and over the greater area of the wetland, observations were made concerning the presence of a hydrological regime, which would sustain wetland processes. Taken into consideration were: the site context, site location, and the microtopography of the wetland area.

Primary hydrology indicators (of which at least one must be present) include surface water, high water table, saturation, sediment deposits, among many other others (USACE 1987). Secondary indicators (of which two are required, in the absence of a primary indicator) include surface soil cracks, drainage patterns and moss trim lines among others.

Functional Assessment: Wetland Ecosystem Services Protocol-Atlantic Canada (WESP-AC)

WESP-AC represents a standardized approach to the way data is collected and interpreted to indirectly yield relative estimates of a wide variety of important wetland functions and their associated benefits.

WESP-AC generates scores (0 to 10 scale) and ratings (“Lower”, “Moderate”, or “Higher”) for a variety of wetland functions using visual assessments of weighted ecological indicators. The number of indicators that is applied to estimate a particular wetland function depends on which function is being assessed. The indicators are then combined in a spreadsheet using logic-based, mathematical models to generate the score and rating for each wetland function and benefit (NBDELG 2018c). Together they provide a profile of “what a wetland does.”

For each function, the scores and ratings represent a particular wetland’s standing relative to those in a statistical sample of non-tidal wetlands previously assessed in the province (98 for New Brunswick) (NBDELG 2018c). **Table 5.5.1** provides a list of various functions, their definitions, and potential benefits.

Table 5.5.1: Benefits of Wetland Functions Scored by WESP-AC

Function	Definition	Potential Benefits
Hydrologic Functions:		
Water Storage and Delay	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control, maintain ecological systems
Stream Flow Support	The effectiveness for contributing water to streams especially during the driest part of a growing season.	Support fish and other aquatic life
Water Quality Maintenance Functions:		
Water Cooling	The effectiveness for maintaining or reducing temperature of downslope waters.	Support cold water fish and other aquatic life
Sediment and Retention Stabilization	The effectiveness for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting	Maintain quality of receiving waters. Protect shoreline structures from erosion.

Table 5.5.1: Benefits of Wetland Functions Scored by WESP-AC

Function	Definition	Potential Benefits
	excessive erosion, and stabilizing underlying sediments or soil	
Phosphorous Retention	The effectiveness for retaining phosphorus for long periods (>1 growing season)	Maintain quality of receiving waters.
Nitrate Removal and Retention	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous oxide (a potent greenhouse gas).	Maintain quality of receiving waters.
Organic Nutrient Transport	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved.	Support food chains in receiving waters.
Ecological (Habitat) Functions:		
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values.
Aquatic Invertebrate Habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, clams, snails, water beetles, shrimp, aquatic worms, and others.	Support salmon and other aquatic life. Maintain regional biodiversity.
Amphibian and Reptile Habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles.	Maintain regional biodiversity
Waterbird Feeding Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that migrate or winter but do not breed in the region.	Support hunting and ecological values. Maintain regional biodiversity.
Waterbird Nesting Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that nest in the region.	Maintain regional biodiversity.
Songbird, Raptor, and Mammal Habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water	Maintain regional biodiversity.
Native Plant Habitat and Pollinator Habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them	Maintain regional biodiversity and food chains.
Public Use and Recognition*	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, education, or research.	Commercial and social benefits of recreation. Protection of public investments.

*Considered a benefit rather than a function of wetlands

Source: NBDELG (2018)

During the field analysis conducted between August 14 and 16, 2018, 13 unmapped wetlands were identified, delineated and functionally assessed within the PDA (refer to **Figure 5.5.1**). The delineated wetlands are summarized in **Table 5.5.2**, below.

Table 5.5.2: Summary of Wetland Findings

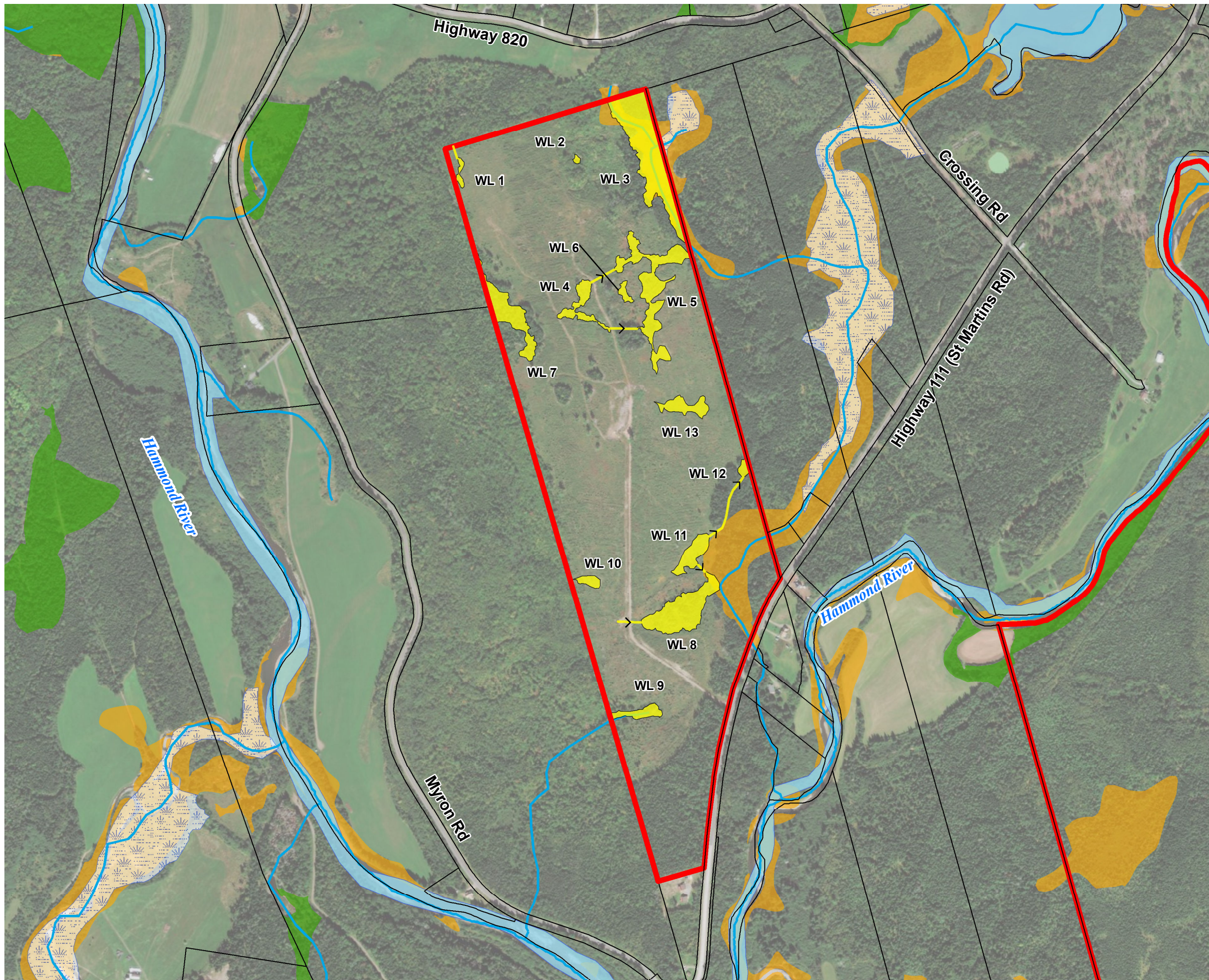
Wetland Identifier	Wetland Type	Key Wetland Functions¹	Delineated Area (ha)	Area (ha) of Wetland to be Potentially Affected by the Project activities
Wetland 1 (WL1)	Shrub Swamp	Water Storage & Delay, Sediment Retention & Stabilisation, Aquatic Invertebrate Habitat	0.06	0.06
Wetland 2 (WL2)	Vernal Pond	Water Storage & Delay, Sediment Retention & Stabilisation, Phosphorus Retention, Nitrate Removal & Retention, Amphibian & Turtle Habitat, Waterbird Feeding Habitat, Waterbird Nesting Habitat	0.02	0.02
Wetland 3 (WL3)	Fen/ Wet Meadow complex	Organic Nutrient Export, Anadromous Fish Habitat, Resident Fish Habitat, Waterbird Feeding Habitat, Waterbird Nesting Habitat, Songbird, Raptor, & Mammal Habitat, Pollinator Habitat, Native Plant Habitat	1.8	1.8
Wetland 4 (WL4)	Bog	Water Storage & Delay, Sediment Retention & Stabilisation, Nitrate Removal & Retention, Songbird, Raptor, & Mammal Habitat, Pollinator Habitat	0.30	0.30
Wetland 5 (WL5)	Bog/ Wet Meadow complex	Songbird, Raptor, & Mammal Habitat, Pollinator Habitat	1.09	1.09
Wetland 6 (WL6)	Bog	Water Storage & Delay, Sediment Retention & Stabilisation, Phosphorus Retention, Nitrate Removal & Retention, Carbon Sequestration, Organic Nutrient Export, Aquatic Invertebrate Habitat	0.07	0.07

Table 5.5.2: Summary of Wetland Findings

Wetland Identifier	Wetland Type	Key Wetland Functions ¹	Delineated Area (ha)	Area (ha) of Wetland to be Potentially Affected by the Project activities
Wetland 7 (WL7)	Shrub Swamp	Water Cooling, Organic Nutrient Export, Songbird, Raptor, & Mammal Habitat, Pollinator Habitat	0.68	0.68
Wetland 8 (WL8)	Treed Swamp	Organic Nutrient Export, Songbird, Raptor, & Mammal Habitat, Pollinator Habitat, Native Plant Habitat	0.93	0
Wetland 9 (WL9)	Treed Swamp	Songbird, Raptor, & Mammal Habitat, Pollinator Habitat, Native Plant Habitat	0.19	0
Wetland 10 (WL10)	Shrub Swamp	Water Storage & Delay	0.10	0.10
Wetland 11 (WL11)	Shrub Swamp/ Wet Meadow complex	- ²	0.31	0.31
Wetland 12 (WL12)	Shrub Swamp	Organic Nutrient Export, Resident Fish Habitat, Songbird, Raptor, & Mammal Habitat, Pollinator Habitat	0.08	0.08
Wetland 13 (WL13)	Wet Meadow	- ²	0.27	0.27
Total Wetland Area			5.90	4.78

Notes:

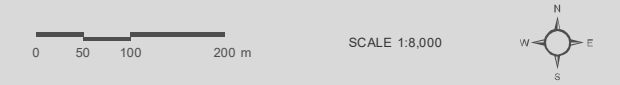
1. Key wetland functions are those functions that scored as 'higher' during the WESP-AC. Refer to detailed WESP-AC results in Appendix B.
2. The WESP-AC functional assessment for this wetland did not identify higher scoring functions. The functions for this wetland scored low and moderate.



HAMMOND RIVER HOLDINGS LTD.
PROPOSED UPHAM EAST GYPSUM QUARRY

WETLANDS
FIGURE 5.5.1

- PROPERTY BOUNDARY
 - PROPERTY OWNED BY J D IRVING LIMITED
 - GEO NB MAPPED WATERCOURSE
 - FIELD DELINEATED WETLANDS
 - FIELD IDENTIFIED WETLAND DRAINAGE CONNECTION (WITH FLOW DIRECTION ARROW)
 - REGULATED WETLAND
 - NBDELG DRAFT BETA WETLAND MAPPING (UNREGULATED)**
 - PROVINCIALY SIGNIFICANT WETLANDS
 - INTERMEDIATE WETLANDS
 - FORESTED WETLANDS
- WL = WETLAND



MAP DRAWING INFORMATION:
DATA PROVIDED BY DILLON CONSULTING LIMITED, CANVEC
SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISS TOPO, OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

MAP CREATED BY: BQS
MAP REVISED BY: JH
MAP CHECKED BY: AS
MAP PROJECTION: NAD_1983_CSRS_New_Brunswick_Stereographic

FILE LOCATION: \\DILLON.CAD\DILLON_DFS\FREDERICTON\FREDERICTON CAD\CAD\GIS\188346 UPHAM GYPSUM QUARRY\MXD



PROJECT: 18-8346
STATUS: FINAL
DATE: OCT 2018

The following sections provide a summary of the wetland delineation and functional assessment results for unmapped wetlands located within the PDA. There were no mapped (regulated) wetlands located within the PDA; the nearest mapped wetland is located on the adjacent property to the northeast of the site. Further details of the wetland's primary and secondary indicators and attributes as well as WESP-AC functional assessment results are presented within wetland profile sheets presented within **Appendix B**. Refer to **Figure 5.5.1** for approximate wetland field delineations. It is important to note that the field assessment was completed for only the wetlands that are present entirely within the PDA (i.e., unmapped wetlands) and for the portion of wetlands that are present on the PDA for wetlands that extend to other neighbouring properties, to avoid trespassing on privately owned property.

Wetland 1 (WL1) – 0.06 ha Unmapped Shrub Swamp

Based on the results of the field assessment, Wetland 1 is characterized as a 0.06 ha outflow shrub swamp that is seasonally saturated and located on a slope (i.e., terrene position). This outflow wetland drains northward, out of the PDA into a mature mixed forest habitat as shown in **Figure 5.5.1**. Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by white meadowsweet (*Spiraea alba*), steeplebush (*Spiraea tomentosa*), and red maple (*Acer rubrum*). The herbaceous understory layer was dominated by woolgrass (*Scirpus cyperinus*), grass-leaved goldenrod (*Euthamia graminifolia*), narrow-leaved cattail (*Typha angustifolia*), marsh bedstraw (*Galium palustre*), and necklace sedge (*Carex projecta*). The vegetation community identified at Wetland 1 (shrub swamp) is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at the surface that is slower to decompose due to wet conditions, and iron concentrations in soil close to the surface indicating that the water table regularly moves into this layer of the soil. The origin of the wetland is unknown and is possibly the result of tree removal and soil compaction from past forestry activities.



Wetland 2 (WL2) – 0.02 ha Unmapped Vernal Pool

Based on the results of the field assessment, Wetland 2 is characterized as a 0.02 ha isolated and seasonally flooded vernal pool located within what is expected to be a gypsum depression. Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by red osier dogwood (*Cornus sericea*) and common elderberry (*Sambucus nigra*). The herbaceous understory layer was dominated by common spikerush (*Eleocharis palustris*), woolgrass, and slender manna-grass (*Glyceria melicaria*). There were no flora SAR or SOCC observed during the desktop or field delineations



of this wetland. The vegetation community identified at Wetland 2 was comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. The wetland also had wet soil indicators in the form of abundant iron concentrations in soil close to the surface as well as a gleyed (depleted) layer indicating that the water table regularly moves into this layer of the soil. The wetland had several hydrology indicators including, the presence of surface water, and a high water table. The origin of the wetland is expected to be natural due to its position on the landscape, within a natural depression caused by sinking of the gypsum bedrock.

Wetland 3 (WL3) – 1.8 ha Unmapped Fen/Wet Meadow Complex

Based on the results of the field assessment, Wetland 3 is characterized as a permanently flooded/saturated throughflow fen/wet meadow complex associated with the floodplain of a lotic watercourse system. The area of the wetland delineated within the PDA totalled 1.8 ha; however, the wetland extends off-site, and is hydrologically connected to a mapped (regulated) wetland located just northeast of the PDA through a mapped watercourse (WC1; refer to **Section 5.4** for further details). Due to recent cut-over, there was no overstory (trees) within the wetland. The shrub layer was dominated by red osier dogwood (*Cornus sericea*), speckled alder (*Alnus incana*) and steplebush. The herbaceous understory layer was dominated by common spikerush, woolgrass, common water parsnip (*Sium suave*), and marsh seedbox (*Ludwigia palustris*).

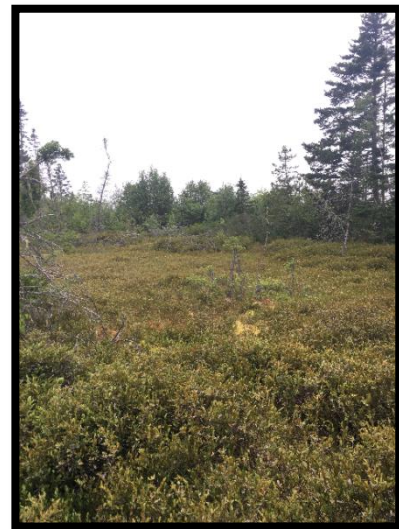


The vegetation community identified at Wetland 3 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at the surface that is slower to decompose due to wet conditions in soil close to the surface as well as a gleyed (depleted) layer indicating that the water table regularly moves into this layer of the soil. The wetland had several hydrology indicators including, the presence of surface water, and a high water table. The origin of the wetland is expected to be natural due to its connection with a mapped watercourse and adjacent wetland.

As noted above, this unmapped wetland is connected to a mapped wetland and a mapped watercourse, therefore, it is considered to be a part of a larger wetland complex. The development of the open pit for extraction of gypsum will result in the direct loss of the unmapped portion of the wetland (i.e., WL3). Due to the location of the gypsum deposit (the thickest portion of the deposit is located in the northeastern portion of the property; refer to **Section 2.2 and 2.3** for further details), there are no other feasible alternatives to the placement of the open pit (refer to **Section 2.8** for further details on Alternative means of carrying out the project). Although it is known that WL3 will be directly lost as a result of the development of the open pit, the indirect effects of this Project activity on the mapped portion of the wetland complex (located outside of the PDA) is currently unknown (refer to **Section 5.5.3** for further details of anticipated residual effects).

Wetland 4 (WL4) – 0.3 ha Unmapped Bog

Based on the results of the field assessment, Wetland 4 is characterized as an isolated 0.3 ha seasonally flooded and permanently saturated bog. This wetland is connected to Wetlands 5 and 6 through a field identified wetland connection channel (refer to **Figure 5.5.1**). The treed overstory was dominated by black spruce (*Picea mariana*) and eastern larch (*Larix laricina*). The shrub layer was dominated by leatherleaf (*Chamaedaphne calyculata*); rhodora (*Rhododendron canadense*); sheep laurel (*Kalmia angustifolia*); and false holly (*Nemopanthus mucronatus*). The herbaceous understory layer was dominated by large cranberry (*Vaccinium macrocarpon*), tawny cottongrass (*Eriophorum virginicum*); and *Carex* sp. The vegetation community identified at Wetland 4 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. The wetland also had wet soil indicators in the form of a thick layer (over 48 inches) of peat. The wetland had several hydrology indicators including, the presence of surface water, a high water table and saturation of soil as well as stunted and stressed vegetation. The origin of the wetland is expected to be natural due to the depth of peat within the wetland and its position within the landscape (i.e., basin).



Wetland 5 – 1.09 ha Unmapped Bog/Wet Meadow Complex

Based on the results of the field assessment, Wetland 5 is characterized as a 1.09 ha seasonally flooded and permanently saturated outflow bog/wet meadow complex located on a slope. This wetland is connected to Wetland 4 through a field identified wetland connection channel (refer to **Figure 5.5.1**). The treed overstory was dominated by red maple (*Acer rubrum*), black spruce, and eastern larch. The shrub layer was dominated by sheep laurel, trembling aspen (*Populus tremuloides*), leatherleaf, rhodora, false holly (*Nemopanthus mucronatus*), steplebush, and white meadowsweet. The herbaceous



understory layer was dominated by woolgrass, spotted Joe-Pye weed (*Eupatorium maculatum*), and large cranberry. The vegetation community identified at Wetland 5 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at the surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis. The wetland had several hydrology indicators including, a high water table and saturation of soil as well as stunted and stressed vegetation. The origin of the wetland is expected to be natural.

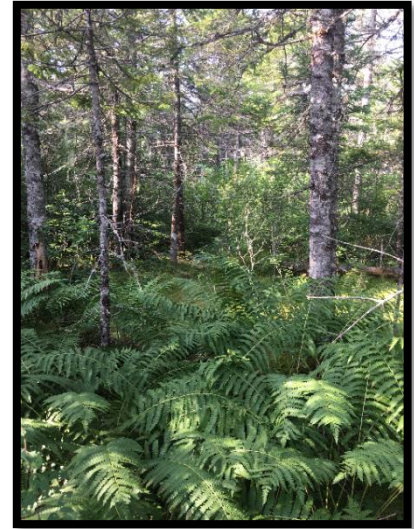
Wetland 6 – 0.07 ha Unmapped Bog

Based on the results of the field assessment, Wetland 6 is characterized as an isolated 0.07 ha seasonally flooded and permanently saturated bog located within a basin. This wetland is connected to Wetland 4 through a field identified wetland connection channel (refer to **Figure 5.5.1**). The treed overstory was dominated by red maple, black spruce, and white pine (*Pinus strobus*). The shrub layer was dominated by leatherleaf, white meadowsweet, and false holly. The herbaceous understory layer was dominated by woolgrass, two-seeded sedge (*Carex disperma*), cinnamon fern (*Osmunda cinnamomea*), tawny cottongrass, and crested shield fern (*Dryopteris cristata*). The vegetation community identified at Wetland 6 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer (40 inches) over top of mineral soil that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis. The wetland had several hydrology indicators including, a high water table and saturation of soil as well as stunted and stressed vegetation. The origin of the wetland is expected to be natural.



Wetland 7 – 0.68 ha Unmapped Shrub Swamp

Based on the results of the field assessment, Wetland 7 is characterized as a 0.68 ha seasonally flooded and permanently saturated outflow shrub swamp. The treed overstory was dominated by balsam fir (*Abies balsamea*), red maple, and black spruce. The shrub layer was dominated by speckled alder, false holly, and wild raisin (*Viburnum nudum*). The herbaceous understory layer was dominated by cinnamon fern, interrupted fern (*Osmunda claytoniana*), slender manna-grass, two-seeded sedge, and dwarf enchanter's nightshade (*Circaea alpina*). The vegetation community identified at Wetland 7 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis; as well as iron concentrations near surface indicating that the water table regularly moves into this layer of the soil. The wetland had several hydrology indicators including: the presence of surface water, a high water table, and saturation of soil, as well as water stained leaves. The origin of the wetland is expected to be natural.



Wetland 8 – 0.93 ha Unmapped Treed Swamp



Based on the results of the field assessment, Wetland 8 is characterized as a 0.93 ha seasonally flooded and permanently saturated outflow treed swamp located on a slope. This outflow swamp is connected to a mapped watercourse (WC3; refer to **Section 5.4** for further details). The treed overstory was dominated by northern white cedar (*Thuja occidentalis*), red maple, balsam fir, black spruce, and eastern larch. The shrub layer was dominated by speckled alder and false holly. The herbaceous understory layer was dominated by jewelweed (*Impatiens capensis*), cinnamon fern, interrupted fern, slender manna-grass, Canada manna-grass (*Glyceria canadensis*), sensitive fern (*Onoclea sensibilis*). The vegetation community identified at Wetland 8 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer

at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis. The wetland had several hydrology indicators including: the presence of surface water, a high water table, and saturation of soil, as well as water stained leaves. The origin of the wetland is expected to be natural.

Wetland 9 – 0.19 ha Unmapped Treed Swamp

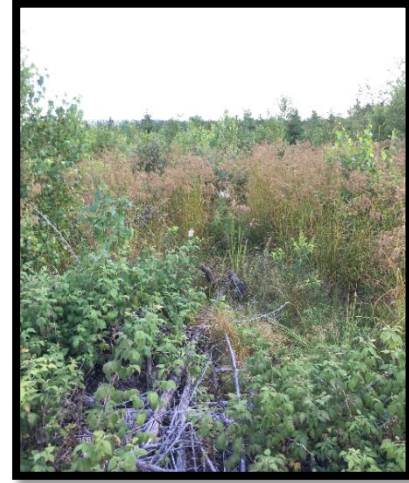
Based on the results of the field assessment, Wetland 9 is characterized as a seasonally flooded and permanently saturated outflow treed swamp located on a slope. This outflow wetland is connected to a mapped watercourse (WC2; refer to **Section 5.4** for further details). During the field assessment, 0.19 ha of the wetland was delineated within the PDA, however, the wetland extends off of the property (this area was not delineated). The treed overstory was dominated by northern white cedar, red maple, and balsam fir. The shrub layer was dominated by speckled alder and red maple. The herbaceous understory layer was dominated by cinnamon fern, bluejoint reed grass (*Calamagrostis Canadensis*), interrupted fern, slender manna-grass, Canada manna-grass (*Glyceria canadensis*), prickly sedge (*Carex echinata*).



The vegetation community identified at Wetland 9 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis; as well as a gleyed (depleted) layer indicating that the water table regularly moves into this layer of the soil. The wetland had several hydrology indicators including: the presence of surface water, a high water table, and saturation of soil, as well as water stained leaves. The origin of the wetland is expected to be natural.

Wetland 10 – 0.10 ha Unmapped Shrub Swamp

Based on the results of the field assessment, Wetland 10 is characterized as a 0.10 ha seasonally flooded and permanently saturated outflow shrub swamp located on a slope. Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by false holly, sheep laurel, steplebush, and red maple. The herbaceous understory layer was dominated by woolgrass, soft rush (*Juncus effusus*). The vegetation community identified at Wetland 10 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis as well as stratified layers. The wetland had several hydrology indicators including: a high water table, and saturation of soil, as well as water stained leaves. The origin of the wetland is unknown and may be the result of tree removal and soil compaction from former logging activities.



Wetland 11 – 0.31 ha Unmapped Shrub Swamp/Wet Meadow

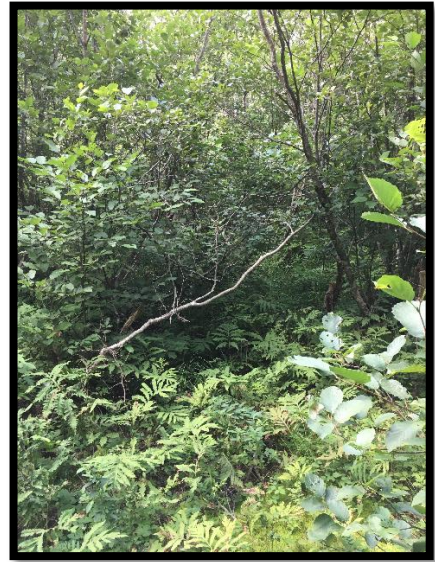
Based on the results of the field assessment, Wetland 11 is characterized as a 0.31 ha seasonally flooded and permanently saturated outflow shrub swamp located on a slope. This outflow wetland is connected to a field identified watercourse (WC4; refer to **Section 5.4** for further details). Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by white meadowsweet, speckled alder, willow spp. (*Salix* spp.) and bristly black currant (*Ribes lacustre*). The herbaceous understory layer was dominated by woolgrass, soft rush (*Juncus effusus*) spotted Joe-Pye weed, and marsh willow-herb (*Epilobium palustre*). The vegetation community identified at Wetland 11 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. A single *Spiranthes* spp. specimen was encountered along the edge of Wetland 11. The specimen had begun to go to seed when encountered and was not able to be identified to species at the time of the field assessment, but its habitat and location were consistent with *Spiranthes lucida*, an SOCC listed as an “Uncommon” (S3) species



identified by the AC CDC. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis as well as stratified layers. The wetland had several hydrology indicators including: a high water table, and saturation of soil. The origin of the wetland is unknown and may be the result of tree removal and soil compaction from former logging activities.

Wetland 12 – Unmapped 0.08 ha Shrub Swamp

Based on the results of the field assessment, Wetland 12 is characterized as a seasonally flooded and permanently saturated throughflow shrub swamp located along a lentic stream system. During the field assessment, 0.08 ha of the wetland were delineated; however, the wetland extends off of the property (this area was not delineated to avoid trespassing on private property). Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by speckled alder, false holly, wild raisin, and white meadowsweet. The herbaceous understory layer was dominated by slender manna-grass, small floating manna-grass (*Glyceria borealis*), sensitive fern, arrow-leaved tearthumb (*Polygonum sagittatum*). The vegetation community identified at Wetland 12 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis as well as a gleyed (depleted) layer indicating that the water table regularly moves into this shallow layer of soil. The wetland had several hydrology indicators including: the presence of surface water, a high water table, saturation of soil, and aquatic fauna. The origin of the wetland is considered to be natural.



Wetland 13 – 0.27 ha Unmapped Wet Meadow

Based on the results of the field assessment, Wetland 13 is characterized as a 0.27 ha seasonally flooded and permanently saturated outflow wet meadow located on a slope. Due to recent cut-over, there is no overstory (trees) within the wetland. The shrub layer was dominated by white meadowsweet, steeplebush, speckled alder, and red raspberry (*Rubus idaeus*). The herbaceous understory layer was dominated by woolgrass, narrow-leaved cattail, sensitive fern, nodding sedge (*Carex gynandra*), and narrow-leaved tearthumb. The vegetation community identified at Wetland 13 is comprised of greater than 50% wet adapted vegetation species based on their indicator status (i.e., FAC, FACW, OBL) (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no flora SAR or SOCC observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis as well as stratified layers. The wetland had several hydrology indicators including: the presence of surface water, a high water table, saturation of soil, and aquatic fauna. The origin of the wetland is unknown and may be the result of tree removal and soil compaction from former logging activities.



During the field assessment, anthropogenic activities/effects were noted throughout the assessed wetlands. The activities included soil compaction and rutting due to former logging road development and former tree harvesting within or directly adjacent to all wetlands.

For the detailed results of the WESP-AC functional assessments conducted for the Wetlands 1-13, refer to the WESP-AC sheets provided in **Appendix B**.

Wetland and Upland Vegetation Communities

In addition to the characterization of wetland vegetation communities during the wetland delineations, upland vascular vegetation communities were inventoried in the field by a Dillon biologist skilled in the identification of common and rare plant species of New Brunswick. The vascular plant inventory for the PDA was completed during the site visits between August 14 and 16, 2018. Additionally, a characterization of land cover was derived from the field inventories and then further refined during the compilation of plant species lists. Refer to plant species lists provided in **Appendix C**.

Approximately 65% (40 hectares) of the PDA was cut-over for logging purposes beginning in the late summer of 2010. The remaining forest cover is mostly associated with wetland areas and stream buffers to the southern end of the PDA, as well as some limited tree “islands” in the centre of the PDA that are associated with sinkholes. The forested areas immediately surrounding the site are composed primarily

of middle-age softwood dominated forest comprised of balsam fir, red spruce (*Picea rubens*), northern white cedar, white spruce (*Picea glauca*), white birch (*Betula papyrifera*), and red maple.

Although there were no vegetation SAR or SOCC identified during the AC CDC records review, a single *Spiranthes* spp. specimen was encountered along the edge of Wetland 11. The specimen had begun to go to seed when encountered and was not able to be identified to species at the time of the field assessment, but its habitat and location were consistent with *Spiranthes lucida*, listed as an “Uncommon” (S3) species identified by the AC CDC. There were no other SOCC or SAR species identified during these surveys. Refer to detailed plant species lists provided in **Appendix C**.

5.5.3 Environmental Effects Assessment

The potential environmental effects of the Project on wetlands and vegetation are assessed in this section.

5.5.3.1 Potential Effects

The Project is expected to interact with wetlands and vegetation throughout all phases (i.e., construction, operation, reclamation and closure). The primary possible effects to wetlands include direct loss of wetland area or function for those wetlands in the PDA that will be subjected to Project activities such as site clearing, grubbing, and construction of infrastructure, access roads and blasting /extraction of gypsum. Additionally, indirect loss of wetland area or function of regulated wetlands may occur on other wetlands located outside the PDA but within the LAA (e.g., wetlands on adjacent properties to the Project site) through changes in the surface hydrology within the PDA as a result of the development of the Project site and the presence of the open pit. The primary possible effects to vegetation include direct loss of vegetation communities through clearing and grubbing. More specifically, the Project may interact with vegetation and wetlands in the following ways:

- The construction and operation phases of the Project will result in the direct loss of approximately 4.78 ha of unmapped (field identified) wetlands within the PDA, but no regulated (mapped) wetlands are located in the PDA nor is it expected that they will be directly affected by the Project.
- The construction and operation phases of the Project may result in the indirect loss of wetland area or function associated with a regulated (mapped) wetland on a neighbouring property within the LAA (on the northeast corner of the PDA), which is connected to WL3 and WC1.
- Construction activities (e.g., road and infrastructure development) that may occur within 30 m of wetlands have the potential to alter natural drainage patterns and increase erosion rates.
- A spill or fire could occur as an accident or unplanned event (refer to Section 7.0) which could affect wetlands and vegetation within the PDA and LAA.
- Wetlands and vegetation may interact with the Project during reclamation and closure through re-establishment of vegetation communities and wetland areas (potential for incorporation of wetland restoration within the PDA).

5.5.3.2

Mitigation

Mitigation is identified for each interaction and/or effect in relation to vegetation and wetlands in an attempt to prevent the interaction from occurring if possible, or to reduce the severity, magnitude, geographic extent, frequency, or duration of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been identified as appropriate mitigative strategies. In addition, several acts, codes, regulations and guidelines may require appropriate actions be conducted as mitigative measures prior to or during the interaction. The following mitigation will be implemented as a part of the Project:

- The area to be disturbed by the Project will be minimized to the extent possible (i.e., limited to the area which is required to accomplish the Project objectives);
- Surface water drainage will be designed to minimize changes in hydrological regimes within the LAA;
- Perimeter drainage ditches will be installed in low lying areas around the PDA to assist in the management of surface water on-site;
- Efforts will be made to maintain as much mature vegetation along the edges of the site; in particular, existing treed buffers surrounding wetlands located on the southeastern and southwestern portions of the PDA will be maintained to the extent possible;
- Potential installation and/or upgrades to watercourse crossings (culverts) draining to wetlands will be designed as per the New Brunswick Watercourse and Wetland Alteration (WAWA) Guidelines (NBDELG 2012);
- Obtaining a watercourse and wetland alteration (WAWA) permit for any alterations to regulated wetlands (and their 30 m buffers) that result in a net loss of wetland function as a result of the Project, with applicable compensation, under the New Brunswick *Clean Water Act* and New Brunswick Wetlands Conservation Policy (NBDNRE-NBDELG 2002);
- Construction and operation activities will comply with the conditions of the WAWA permit;
- Proper erosion and sediment control measures will be installed and checked regularly and prior to and after storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat;
- All construction equipment will be properly cleaned prior to mobilizing to site to avoid potential introduction of invasive species;
- Implement a water management plan that incorporates measures aimed at retaining site water in a pit sump and settling pond to allow for settling of suspended sediments prior to release to the environment;
- An emergency response plan (ERP) for accidental spills, emergencies, incidents or storm events will be completed and detailed in the environmental protection plan (EPP), and the contractor will be required to provide spill response training to construction personnel; and,
- A follow-up vegetation survey will be conducted in the Spring of 2019 to confirm *Spiranthes* species for proper identification of the potential SOCC *Spiranthes lucida*.

5.5.3.3

Characterization of Residual Effects

Though much of the Project site has been cleared already for logging purposes, the Project will result in the loss of immature vegetation within the PDA so that Project facilities can be developed. There are no known occurrences of plant SAR or SOCC on the Project site, with the possible exception of *Spiranthes* species which will be confirmed through a follow-up field survey in Spring 2019. Remaining mature vegetation located along the property boundaries as well as surrounding wetlands and watercourses located on the southeast portion of the PDA will be maintained to the extent possible. Forest habitat is ample in the LAA and beyond, and the loss of immature vegetation will not result in a change in species distribution or threats to the population on a landscape level. Thus, the Project is not expected to result in a substantive interaction with vegetation during any phase.

The Project will result in the direct loss of approximately 4.78 ha of unmapped wetland within the PDA, to allow for the construction of the open pit and related surface facilities to be located on site. This is an unavoidable loss to accomplish the Project, which will occur during construction and persist through the life of the Project. The Project has been developed to minimize the area of disturbance of the PDA to that which is required to meet the Project objectives, maintaining treed buffers around watercourses and wetlands to the extent possible, to minimize the net loss of wetland function.

During operation, it is anticipated that additional indirect loss of, or alterations to, wetlands and wetland functions located on some neighbouring properties to the Project site may occur from localized changes in surface water hydrology arising from the reshaping of the Project site and the storage of runoff in the pit sump and settling pond. Although not specifically located on the Project site and not subject to direct disturbance as a result of the Project activities, a regulated (mapped) wetland that is contiguous to WL3 (to the northeast of the Project site) will likely experience indirect effects as a result of water infiltration into the open pit. Establishing a substantial buffer around this regulated wetland in an effort to minimize a change in wetland function of this wetland would render the Project unfeasible. This indirect loss cannot be characterized at this early planning stage and ongoing follow-up and monitoring (with adaptive management as necessary) will be conducted to monitor any changes that may occur to this wetland and to plan response actions. However, a change in wetland function of this wetland is likely unavoidable if the Project is to proceed. Any regulated wetlands that are located on adjacent properties to the Project site and which may experience indirect net loss of wetland function due to potential localized changes in surface water hydrology due to the presence of the Project (e.g., draining into the open pit) will be monitored through the Project life and retroactively subjected to a WAWA permit and associated compensation, as an adaptive management measure if necessary.

Without mitigation, construction activities and some operation activities could result in direct net loss of functions to existing and nearby wetlands. The implementation of the practice 'avoid', 'minimize' and/or 'compensation' will be considered for all potential impacts to wetlands within the PDA and LAA. Applicable authorization (i.e., WAWA permit and associated compensation) will be secured with NBDELG prior to undertaking construction activities within 30 m that could affect regulated wetlands, will reduce the potential net loss of wetland function. Follow-up and monitoring of potential indirect effects on wetlands located on adjacent properties will be conducted, and if indirect effects are identified during

this monitoring, the implementation of adaptive management measures would be initiated to minimize such loss, with appropriate WAWA permitting and compensation for retroactive net loss of wetland function if required.

For construction equipment mobilizing to the site and working within 30 m of a wetland, contractors will be required to properly clean equipment prior to mobilizing to the site so as to avoid the transfer of vegetative invasive species to the area.

The direct/indirect net loss of wetland function in regulated (mapped) wetlands that is deemed by NBDELG and Environment and Climate Change Canada (ECCC) to result in a ‘no net loss of wetland function’ under the New Brunswick Wetlands Conservation Policy (NBDNRE-NBDELG 2002) requires wetland compensation for net loss of wetland function of a regulated wetland at a 2:1 ratio. All enterprises, activities, projects, works, or programs affecting two or more hectares of bog, marsh or other wetland must be submitted to the NBDELG for review in accordance with the EIA pursuant the *Clean Environment Act*.

5.5.4 Summary

Based on the above, with planned mitigation, authorization (with compensation), and environmental protection measures, the residual environmental effects of the Project on vegetation and wetlands during all phases of the Project are rated not significant, with a moderate level of confidence.

The implementation of water management features, water quality monitoring, groundwater level monitoring, wetland function monitoring and other follow-up and monitoring measures to be implemented to monitor changes to wetland function arising from the Project, with adaptive management measures implemented as necessary to address those changes, will improve the confidence of this prediction.

5.6 Wildlife and Wildlife Habitat

The potential environmental effects of the Project on wildlife and wildlife habitat are assessed in this section.

5.6.1 Scope of VC

Wildlife and wildlife habitat includes wildlife (fauna) and the habitats that support wildlife species. This VC is focused on birds, mammals, invertebrates, and herpetiles within terrestrial components of their lifecycle, as well as the habitats that support them. Wildlife and wildlife habitat is selected as a VC because of potential interactions between wildlife, its habitat, and proposed Project activities. Species of conservation interest (i.e., species at risk (SAR) and species of conservation concern (SOCC)) as identified by provincial and federal regulatory agencies, are of particular focus in this assessment because they are often susceptible to changes in the environment and are therefore useful indicators of ecosystem health and regional biodiversity.

Both provincial and federal legislation provides protection to designated bird, mammal, herpetile, and other species at risk. Most bird species, specifically, are protected under the *Migratory Birds Convention Act*. The wildlife and wildlife habitat VC has connections to the vegetation and wetlands VC (**Section 5.5**) because of its relationship with vegetation, hydrology, land form, and soil components.

To provide information on potential occurrences of rare and endangered wildlife, and unique or sensitive wildlife habitats potentially existing within and/or near the PDA, a review of the following existing data and information sources was conducted:

- Previous background information from other similar assessments completed in the general project area;
- Listed species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Listed species under the federal *Species at Risk Act* (SARA);
- Listed species under the New Brunswick *Species at Risk Act* (NB SARA); and,
- Ranked species by the New Brunswick Department of Energy and Resource Development (NBDERD).

As part of the desktop assessment, a site-specific AC CDC report (AC CDC 2018) was obtained for the Project area (refer to **Appendix A**). The report provided historical flora and fauna species occurrence, as well as environmentally sensitive or managed areas within 5 km of the Project site. Wildlife species at risk or species of conservation concern are identified as extremely rare (S1), rare (S2), or uncommon (S3).

Other available background information sources and mapping reviewed to identify and assess wildlife and wildlife habitat presence at the Project location included:

- Ecological Reserves in the Maritimes;
- Environmentally Sensitive Areas database;
- Atlas of Breeding Birds of the Maritime Provinces;
- Important Bird Areas of Canada;
- Federally designated Migratory Bird Sanctuaries;
- Provincially identified deer wintering areas; and,
- Identified Protected Natural Areas, and Wildlife Management Zones.

Incidental observations conducted during wetland and vegetation survey efforts were used to collect information on the presence of wildlife within the LAA, with an emphasis on SAR/SOCC.

5.6.1.1

Temporal Boundaries

The temporal boundaries for the Project include the following:

- Construction: extending for a period of approximately six months, anticipated to begin in the second quarter of 2019 (subject to the receipt of all approvals and permits required for the Project);
- Operation: beginning in approximately the fourth quarter of 2019, and lasting for approximately 10 years or until the mineral resource has been depleted; and,
- Reclamation and closure: To be initiated following the completion of operations at the site, with decommissioning and reclamation of the surface facilities at the site for an anticipated duration of six months following operation.

5.6.1.2 Spatial Boundaries

The Project Development Area (PDA) is defined as the area of physical disturbance associated with construction and operation of the Project. Specifically, the PDA consists of an area of approximately 61.81 ha (i.e., conservatively assumed to be the entirety of PID No. 00149013) that includes the open pit and all related surface facilities located on the property. The PDA is the area represented by the physical Project footprint.

The Local Assessment Area (LAA) is the maximum anticipated area within which Project-related environmental effects are expected. For wildlife and wildlife habitat, the LAA includes the PDA and areas within approximately 300 m beyond the PDA where Project-related environmental effects could be expected to occur.

5.6.1.3 Significance Threshold

A significant adverse residual environmental effect on wildlife and wildlife habitat is one where the population of a species is sufficiently affected to cause a decline in abundance and/or change in distribution, beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.

5.6.2 Existing Conditions

Information regarding the use of the LAA by wildlife and presence of wildlife habitat was derived from several sources including existing databases and secondary information sources, as well as limited field-level reconnaissance surveys. Additional confirmatory biophysical field studies for avian wildlife will be completed during appropriate seasonal timing windows in Spring and Summer 2019, targeting potential at risk wildlife species and their critical habitat as identified in the desktop assessment.

5.6.2.1 Resident and Migratory Birds

The vast majority of bird species found in New Brunswick are migratory and either breed in the province during the summer months, or pass through it during the spring and fall migratory periods. Jurisdiction for many migratory birds is federal, since migratory birds cross both provincial and international boundaries. The *Migratory Birds Convention Act* (MBCA) is the federal law which protects migratory birds in both Canada and the United States. The Act prohibits killing, injuring or harassing migratory

birds, their nests, or their young. Furthermore, species listed pursuant the federal *Species at Risk Act* or New Brunswick *Species at Risk Act* are afforded further protection as harm, the destruction of their nest, eggs or young is prohibited. Migratory birds that are protected under the MBCA in Canada, and that are relevant to the Project, include:

- Waterfowl (e.g., ducks and geese);
- Rails (e.g., coots, gallinules, sora, and other rails);
- Shorebirds (e.g., plovers and sandpipers); and,
- Songbirds (e.g., thrushes and warblers).

Birds not addressed under federal jurisdiction include grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, and kingfishers. Most birds not included in this list are protected under provincial laws, most notably the New Brunswick *Fish and Wildlife Act*. The New Brunswick *Fish and Wildlife Act* protects all fish and wildlife species (including all vertebrate animals or birds) from angling, hunting, trapping and other forms of intentional take, except under the authority of permits or licences. The Act also prohibits the disturbance, gathering or collection of the nests or eggs of any bird species, except under the authority of a permit. Under Section 4 of the Act, some wildlife and bird species (including American crow, double-crested cormorant, and European starling) may be taken if they present a risk of injury to landowners, or a risk of property damage, but this requires a separate permit.

Maritime Breeding Bird Atlas

The Maritime Breeding Bird Atlas (MBBA) database provides information on the presence of breeding bird species in counts conducted between 2006 and 2010. Within the MBBA Second Atlas, the PDA lies within Region #12, Saint John, at the southernmost extent of Square #20KR94 (Salt Springs), with the two nearest roadside breeding bird point counts within 1 km of the Project area, to both the east and the west of the PDA (BSC 2018; see **Appendix D, Table D.1**). During the MBBA period 2006-2010, a total of 96 species of birds were recorded within this square. Of these species, 64 were confirmed as breeding, 19 were probable breeders, and 13 were possible breeders. There were seven species at risk or species of conservation concern detected during the most recent MBBA in this square. These species included: bald eagle, bank swallow, barn swallow, bobolink, Canada warbler, common nighthawk, and olive-sided flycatcher (BSC 2018).

NBDERD's *General Status of Wild Species* (NBDERD 2018a) reports that there are 407 extant bird species known to occur in the New Brunswick, of which 143 are considered accidental (NBDERD 2018a). Of the species that regularly occur in the Province during at least part their lifecycle, 12 species are listed as "At Risk", 12 are listed as "May be At Risk", and 48 are considered "Sensitive".

Important Bird Areas

The nearest Important Bird Area (IBA) is Quaco Bay, located along the northern coast of the Bay of Fundy, which is approximately 17 km from the Project area to the southeast. Featuring intertidal reef ledges, bordered by mud flats and a few shallow inlets, this IBA is especially important for semipalmated

plovers and least sandpipers during fall migration (Nature NB 2018). Preferred habitat for these two species is not present within the LAA.

AC CDC Species at Risk Database Review

A review of the AC CDC database indicated that there were 45 records of 24 vertebrate species historically observed within 5 km of the PDA; 16 records are considered species at risk (SAR) or species of conservation concern (SOCC), including one “location sensitive” species (i.e., bald eagle) which intersects the Project area (AC CDC 2018).

Of the 24 species at risk/species of conservation concern identified by the AC CDC, nine are listed as “Threatened” pursuant the federal *Species at Risk Act*, while seven of those species are also listed as “Threatened” pursuant New Brunswick’s *Species at Risk Act*. In addition to the SAR species list above, two species listed as “Special Concern” pursuant to the federal *Species at Risk Act* and New Brunswick’s *Species at Risk Act*. The SAR and SOCC identified by the AC CDC as having been historically observed within 5 km of the Project site, as well as their habitat requirements and potential to occur within the Project area, is discussed in **Table 5.6.1**, below.

Table 5.6.1: Bird Species At Risk Historically Observed within 5 km of the Project (AC CDC 2018)

Species	Status*	Habitat	Potential to Occur in Project Area
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened	Typically nest in forested areas adjacent to large bodies of water, staying away from heavily developed areas when possible. However, bald eagles are tolerant of human activity when foraging. During winter, they are often found in areas which have access to open water (Armstrong 2014).	Based on the proximity of the PDA to the Hammond River and the presence of forested areas within the PDA, it is possible that this species may use the Project area for foraging purposes or occur within the PDA incidentally. The PDA does not offer preferential habitat for this species.
Bank Swallow (<i>Riparia riparia</i>)	COSEWIC: Threatened SARA: Threatened NB S Rank: S2S3B,S2S3M/3	Typically nest in steep embankments along eroding river/ocean shore and forage in open areas (COSEWIC 2013).	There are no large open habitats directly within the LAA. The Hammond River and other nearby tributaries may offer an eroding river bank which may provide potential nesting habitat. There is potential for this species to occur in the PDA incidentally or use the area for foraging purposes;

Table 5.6.1: Bird Species At Risk Historically Observed within 5 km of the Project (AC CDC 2018)

Species	Status*	Habitat	Potential to Occur in Project Area
			however, the PDA does not offer preferential habitat for this species.
Barn Swallow (<i>Hirundo rustica</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S2B,S2M/ 3 Sensitive	Typically nest on human-made structures such as abandoned buildings or barns and forages in open areas (COSEWIC 2011).	The species may use the PDA for foraging purposes; however, the PDA does not offer preferential habitat for this species.
Bobolink (<i>Dolichonyx oryzivorus</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S3B,S3M/ 3 Sensitive	Typically nest in lush meadows, open grasslands, and hayfields (COSEWIC 2010).	The PDA consists predominantly of young deciduous regrowth, and some mixed mature forest to the east and west. There are no large open agricultural fields, preferred by bobolink directly within the LAA, although there are open fields located within 5 km. The PDA does not provide preferential habitat for this species and it is unlikely that this species would use habitat within the PDA.
Canada Warbler (<i>Wilsonia canadensis</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S3B, S3M/ 1 At Risk	Typically breeds throughout Maritimes and southeastern Canada. Typical habitat includes a variety of forest types (COSEWIC 2008). They prefer wet mixed forest with well-developed shrub layer as well as regenerating areas.	The Project area is dominated by young deciduous regrowth, consistent with Canada warbler preferential habitat. A Canada warbler was observed foraging (incidentally) in a wetland (WL7) in the northwestern portion of the PDA during biological field studies in summer 2018, and has the potential to occur in areas within the LAA.

Table 5.6.1: Bird Species At Risk Historically Observed within 5 km of the Project (AC CDC 2018)

Species	Status*	Habitat	Potential to Occur in Project Area
Chimney Swift (<i>Chaetura pelagica</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S2S3B,S2M	Historically, the Chimney Swift used mainly large hollow trees for nesting sites but have adopted chimneys as preferred nesting sites. They are generally associated with urban and rural areas where chimneys are available for nesting and roosting. Chimney swifts are aerial foragers and tend to concentrate near water where insects are abundant (COSEWIC 2007a).	Although there are unlikely any large hollow trees suitable for this species within the PDA, there may be hollow trees or chimneys for nesting and roosting within the LAA. The watercourses within the PDA could provide marginal foraging habitat although it is expected that the nearby Hammond River would be selected as a preferred area for foraging.
Common Nighthawk (<i>Chordeiles minor</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S3B,S4M/1 At Risk	Common nighthawk typically breeds throughout the Maritimes and nests on the ground in open vegetation free habitats (COSEWIC 2007b).	The PDA is dominated by young deciduous regrowth. There are few vegetation free habitats directly within the PDA, however, there are open wetlands located in the northeastern portion of the PDA. The species was observed (incidentally) foraging during biological field studies in summer 2018, and has the potential to occur in areas within the LAA.
Eastern Wood-Pewee (<i>Contopus virens</i>)	COSEWIC: Special Concern SARA: Special Concern NB SARA: Special Concern NB S Rank: S4B,S4M	The Eastern Wood-pewee is often associated with the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in forest stands of intermediate age and in mature stands with little understory vegetation. During migration, a variety of habitats are used, including forest edges and early	The majority of the PDA is comprised of early successional regeneration or recent cut-over; therefore, it is unlikely that the Eastern wood-peewee would use the PDA for foraging or breeding purposes. However, they may use the area as a stopover during migration. There is potential for this

Table 5.6.1: Bird Species At Risk Historically Observed within 5 km of the Project (AC CDC 2018)

Species	Status*	Habitat	Potential to Occur in Project Area
		successional clearings (COSEWIC 2012a).	species to occur in areas of intermediate/mature stands within the LAA.
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S3B,S3M/1 At Risk	Typically breeds in coniferous edges and open areas with perches (e.g., forest openings near wetlands and clear-cuts) (COSEWIC 2007c)	The PDA consists of young deciduous regrowth, surrounded by mature coniferous dominant habitat with available wetland habitats. There is preferential habitat for this species immediately adjacent to the PDA and it is possible that this species may use areas within the LAA for foraging purposes.
Rusty Blackbird (<i>Euphagus carolinus</i>)	COSEWIC: Special Concern SARA: Special Concern NB SARA: Special Concern NB S Rank: S3B,S3M	Typically breeds in coniferous-dominated forests adjacent to wetlands, such as slow-moving streams, peat bogs, sedge meadows, marshes, swamps and beaver ponds (COSEWIC 2017).	The PDA may contain habitat suitable for breeding in the wetland area located at near the boundary of the PDA although these areas are not considered preferential habitat for this species.
Wood Thrush (<i>Hylocichla mustelina</i>)	COSEWIC: Threatened SARA: Threatened NB SARA: Threatened NB S Rank: S1S2B,S1S2M	Wood Thrush nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Large forest mosaics are preferred, but they may also nest in small forest fragments (COSEWIC 2012b).	The PDA consists predominantly of young deciduous regrowth, and some mixed mature forest to the east and west. The PDA does not provide preferential habitat for this species and it is unlikely that this species would use habitat within the PDA.

Notes: 1 S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (AC CDC 2018)

Environment and Climate Change Canada (ECCC) provides general avoidance information for migratory birds, including regional nesting periods during which most migratory bird species covered under the MBCA breed. The PDA is located in Breeding Zone C3, where most migratory birds breed from mid-April to late August each year (ECCC 2018b). However, it is noted that some avian species nest outside of this period, including corvids, crossbills, owls and waxwings.

Bird surveys were not conducted as a part of this assessment due to timing; breeding bird surveys will be conducted during the appropriate breeding bird window in Spring 2019, and the results will be presented within a supplementary report. However, during the August 2018 field surveys, Canada warbler and common nighthawk were incidentally observed in flight over the PDA at the locations provided on **Figure 5.6.1**.

5.6.2.2

Mammals

NBDERD's *General Status of Wild Species* (NBDERD 2018a) reports that there are 52 species of mammals known to occur within New Brunswick, and an additional seven which are extinct, extirpated or unverified. Of these 52 species, Canada lynx is listed as "Endangered" under the federal SARA and NB SARA, Gaspé shrew (*Sorex gaspensis*) is listed as "Special Concern" under Schedule 3 of SARA, and three bat species are listed as "Endangered", including the little brown bat (little myotis; *Myotis lucifugus*), northern long-eared bat (northern myotis; *Myotis septentrionalis*), and eastern pipistrelle (tri-coloured bat; *Perimyotis subflavus*) under the federal SARA.

A review of the AC CDC database (AC CDC 2018) indicated that there are no records of federally or provincially protected mammals, and that no hibernaculum has been reported to be within 5 km of the PDA.

Incidental observations of wildlife signs recorded during 2018 field surveys included: Eastern coyote (*Canis latrans*) scat; moose (*Alces alces*), White-tailed deer (*Odocoileus virginianus*), and snowshoe hare (*Lepus americanus*) pellets. A racoon skull was observed during the vegetation and wetlands survey on August 14, 2018. Two white-tailed deer were observed in the PDA during the noise monitoring field program on September 25, 2018. White-tailed deer use a wide variety of habitats throughout most of the year but depend on deer wintering areas during the winter months (GNB 2018a). The PDA does not provide suitable deer wintering habitat due to the limited amount of canopy cover throughout most of the property.

A review of GIS layers containing locations of known and potential bat hibernacula (i.e., abandoned mines and caves) in southern New Brunswick indicates that the potential for hibernacula exists within 5 km of the Project site. Observations made during the 2018 field surveys confirm that there are no caves or abandoned mine openings within the PDA, and no bats were incidentally observed.

5.6.2.3

Invertebrates

Lists of butterfly and odonate (dragonfly and damselfly) species in New Brunswick is maintained in the NBDERD's *General Status of Wild Species* database (NBDERD 2018a). The database currently lists 80 butterfly and 131 odonate species known to occur in the province. Of these species, one (Maritime

ringlet) is considered to be “At Risk”, 15 (4 butterflies and 11 odonates) are considered “May be At Risk”, and 13 (one butterfly and 12 odonates) are considered “Sensitive”. The cobblestone tiger beetle (*Cicindela marginipennis*), Maritime ringlet (a butterfly), and skillet clubtail (an odonate) are listed as “Endangered” under SARA, while the monarch butterfly and pygmy snaketail (an odonate) are considered to be SOCC. The Maritime ringlet is listed as “Endangered” under the NB SARA.

A review of the AC CDC database (AC CDC 2018) indicated that there are no records of federally or provincially protected invertebrates within 5 km of the Project area.

Autumn meadowhawks (*Sympetrum vicinum*) were incidentally observed in the PDA during the wetland and vegetation surveys completed on August 14 – 16, 2018.

5.6.2.4 Herpetiles

NBDERD’s *General Status of Wild Species* database (NBDERD 2018a) reports that there are 7 reptile and 16 amphibian species known to occur in New Brunswick. Of these species, one (wood turtle) is considered to be “At Risk” and one (dusky salamander) is considered “Sensitive”. No terrestrial reptiles or amphibians are listed under the NB SARA. Under the federal SARA, the wood turtle is listed as “Threatened”, and the snapping turtle is considered a SOCC.

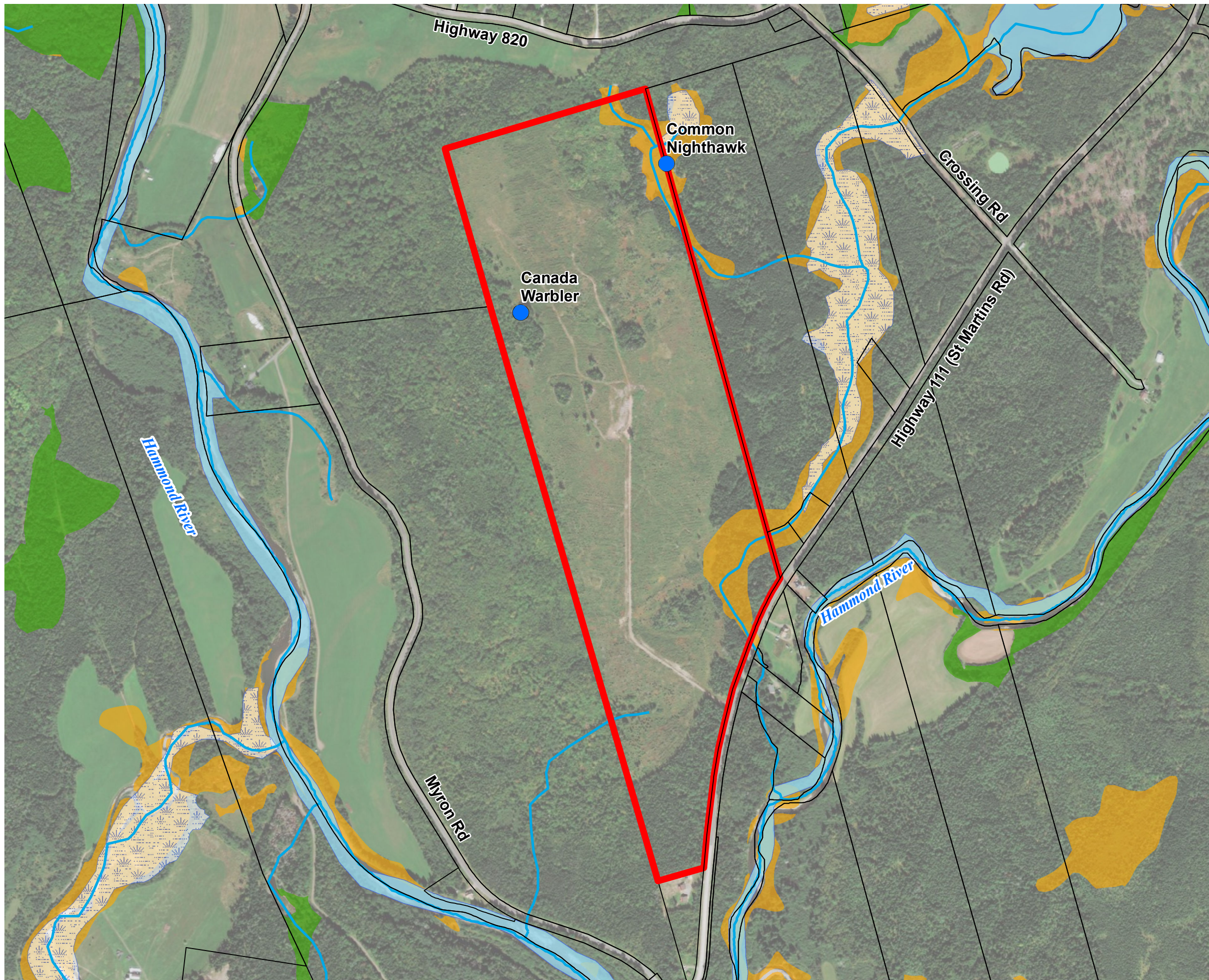
Snapping turtles generally inhabit ponds, sloughs, streams, rivers, and shallow bays that are characterized by slow moving water, aquatic vegetation, and soft, muddy bottoms. Wood turtles are generally associated with watercourses and the riparian habitats associated with them. Individuals nest on sandy and gravelly riverbanks but will also make use of other features such as sand pits and road embankments near watercourses that provide a sandy or gravelly substrate. Both snapping turtles and wood turtles are known to overwinter in deep pools in larger rivers and in deep ponds. The Hammond River provides the nearest turtle overwintering habitat to the Project Area. It is possible that individuals of each species could wander upstream on tributaries from the Hammond River to foraging areas at or near the PDA during the summer season.

A review of the AC CDC database (AC CDC 2018) indicated that there are no records of federally or provincially protected terrestrial reptiles or amphibians within 5 km of the Project area. No turtle species or evidence of turtle presence was observed during 2018 field studies.

Wood frog (*Rana sylvatica*) and eastern red-backed salamander (*Plethodon cinereus*) were incidentally observed within the PDA during the fish and fish habitat field surveys completed on August 29 – 30, 2018.

5.6.2.5 Environmentally Sensitive Areas

The site-specific AC CDC report (AC CDC 2018) was obtained for the Project area that provides historical flora and fauna species occurrence, as well as environmentally sensitive or managed areas within 5 km of the PDA’s centre point.



HAMMOND RIVER HOLDINGS LTD.
 PROPOSED UPHAM EAST GYPSUM QUARRY

INCIDENTAL WILDLIFE OBSERVATIONS
 FIGURE 5.6.1

- SAR BIRD OBSERVED (AUG 2018)
 - PROPERTY BOUNDARY
 - PROJECT DEVELOPMENT AREA
 - GEO NB MAPPED WATERCOURSE
 - REGULATED WETLANDS
- NBDELG DRAFT BETA WETLAND MAPPING (UNREGULATED)**
- PROVINCIALY SIGNIFICANT WETLANDS
 - INTERMEDIATE WETLANDS
 - FORESTED WETLANDS



MAP DRAWING INFORMATION:
 DATA PROVIDED BY DILLON CONSULTING LIMITED, CANVEC
 SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, INTERMAP, INCREMENT
 P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL,
 ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISS
 TOPO, OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

MAP CREATED BY: BQS
 MAP REVISED BY: JH
 MAP CHECKED BY: AS
 MAP PROJECTION: NAD_1983_CSRS_New_Brunswick_Stereographic

FILE LOCATION: \\DILLON.CA\DILLON_DFS\FREDERICTON\FREDERICTON CAD\CAD\GIS\188346 UPHAM GYPSUM QUARRY\MXD



PROJECT: 18-8346
 STATUS: FINAL
 DATE: OCT 2018

According to the AC CDC records review and desktop analysis conducted to support this EIA Registration document, there are no biologically significant areas within 5 km of the Project footprint. The closest managed area is the Hanford and Porters Brook Sandstone Beds ESA, located approximately 1 km to the southwest of the Project area (AC CDC 2018). There are also no provincially identified deer wintering areas.

The PDA does not provide identified unique or limited habitat and is not located within a defined Environmental Sensitive Area or other provincially regulated or protected area.

5.6.3 Environmental Effects Assessment

As part of the desktop assessment, the habitat requirements of wildlife species identified as potentially occurring within and/or near the Project area were compared to the range of environmental conditions within the Project area to determine if suitable habitat was present for these taxa. Knowledge of the habitats present within the Project area was determined through an interpretation of aerial photography, topographic and geological mapping, as well as information obtained through field reconnaissance efforts (**Section 5.5**). In instances where appropriate habitat was present for a particular species, that taxon was considered to be potentially present in the Project area, mitigation identified and potential impacts assessed, and the habitat is identified as a target for 2019 confirmatory field surveys.

5.6.3.1 Potential Effects

A number of activities (i.e., vegetation clearing, grubbing, blasting) related to the Project have the potential to interact with wildlife and wildlife habitat. Potential effects on wildlife include direct mortality, habitat loss, and fragmentation. These potential effects are discussed in this section.

Migratory Birds

The primary possible effects to birds due to the proposed Project development include habitat loss and fragmentation, destruction of nests, direct mortality due to collision, and noise disturbance. The purpose of the desktop review and reconnaissance field work aimed to refine constraints mapping by identifying protected species, habitats or features (such as a colony tree or raptor nest) to ensure effective mitigation during construction phases in order to be compliant with federal and provincial legislation.

The Project may interact with birds and bird habitat in the following ways:

- Construction activities may alter or destroy migratory bird habitat;
- Activities may destroy or alter habitat for bird SAR or SOCC;
- Noise from Project activities may deter birds from migrating into and using the Project area;
- Vegetation clearing and grubbing activities may destroy bird nests and breeding habitat (including SAR/SOCC), and result in habitat fragmentation;
- Noise from Project activities may result in the abandonment of nests or increased rates of predation and exposure of hatchlings and eggs during temporary abandonment; and,

- There is the potential for bank swallows to establish colonies in vertical banks or areas of stockpiled soils comprised of sandy material and to be directly disturbed by project activities.

In addition, the operation of the Project may result in sensory disturbance to and avoidance by birds due to noise and human activity, and incidental bird collisions with vehicles travelling on the new roads.

Mammals

The Project may interact with wildlife (fauna) and their habitat in the following ways:

- Clearing and grubbing of vegetation (habitat) during construction will cause a change in vegetation (flora) quality and/or quantity (i.e., a disturbance to wildlife habitat);
- The Project footprint will cause loss of immature (and limited mature) vegetation that provide habitat for wildlife;
- Disturbance from vehicles and construction equipment may cause wildlife avoidance or disruption of wildlife activity (such as breeding and/or feeding);
- Noise, dust, combustion fuel emissions, and vibration may cause a disturbance to wildlife species during the Project;
- Mobile equipment use during the construction or operation activities may cause direct injury or death of wildlife, particularly to small wildlife such as rodents and shrews, through collisions or destruction of dens and food sources;
- Medium and large sized mammals are unlikely to suffer direct mortality from Project activities as they would flee the area in response to human presence and noise. However, such avoidance of behaviour could result in changes to normal movements, migrations, and other life cycle processes; and,
- Following vegetation clearing, there will be local habitat fragmentation while the quarry is operational, making it difficult for mammals to move from one side of the quarry to the other due to lack of cover and increased risk of predation.

In addition, the operation of the Project may result in wildlife encounters, sensory disturbance to and avoidance by wildlife due to noise and human activity, and incidental wildlife collisions.

Herpetiles

The Project may interact with herpetiles and their habitat in the following ways:

- Following vegetation clearing, there will be local habitat fragmentation while the quarry is operational, making it difficult for herpetiles to move from one side of the quarry to the other due to lack of cover and increased risk of predation; and,
- Loss of foraging habitat may occur from wetland alterations, should they be used for such purposes.

It is possible (though unlikely) that wood turtles and snapping turtles could wander upstream along tributaries from the Hammond River to foraging areas at or near the Project area during the summer

season. The main threat to these species is from vehicular collisions which effects adult survivorship, which in turn greatly influences population sizes.

5.6.3.2

Mitigation

The following mitigation measures are planned to reduce environmental effects on wildlife and wildlife habitat.

Migratory Birds

- Clearing and grubbing activities will be scheduled to the extent possible outside of the normal breeding bird and migratory bird season (April 1 to August 31) to ensure that eggs and flightless young are not inadvertently harassed or destroyed. At a minimum, if complete avoidance of these activities during the specified timeframe is not feasible, nest searches will be undertaken by a qualified biologist and avoidance setbacks will be established around active nests. Nest searches will only be completed following consultation with Environment and Climate Change Canada;
- If there is a delay between clearing and operational activities such that Project operations are initiated during the breeding season, nest surveys will be conducted by experienced biologist or forester for the purpose of determining the presence and activities of birds, such as the common nighthawk, which are known to target cleared areas for nesting purposes;
- On-site workers will receive training and reference material that will help them identify species that could be attracted to habitats created by Project operations (e.g., common nighthawk and bank swallow). If workers encounter birds that they suspect may be nesting within the Project area, a biologist will be contacted to determine whether nesting is occurring and to locate the nest. Note: nests should not be flagged since this increases the probability of predation;
- If a nest is found within Project area, an appropriate setback will be established around the nest in which humans activities will be restricted until the young fledge and leave the area or until the nest naturally fails; and,
- If a species at risk is encountered, contact will be made to a Species at Risk Biologist at NBDERD at (506) 453-5873 or by email.

Mammals

- Because of past forestry activities throughout the Project area, it is unlikely that species particularly sensitive to human activities currently reside in the immediate Project area.

Herpetiles

- The most suitable habitat along tributaries upstream of the Hammond River for foraging turtle species is located approximately 300 m east of the PDA. This area will be preserved and a mature coniferous dominant upland forested area is between the tributary and its riparian area and the Project footprint.

5.6.3.3

Characterization of Residual Effects

Development of the Project will result in vegetation clearing and the loss of some immature and mature vegetation in the immediate Project area. Although the vegetation may provide habitat for wildlife species, the Project is located within an area recently clear cut for forestry purposes, and as such, the habitat offered by the vegetation to be cut is not likely preferred by most wildlife species. Further, there exists ample vegetation and forested land in proximity to the Project for wildlife species to use as higher value habitat than that affected by the Project.

AC CDC records indicate that no mammal or herpetile species at risk (SAR) have been historically observed within 5 km of the Project location, and no mammal or herpetile SAR were identified by Dillon biologists during the field surveys conducted for the Project. However, two bird SAR, common nighthawk and Canada warbler, were observed incidentally while in-flight over the PDA. Therefore, a direct interaction of SAR with the Project is not anticipated. Project activities are likely to result in sensory disturbance to wildlife and thus wildlife is likely to avoid the areas where Project activities are to take place, thereby limiting the potential for wildlife encounters, injury, or mortality of wildlife species. Operation of the site access road and internal roads as well as other activities (e.g., crushing) will result in some noise and likely avoidance by wildlife. Given the relatively limited area of disturbance associated with the Project, and the environmental setting of the Project including being largely on previously disturbed land, substantive interactions between the Project and wildlife and wildlife habitat are not anticipated.

Although the vegetation in the PDA may provide habitat for bird species, including SAR (e.g., common nighthawk, Canada warbler, and olive-sided flycatcher), the Project is located in a larger surrounding area with ample vegetation and forested land for bird species to use as higher value habitat than that affected by the Project. Development of the Project is likely to result in sensory disturbance to birds and thus birds are likely to avoid the areas where construction activities are to take place, thereby limiting the potential for injury or mortality of bird species. Operation of the new access road and quarry and related operations will result in some noise and likely avoidance by birds. Given the relatively limited area of disturbance associated with the Project, the environmental setting, past use of the project footprint, and implementation of the mitigation measures outlined in **Section 5.6.3.2**, substantive interactions between the Project and birds and bird habitat are not anticipated.

Following the completion of the operation of the Project, the PDA will be reclaimed and restored to as near natural conditions as possible, thereby returning the Project site to a state where it can, over time, provide habitat for wildlife species.

5.6.4

Summary

Assuming application of the mitigation measures described above, including conducting vegetation clearing activities outside of the Environment and Climate Change Canada recommended timing window for the Project location to facilitate compliance with the MBCA, and a worker education program for identifying species at risk and species of conservation concern, the residual environmental effects of the Project on wildlife and wildlife habitat during all phases of the Project are rated not significant, with a

moderate level of confidence. Confirmatory avian surveys to be conducted in Spring and Summer 2019 to confirm the results of the desktop evaluation (in a separate supplemental report) will increase the level of confidence of this prediction.

Based on a consideration of existing conditions and likely residual effects of the Project, no monitoring programs are currently recommended for wildlife and wildlife habitat, with the exception of the confirmatory avian surveys mentioned previously.

5.7 Socioeconomic Environment

The potential environmental effects of the Project on the socioeconomic environment are assessed in this section.

5.7.1 Scope of VC

The Project has the potential to interact with the socioeconomic environment, which includes land and resource use, and employment and the local economy. These potential interactions are of concern to regulatory agencies, non-governmental organizations, and the general public because they can have a direct influence on the everyday lives of those living and working in the vicinity of a project.

The main components of the socioeconomic environment are defined as follows.

- Land and resource use refers to current and future uses of public and private land and resources. It includes uses such as industrial, commercial, and residential use, property ownership (including potential nuisance effects), and the use of land and resources for recreational purposes.
- Employment and economy refers to the labour market and availability, employment, employment income, business income, and their aggregate influence on the local, regional and provincial economies.

The scope of this VC includes potential interactions of the Project with residential, agricultural, forestry recreation, and transportation land uses; and the employment and economic conditions. The scope of the assessment is based on applicable regulations and policies, anticipated issues and concerns, existing knowledge of the area, and anticipated potential interactions.

5.7.1.1 Temporal Boundaries

The temporal boundaries for the Project include the following:

- Construction: extending for a period of approximately six months, anticipated to begin in the second quarter of 2019 (subject to the receipt of all approvals and permits required for the Project);
- Operation: beginning in approximately the fourth quarter of 2019, and lasting for approximately 10 years or until the mineral resource has been depleted; and,

- Reclamation and closure: To be initiated following the completion of operations at the site, with decommissioning and reclamation of the surface facilities at the site for an anticipated duration of six months following operation.

5.7.1.2 Spatial Boundaries

The Project Development Area (PDA) is defined as the area of physical disturbance associated with construction and operation of the Project. Specifically, the PDA consists of an area of approximately 61.81 ha (i.e., conservatively assumed to be the entirety of PID No. 00149013) that includes the open pit and all related surface facilities located on the property. The PDA is the area represented by the physical Project footprint.

The Local Assessment Area (LAA) is the maximum anticipated area within which Project-related environmental effects are expected. For the socioeconomic environment, the LAA includes the local communities of Upham, Hanford Brook, and Upperton. The LAA includes the PDA and any adjacent areas along the preferred transportation route where Project-related environmental effects could be expected to occur.

5.7.1.3 Significance Threshold

Significance thresholds are defined for a change in land and resource use and a change in employment and economy, as follows.

A significant adverse residual environmental effect of the Project on land and resource use is one where the Project directly results in an uncompensated loss of land-based resource value or permanent change in regional access (current) or future opportunities to develop land-based resources.

A significant adverse residual environmental effect of the Project on employment and the local economy is one that results in a Project-related sustained long-term decreased level in employment and economic activity in the community, region or province. A significant positive residual environmental effect of the Project on employment and the local economy is one that results in a Project-related sustained increased level of employment and economic activity in the community, region, or province.

5.7.2 Existing Conditions

Existing socioeconomic conditions in the LAA are described in this section.

5.7.2.1 Land and Resource Use

The Project is located in the small community of Upham, Upham Parish, Kings County, in Southern New Brunswick (**Figure 1.1.1**). Like other communities in the LAA, Upham is a sparsely populated rural community with land use generally focused on residential, forestry, and agricultural uses.

Local Government Structure

There are twelve service regions in New Brunswick directed by Regional Service Commissions (RSC) that are responsible for delivery of local land use planning, solid waste management, and sports and

recreation services. Each commission is made up of representatives from the area's incorporated municipalities and incorporated Local Service Districts (LSDs).

The PDA is located within the RSC 8, which is comprised of 14 LSDs, the Villages of Norton and Sussex Corner, and the Towns of Sussex and Hampton. Refer to **Figure 5.7.1** for an illustration of the boundaries of RSC 8. The Project site is located within the LSD of Upham.

Land Use Planning

Development in Upham Parish is not guided by a Rural Plan or Basic Planning Statement; however, development projects are subject to provincial regulations and permitting and inspections is managed by RSC 8. Existing land uses in the LAA are shown in **Figure 5.7.2**.

Residential Land Use

Residential land use in the vicinity of the PDA is a linear pattern along the main roads, primarily Route 820 and Route 111. A point file of dwellings was created based on aerial imagery, and approximately 20 residential dwellings are located within a 1 km radius of the PDA. Statistics Canada's 2016 Census for Upham Parish indicates that the number of dwellings occupied by usual residents is 521, while the total number of private dwellings is 579 (Statistics Canada 2017).

Commercial Land Use

There is one small home-occupation business listed in the Yellow Pages and commercial websites that specializes in spa sales located near the PDA, on Route 820. It would appear that this commerce is limited to a home office and not a larger place of business.

Institutional Land Use

The Upham Volunteer Firefighter Hall is located at 2268 Route 820 in Upham, approximately 4 km from the PDA. Other institutional land uses within the general vicinity are limited to local churches and community halls.

Though they have no facilities located in the LAA, policing services are provided by the Royal Canadian Mounted Police (RCMP), with the nearest detachments located in Hampton and Sussex. Emergency medical services are provided by Ambulance New Brunswick with stations in Hampton, Sussex, and St. Martins. Health Services are provided by the Horizon Health Network, with the nearest hospitals located in Saint John.

Industrial Land and Resource Use

Industrial land uses in the general vicinity of the PDA are limited to small scale pit and quarry operations. The former Cassidy Lake potash mine was located approximately 12 km northeast of the PDA at Clover Hill, but was decommissioned in 1997; however, some limited buildings remain, and the tailings pond remains active.

Agricultural Land Use

Agricultural uses in the general vicinity of the PDA are primarily pasture and hay fields and occasional livestock farms.

Forestry Land and Resource Use

Forestry is an important industry in New Brunswick and occurs to varying degrees throughout the rural regions in the southwest of the province. The PDA itself has been the subject of forest harvesting in the past 10 years, and active woodlots are clearly evident on nearby properties.

Recreational Land and Resource Use

While there is no recreation-related infrastructure within the general vicinity of the PDA, the Hammond River is a primary water feature and recreational asset in the parish and in proximity of the PDA. The river is a recreational resource for angling and is located within Recreational Fishing Area (RFA) 6—Lower Saint John. Sportfish species found in waters in RFA 6 include brook trout, landlocked salmon, and smallmouth bass (NBDERD 2018b). The PDA is situated in wildlife management zone 23 and hunting, trapping and snaring are permitted in the area, with the exception of any Protected Natural Areas (NBDERD 2017). A number of all-terrain vehicle and snowmobile trails are likely also present in the LAA.

Transportation Land Use

Route 111 is the primary transportation route through Upham Parish. Route 111 runs between Sussex and St. Martins and connects with Loch Lomond Road in the City of Saint John. Secondary routes include Route 820 which connects Loch Lomond and Upperton east of the PDA, and Route 865 connecting Norton to Hillsdale.

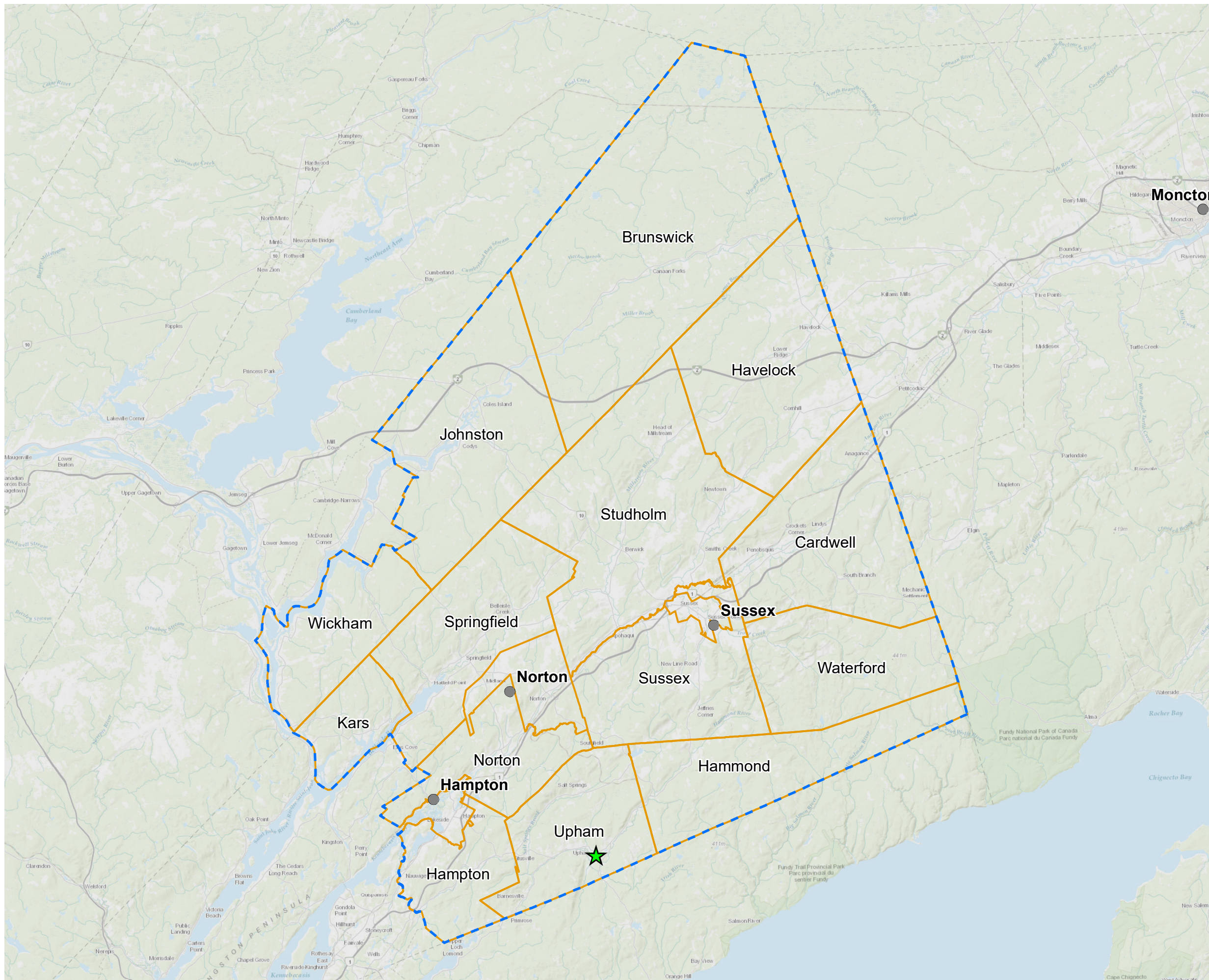
There are no active rail lines or airfields in Upham Parish. The nearest operational rail line is a Canadian National (CN) Rail line which runs between Moncton and Saint John. There is a CN-owned non-operational spur line between Moosehorn Siding (south of Norton) and the former Cassidy Lake Potash mine. The Saint John Airport is located in Loch Lomond 25 km west of Upham, and another airfield is located in Sussex approximately 23 km northeast of Upham.

5.7.2.2

Employment and Economy

Population

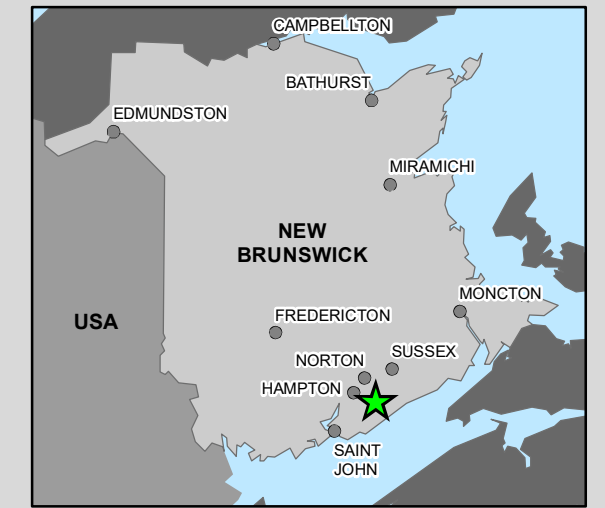
According to the Statistics Canada 2016 Census Profile for Upham Parish Census Subdivision (the smallest census division available for the Project location), the total population in 2016 was 1,269, down 2.8% from 1,306 in 2011. The population density of the parish is 6.7 persons per square kilometre, compared to 10.5 for the province. **Table 5.7.1** shows the distribution by age category for the 2011 and 2016 census years. The age distribution of people living in Upham Parish for the 2016 Census indicates that the largest proportion of the population is in the 25-54 age group, followed by the 0-24 age group. Both of those age groups have decreased between the 2011 and 2016 Census years, while the number of people aged 55 and over have increased (Statistics Canada 2012; 2017).



**HAMMOND RIVER HOLDINGS LIMITED
PROPOSED UPHAM EAST GYPSUM QUARRY**

**REGIONAL SERVICE COMMISSION 8 BOUNDARIES
FIGURE 5.7.1**

-  PROJECT LOCATION
-  MAJOR CITIES AND TOWNS
-  REGIONAL SERVICE COMMISSION (RSC) 8
-  LOCAL SERVICE DISTRICTS (LSD)



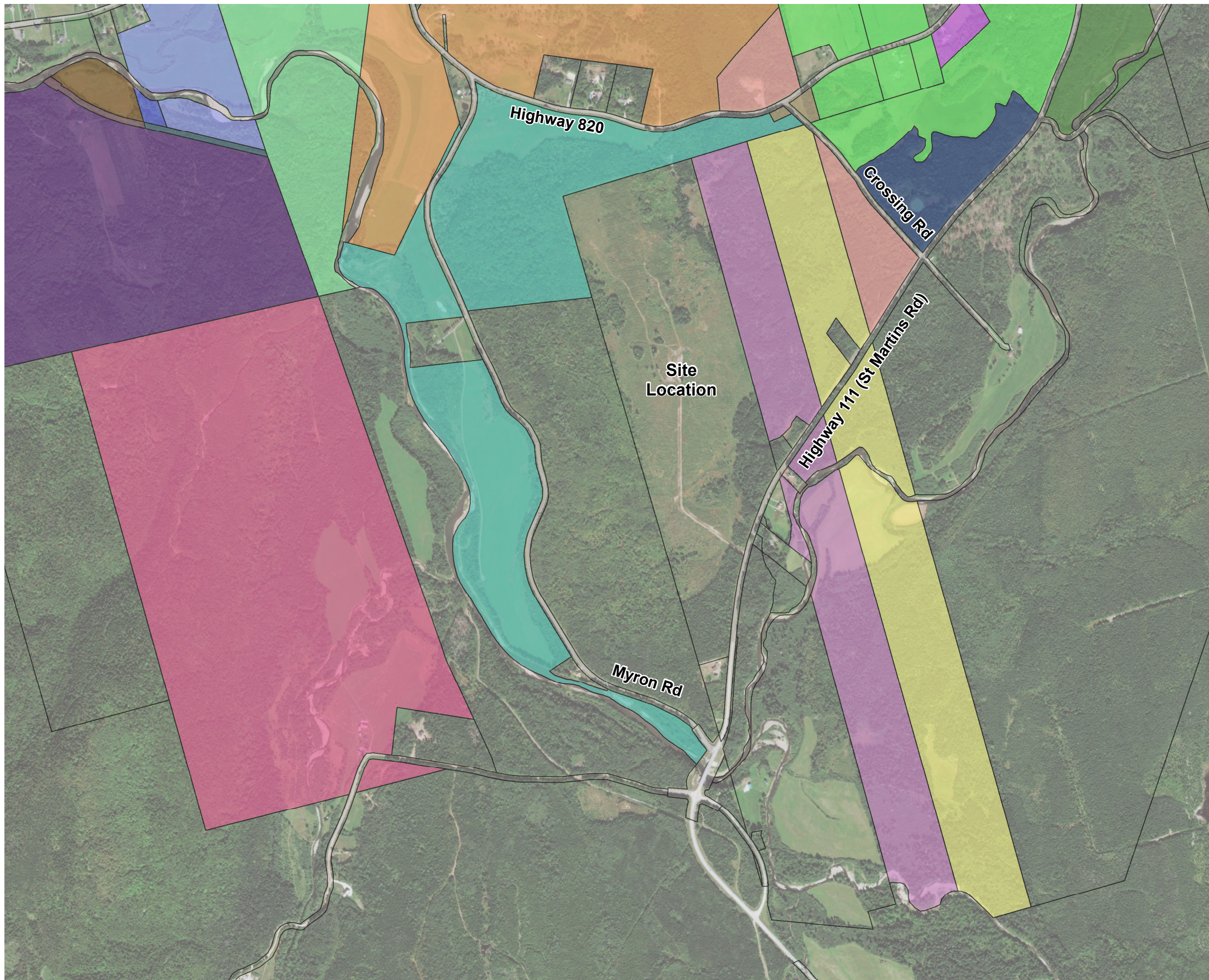
MAP DRAWING INFORMATION:
 DATA PROVIDED BY DILLON CONSULTING LIMITED,
 SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, INTERMAP, INCREMENT
 P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEBCO, IGN, KADASTER NL,
 ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISS
 TOPO, OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

MAP CREATED BY: SCM
 MAP CHECKED BY: DM
 MAP PROJECTION: NAD_1983_CSRS_New_Brunswick_Stereographic

FILE LOCATION: \\DILLON.CAD\DILLON_DFS\FREDERICTON\
 FREDERICTON CAD\CAD\GIS\188346 UPHAM GYPSUM QUARRY\MXD



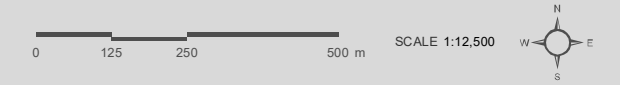
PROJECT: 18-8346
 STATUS: FINAL
 DATE: OCT 2018



HAMMOND RIVER HOLDINGS LTD.
 PROPOSED UPHAM EAST GYPSUM QUARRY

LAND USE IN THE LOCAL ASSESSMENT AREA
 FIGURE 5.7.2

- LAND USE
- FARMLAND - CULTIVATED (FARMLAND & WOODLOT)
 - FARMLAND - PASTURE (BUILDINGS & LAND)
 - HOG FARMS (GRAIN BIN & LAND)
 - MIXED FARM (RESIDENCE BUILDINGS & LAND)
 - MIXED TYPE FARMS (BUILDING & LAND)
 - MIXED TYPE FARMS (BUILDINGS & LAND)
 - MIXED TYPE FARMS (VACANT LAND)
 - MIXED TYPE FARMS (VACANT LAND)
 - MIXED TYPE FARMS (VACANT)
 - MOBILE/MINI HOMES AND LAND (VACANT)
 - RECREATION LAND - UNIMPROVED (VACANT)
 - RECREATIONAL LAND - UNIMPROVED (VACANT LAND)
 - RESIDENTIAL IMPROVED (RESIDENCE & LOT)
 - RESIDENTIAL IMPROVED (RESIDENCE & LAND)
 - RESIDENTIAL LOTS - SERVICED (ABANDONED RAILWAY LINE)
 - RESIDENTIAL LOTS - SERVICED (VACANT LAND)
 - RESIDENTIAL LOTS - SERVICED (VACANT LOT)
 - TIMERLAND (VACANT LAND)
 - NO LAND USE



MAP DRAWING INFORMATION:
 DATA PROVIDED BY DILLON CONSULTING LIMITED, CANVEC
 SERVICE LAYER CREDITS: ESRI, HERE, GARMIN, INTERMAP, INCREMENT
 P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEBCO, IGN, KADASTER NL,
 ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISS
 TOPO, OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

MAP CREATED BY: JH
 MAP CHECKED BY: AS
 MAP PROJECTION: NAD_1983_CSRS_New_Brunswick_Stereographic

FILE LOCATION: \\DILLON.CAD\DILLON_DFS\FREDERICTON\FREDERICTON CAD\CAD\GIS\188346 UPHAM GYPSUM QUARRY\MXD



PROJECT: 18-8346
 STATUS: FINAL
 DATE: OCT 2018

Table 5.7.1: Age Group Distribution for Upham Parish for 2011 and 2016

Age Group	2011 Census Year	% of Total	2016 Census Year	% of Total	Change 2011-2016
0-24	390	29.77%	350	27.78%	-40
25-54	550	41.98%	475	37.70%	-75
55-64	185	14.12%	220	17.46%	35
65+	185	14.12%	215	17.06%	30
Total	1310		1260		

Note: Age group totals differ from population totals.

Source: Statistics Canada (2012); Statistics Canada (2017).

Employment and Economy

The Project is located in the Southwest Economic Region which includes Saint John, Kings, and Charlotte Counties. The City of Saint John is the economic centre of the region and holds the largest population in the Southwest Region.

Few people living in Upham Parish work in the parish. The majority (94%) of residents who commute to their place of employment travel outside of the parish to work, and approximately 55% commute outside of Kings County to work. Statistics Canada employment figures for the 2016 Census indicate that the construction industry is the largest employment sector for Upham Parish at 21%, followed by health care and social assistance care and retail trade sectors at 11% and 10%, respectively (Statistics Canada 2017).

5.7.3 Environmental Effects Assessment

The environmental effects of the Project on the socioeconomic environment are assessed below.

5.7.3.1 Potential Effects

Without mitigation, the mechanisms by which the Project could interact with the socioeconomic environment are discussed below.

Effects on Residential Land Use

Construction of the Project and quarrying activities during operation have the potential to affect nearby residences as a result of light, noise, and dust generated by equipment operation and blasting. Ground vibration and fracturing of bedrock from blasting has the potential to damage private property.

The interaction of the Project with water resources are discussed in **Section 5.3**.

The Project may have a negative effect on residential property values due to elevated noise levels and increased truck traffic as well as perceived effects on aesthetic value of the area.

Effects on Commercial Land Use

Effects on the single home-based business (if in existence) are expected to be similar to those on residences in that vicinity.

Effects on Institutional Land Use

Accidents or malfunctions associated with construction and operation of the Project have the potential to result in an increase in calls for the Upham Volunteer Fire Department, as well as other emergency response organizations whose geographic area of response includes the preferred transportation route. Accidents and malfunctions are assessed in **Section 7.0**.

Effects on Industrial Land and Resource Use

Given the limited amount of current industrial land use in the LAA, no interactions are anticipated as a result of the Project on industrial land use.

Effects on Agricultural Land Use

The Project may indirectly affect local agriculture if surface or groundwater resources are adversely affected as a result of Project activities as those water sources may be used for irrigation or livestock consumption.

Effects on Forestry Land and Resource Use

The PDA was cleared in 2010, and no additional land is anticipated to be required for the Project, and as such no interactions with forestry are anticipated.

Effects on Recreational Land and Resource Use

The Project will result in the unavailability of the PDA for use for recreational hunting, trapping or gathering, with such potential uses returning following closure. The Project could interact with recreation in the event that sediment-laden water were to enter the Hammond River. Sediment deposition may alter fish habitat by affecting spawning beds, rearing habitat, winter or summer refuge or by affecting food species.

Effects on Transportation Land Use

Traffic volumes on local roads are not expected to change significantly during the construction phase of the Project. Construction equipment will be mobilized to the site at the start of construction and will be removed once it is no longer required.

During operation, approximately 35-40 trucks per day will be added to the existing traffic on the preferred transportation route. An increase in traffic volume on the preferred transportation route has the potential to reduce the current level of service on roads used for the Project leading to traffic delays, result in degradation of the infrastructure due to higher than normal loads, and result in an increase in the rate of vehicle collisions.

Effects on Employment and Economy

The Project will generate employment for up to 10 employees or contractors, and provide the local wallboard industry with a secure and financially viable source of natural gypsum needed to continue operations over the long term, rather than relying on a diminishing supply of synthetic gypsum or the

financially unviable alternative of importing natural gypsum from Nova Scotia. Through generation of new employment and maintaining existing jobs at local wallboard facilities, with spin-off employment for third party contractors, the effect of the Project on employment and economy of the region is expected to be an overall positive one.

5.7.3.2 Mitigation

Mitigation measures to reduce the environmental effects of the Project on the socioeconomic environment are identified below.

Residential Land Use

- Hammond River Holdings is committed to engaging with local residents prior to construction to identify and consider areas of concern related to the Project.
- Vehicles and equipment will be well muffled and maintained, and dust suppression will be applied to internal site roads during dry periods.
- The initial 30 m of access road between Route 111 and the security gate will be paved to minimize the transport of dust and mud from internal site roads to the provincial highway network.
- Where possible, efforts will be made to maintain as much mature vegetation that remains along the edges of the site as possible, so as to act as a visual and acoustic buffer.
- Blasting activities will be limited to approximately 25 blasts per year as an annual average (excluding nights, weekends, and statutory holidays), and a communication plan will be developed for residents who wish to be notified. Crushing operations will be conducted mostly within the open pit to minimize noise levels. Given that blasting, crushing, and material handling operations within the open pit will be conducted at depth (i.e., on benches within the pit and below the surrounding ground surface, rather than at ground surface), topography and the presence of the pit walls will further reduce the off-site transport of noise emissions. Periodic pre-blast surveys will be conducted at the nearest residences, and blasts will be periodically monitored using seismographs to ensure that concussion noise levels do not exceed a peak pressure level limit of 128 decibels (dBL) and that peak particle velocities (PPV) remain within 1.25 cm/s, as a best industry practice for quarry operations.
- Directional lighting will be used on site with a downward lateral focus to minimize light leaving the site.

Commercial and Institutional Land Use

- There are no commercial or institutional facilities within the LAA that would be expected to interact with the Project except for accidents and malfunctions, thus no mitigation is proposed. Regarding potential effects on emergency response services related to the PDA or LAA, refer to **Section 7.0** for a discussion of mitigation related to accidents, malfunctions and unplanned events.

Agricultural Land Use

- Though there are agricultural operations in the LAA, there are no known groundwater or surface water supplies within 1 km of the PDA that could interact with the Project; thus no residual effects are expected and no mitigation is proposed. An assessment of the environmental effects and the Project design and mitigation measures planned to address Project effects on water resources is provided in **Section 5.3**.

Forestry Land and Resource Use

- The PDA was cleared in 2010, and no additional land is required for the Project, and as such no interactions with forestry are anticipated. Thus no residual effects are expected and no mitigation is proposed.

Recreational Land and Resource Use

- The PDA is privately-owned and represents a relatively minor loss of potential land available for hunting, fishing, or trapping relative to the terrestrial wildlife habitat in the region.

Transportation Land Use

- The preferred transportation route was selected because it enables the transportation of larger payloads (i.e., 62,500 kg GVM) for most of its length compared to other possible trucking routes. Hammond River Holdings will work with the NBDTI to conduct a condition assessment of a 9 km section of Route 111 to confirm its weight bearing capacity.
- Using larger payloads (if possible) enables fewer trips than would be possible on other trucking routes.
- Truck drivers will adhere to posted speed limits and warning signage and adjust driving to meet weather and road conditions.
- It is possible that oversized loads (very wide or heavy loads) will be required for equipment used during construction and operation. Transportation of these loads on public roads may require special permits from NBDTI and may require special markings, lead and follow vehicles, and temporary traffic interruptions.
- All necessary permits will be obtained and industry best practices will be followed for special moves or traffic interruptions on public roads.
- Transportation accidents and collisions are addressed in **Section 7.0**.

Employment and Economy

- No mitigation is proposed.

5.7.3.3

Characterization of Residual Effects

The residual environmental effects of the Project after the application of mitigation are assessed in this section.

Residential Land Use

The Project will result in the emission of dust, air contaminants, noise and vibration emissions that could cause a nuisance to off-site receptors, thereby affecting residential land use. Given the nature of the Project, the distance of the Project operations to the nearest residences, and the mitigation to be employed (including notably the use of dust suppression, the maintenance of acoustic buffers, the conduct of operations within the open pit below ground surface, conducting intrusive activities during daylight hours Monday to Friday, and other measures), the Project is not expected to result in the undue emission of air contaminants at nearby residential properties. Blasting activities will be carefully controlled and limited to once or twice per week and residents will be notified prior to the blasts to minimize nuisance. Damage to property from Project operations (particularly blasting) are not expected as long as concussion noise levels do not exceed a peak pressure level limit of 128 decibels (dBL) and that peak particle velocities (PPV) remain within 1.25 cm/s, as a best industry practice for quarry operations. Refer to **Section 5.2** for a discussion on residual effects of noise and dust generation from the Project.

With respect to compatibility of land uses, the Project site has been used for forestry operations in the past, and the development of other resource extraction activities on the same site is believed to be compatible with past and present land uses in the area.

Effects on property values are more difficult to determine, since the literature relating property values to proximity to industrial facilities is uncertain. Some studies suggest that proximity to an industrial facility may result in a decline in property values due to nuisance effects and potential damage, whereas others suggest that property values may increase if present near an industrial operation because workers tend to wish to live near where they work. As such, given the lack of clear outcomes in the literature body relating to the effect of industrial operations on property values, the anticipated effects of the Project on property values is ascribed as neutral in this EIA. Hammond River Holdings will monitor the resale value of homes in the area to determine if the Project might be affecting property values and to plan suitable adaptive measures as appropriate.

Commercial and Institutional Land Use

Given the lack of commercial and industrial facilities in the LAA, no residual effects on commercial and institutional land use are expected. Refer to **Section 7.0** for a discussion of the potential residual environmental effects of Project-related accidents or collisions on emergency response services.

Agricultural Land Use

Potential effects of the project on agricultural land use are primarily focussed on groundwater and surface water quality and quantity; refer to **Section 5.3** for a discussion on residual environmental effects of the Project on water resources.

Forestry Land and Resource Use

The PDA was cleared in the early 2010s, and no additional land is required for the Project as currently defined, and as such no interactions with forestry are anticipated. Thus no residual effects are expected.

Recreational Land and Resource Use

The PDA is privately-owned and represents a relatively minor loss of potential land available for hunting, fishing, or trapping relative to the terrestrial wildlife habitat in the region. Substantive interactions with recreational land use are not expected.

Transportation Land Use

The Project will result in a modest increase in traffic volumes on the preferred transportation route during operation. However, Route 111 and Route 865 are designated truck routes with suitable weight bearing capacities to accommodate the Project, and as such, damage to road infrastructure or traffic delays arising from an additional 35-40 trucks per day operating on these roads is not expected. Residents located along the preferred transportation route may notice additional truck traffic at times, but since the highways are rated for such purposes and trucking has occurred and continues to occur on these roads, measurable impacts on transportation land use are not expected. Refer to **Section 7.0** for a discussion of the potential residual environmental effects of transportation related accidents or collisions.

Employment and Economy

The Project is expected to employ a modest workforce during operation of up to 10 personnel, supplemented by contractors for trucking and explosives. Construction will be carried out by a third party, with staffing levels yet to be finalized. A small, but positive interaction, is expected.

5.7.4 Summary

In summary, the Project may result in a perceived change in land use of the LAA, but since the Project site was logged in the early 2010s, the continued use of the PDA for resource extraction activities is expected to be compatible with the surrounding area. Occasional nuisance effects to nearby residents may be possible, but Hammond River Holdings will communicate periodically with residents to understand and consider any concerns. Substantive effects to commercial, institutional, industrial, agricultural, forestry, recreation, or transportation land uses are not expected. Modest employment associated with the creation (or maintenance) of up to 10 jobs for Hammond River Holdings operations, as well as the related spin-off employment and economic activity from third party contractors and other suppliers in addition to maintaining employment at existing wallboard facilities, will result in positive effects to employment and economy.

In light of the above, and in consideration of planned mitigation and best practices aimed at reducing environmental effects, the residual environmental effects of the Project on the socioeconomic environment during all phases of the Project are rated not significant, with a high level of confidence.

5.8 Heritage Resources

The potential environmental effects of the Project on heritage resources are assessed in this section.

5.8.1 Scope of VC

Heritage resources has been selected as a VC related to the Project due to their overall importance to the people of New Brunswick and in recognition of the provincial and federal regulatory agencies who are responsible for their management. Additionally, First Nations have an important interest in the preservation and management of heritage resources related to their history and culture. Furthermore, the Project is within 100-600 m of the Hammond River, which like all major watercourses, carries an elevated potential for harbouring heritage resources. Heritage resources include archaeological resources (e.g., artifacts), palaeontological resources (e.g., fossils), and built heritage resources (e.g., historic buildings or sites).

Heritage resources, both human-made and naturally occurring, are those resources related to the past that remain to inform present and future societies of that past. Heritage resources are highly delicate features of the environment and their integrity is susceptible to ground-disturbing activities. Any Project activity that includes surface or sub-surface ground disturbance has the potential for interaction with heritage resources, where they are present. Accordingly, earth moving activities represent the component of the Project with the greatest potential for interaction with heritage resources that might be contained in surface soils or rock.

Heritage resources in New Brunswick are protected under the *Heritage Conservation Act* as administered by the New Brunswick Department of Tourism, Heritage and Culture, and are considered to be very important and highly valued by the people of New Brunswick (GNB 2018b). The *Heritage Conservation Act* clearly outlines the Province's ownership of all archaeological, palaeontological, and burial site heritage objects (GNB 2018b). Any such objects determined to be of Aboriginal origin are specifically 'held in trust' on behalf of First Nations people and their communities (GNB 2018b). The Act also protects provincially designated heritage places. The following definitions for selected heritage resources are derived from the provincial *Heritage Conservation Act*:

- **Archaeological Object:** *"an object which shows evidence of manufacture, alteration or use by humans that may provide information about past human activities and which meets any criteria set by regulation, and includes a sample collected from that object"*.
- **Archaeological Site:** *"a place where evidence of past human activities, such as archaeological objects and features, is discovered on, buried or partially buried beneath the land, or submerged or partially submerged beneath the surface of a watercourse or permanent body of water"*.
- **Burial Ground:** *"a place that has been used for the placement of human remains or burial objects, but does not include a cemetery regulated under the Cemetery Companies Act"*.
- **Burial Object:** *"an object that is directly associated with the interment of a human, but does not include human remains"*.

- **Palaeontological Object:** *“a work of nature consisting of or containing any remains, trace or imprint of a multicellular plant or animal or a stromatolite preserved in the Earth’s crust since some past geologic time; does not include human remains”.*
- **Palaeontological Site:** *“a place where evidence of palaeontological objects is discovered in rock or unconsolidated sediment, exposed at the surface, buried or partially buried beneath the land, or submerged or partially submerged beneath the surface of a watercourse or permanent body of water”.*

The Province of New Brunswick provides guidance for conducting heritage assessments under its *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (Archaeological Services 2012).

5.8.1.1 Temporal Boundaries

The temporal boundaries for the Project include the following:

- **Construction:** extending for a period of approximately six months, anticipated to begin in the second quarter of 2019 (subject to the receipt of all approvals and permits required for the Project);
- **Operation:** beginning in approximately the fourth quarter of 2019, and lasting for approximately 10 years or until the mineral resource has been depleted; and,
- **Reclamation and closure:** To be initiated following the completion of operations at the site, with decommissioning and reclamation of the surface facilities at the site for an anticipated duration of six months following operation.

5.8.1.2 Spatial Boundaries

The Project Development Area (PDA) is defined as the area of physical disturbance associated with construction and operation of the Project. Specifically, the PDA consists of an area of approximately 61.81 ha (i.e., conservatively assumed to be the entirety of PID No. 00149013) that includes the open pit and all related surface facilities located on the property. The PDA is the area represented by the physical Project footprint.

The Local Assessment Area (LAA) is the maximum anticipated area within which Project-related environmental effects are expected. For heritage resources, the LAA is not expected to extend beyond the PDA, as an environmental effect would be related to ground disturbance/earthworks (to occur only within the PDA).

5.8.1.3 Significance Threshold

A significant adverse residual environmental effect on heritage resources is one where Project-related activities result in the permanent disturbance or unauthorized accidental destruction of an archaeological, palaeontological, or built heritage resource, site, or object (as they are defined above in

Section 5.8.1) that is considered by the provincial heritage regulators to be of major importance and that cannot be mitigated.

5.8.2 Existing Conditions

To assess the potential for significant adverse residual environmental effects on heritage resources, an archaeological impact assessment (AIA) will be conducted. The details of the AIA for the Project as well as a description of the existing conditions in relation to the potential for heritage resources within the PDA is described in the following sections.

The potential for heritage resources to be located within the PDA is defined by the application of a three pronged approach to AIA preliminary investigation that includes: desktop assessment, public and First Nation consultation, and then preliminary field assessment (walkover). Dillon retained Cultural Resources Management Group Limited (CRM Group) to conduct the AIA in support of the proposed EIA registration. The methods used and proposed by CRM Group for the components of the AIA are described in the following sections.

5.8.2.1 Archeological Impact Assessment Preliminary Investigation Methods

The first stage of conducting an AIA in New Brunswick is a preliminary investigation, which includes a desktop assessment (i.e. documentary research), consultation/engagement with local individuals and/or groups (including First Nations), and preliminary field investigation (i.e. a walkover) (CRM Group 2018). The current *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (Archaeological Services 2012) stipulate that an Archaeological Field Research Permit (AFRP) is required to undertake a Preliminary Field Investigation (the third component of a Preliminary AIA Investigation) (CRM Group 2018). The specific proposed methods that CRM Group will undertake to complete an AIA for the PDA are outlined below.

Desktop Assessment and Archaeology Field Research Permit (AFRP) Application

Firstly, at the initiation of the AIA, CRM Group will apply for an AFRP for the PDA. For the application process, CRM Group has requested the most recent Archaeological Predictive Model/Recorded Sites Mapping of the PDA from the Archaeological Services Branch of the New Brunswick Department of Tourism, Heritage and Culture (Archaeological Services Branch). This documentation must then be included as part of the AFRP application.

After receiving the model/mapping from the Archaeological Services Branch, a more robust desktop assessment will be initiated to gather historical and environmental information that would contribute to the identification of archaeological potential within the PDA; and, secondly to provide a historical and cultural context within which to evaluate significance of any archaeological resources if they were encountered (CRM Group 2018).

The background research conducted during the desktop assessment will include a review of the following databases and sources that are relevant to the project area (CRM Group 2018):

- Heritage Branch records (including the New Brunswick Archaeological Site File, the Borden Map File, the Archaeological Projects Manuscripts and the Private Collections File, the New Brunswick Plane Crash Inventory, the New Brunswick Cemeteries Database, etc.);
- The Canadian Inventory of Historic Buildings;
- Legal land survey records; and,
- Relevant published and unpublished reports of heritage investigations or surveys within or adjacent to the project area, local and regional history, pre-contact history, architectural history, ethnography, cultural geography and other pertinent disciplines.

Consultation and Engagement with Local Individuals and/or Groups

Consultation/engagement with knowledgeable locals is intended to elicit information on the location, distribution and significance of reported or unreported heritage resources. Groups to be contacted include the First Nation community located nearest to the PDA, as well as organizations, historical societies, collectors, and specialists having local or regional expertise in the history, geology and archaeology of the PDA and surrounding area (CRM Group 2018). Interviews are to be documented and submitted to Archaeological Services as part of the Final Report.

Preliminary Field Assessment

A preliminary field assessment (walkover) will provide exposure to the geographical setting and topography of the PDA. This exposure will facilitate the preparation of the testing strategy for potential future field evaluation stage of archaeological investigation, if one is required. During the preliminary field assessment, potential resources identified as a result of the background research will be examined. However, as it cannot be predicted if archaeological/heritage resources are present, the level of effort assumes that no archaeological or heritage resources will be found during the walkover.

5.8.2.2

Potential for Heritage Resources within the PDA – Preliminary Characterization

In recognition of the historical use of watercourses as travel route during both the Pre-Contact period (i.e., before the arrival of Europeans) and the Historic period (i.e., the 1700s and 1800s, during which colonization took place), the Archaeological Services (2012) guidelines stipulate that the first 50 m from a watercourse is considered to have a high potential for archaeological resources, while the following 30 m are ascribed as moderate archaeological potential. Beyond 80 m of a watercourse, areas are identified as having low archaeological potential. The confluence of watercourses tends to be ascribed a high archaeological potential, recognizing that confluences were often historically used as camping or gathering sites. Other landscape features (such as topographical features or elevated vistas) are also often characterized as having high archaeological potential.

Although the PDA is located within 50 m of mapped watercourses (i.e., the tips of small unnamed tributaries of the Hammond River that intersect portions of the PDA), these small watercourses would not likely be navigable and thus would not likely have been used as major travel routes by Aboriginal ancestors or colonial people, and as such are not likely to harbour archaeological resources. In addition, the PDA has been previously disturbed through forestry activities, thus putting the PDA in an

area of what is thought to be relatively low archaeological potential. Additionally, though the Hammond River is a major watercourse and could have been used by Aboriginal people for transport, it is located at least 100 m from the edge of the Project site (and up to 600 m, depending on direction), at a distance greater than 50 m from the river (i.e., beyond the high archaeological potential zone). There are historic buildings or other built heritage resources in the PDA, and no such buildings known to be located within 5 km of the PDA. The Upham area is not known to be of interest to provincial regulators due to the presence of fossils or other palaeontological resources. As a result of this preliminary characterization, the potential for heritage resources to be present within the PDA is considered to be low.

5.8.3 Environmental Effects Assessment

The potential environmental effects of the Project on heritage resources are assessed in this section.

5.8.3.1 Potential Effects

As a result of the preliminary desktop assessment (including model/mapping database check for high potential resource areas), there is low potential for heritage resources to be located within the PDA. Therefore, subject to confirmation as part of the preliminary field investigation (walkover, and possible subsequent shovel test pitting), there are no potential Project-related environmental effects to heritage resources anticipated.

Should the discovery of Heritage Resources occur during the construction or operation phases of the Project, it would be considered and addressed as an accidental event, as discussed in **Section 7.0**.

5.8.3.2 Mitigation

Key mitigation measures to minimize the potential for the discovery of a heritage resource include conducting an archaeological impact assessment (AIA), consisting of background research, map and model interpretation, a walkover of the Project site, and associated shovel test pitting of any areas that are determined through the walkover to have a moderate to high archaeological potential. If archaeological or heritage resources are discovered through the AIA, further mitigation including archaeological monitoring during construction and operation, excavation, or other measures would be considered. Additionally, a Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of the accidental discovery of a heritage resource will be developed and implemented. The EPP will include contingency and emergency response procedures to be implemented in the event of a chance find of a heritage resource.

The following mitigation measures, through careful design and planning, are recommended to avoid or reduce the potential for adverse interactions with heritage resources:

- Planned avoidance of areas of elevated archaeological potential, to the extent practical;
- Undertake an archaeological evaluation (AIA) of areas proposed for ground breaking through either a field survey (walkover), to determine appropriate mitigation (e.g., shovel testing, archaeological monitoring) to identify archaeological resources that might be present;

- For any areas where shovel testing is recommended following the archaeological field survey, implement this work as per the Archaeological Services (2012) Guidelines;
- Implement archaeological construction monitoring for any ground breaking activities where shovel testing is not practicable;
- Conduct archaeological monitoring and examination of all soil material removed from the river for any artifacts that may have been deposited in the river after eroding from the shoreline areas; and,
- A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures will be developed and implemented.

If heritage resources are accidentally identified at any point over the course of the project, the following mitigative measures for archaeological resources will be employed:

- Work in the area must cease immediately and the Archaeological Services Branch of the New Brunswick Department of Tourism, Heritage and Culture will be contacted at (506) 453-3014 for further mitigation;
- Until a qualified archaeologist arrives at the site, no one shall disturb, move or re-bury any uncovered object; and,
- Activities at the site may resume only when authorized by Archaeological Services and once mitigative measures have been completed.

Other contingency and emergency response procedures to be implemented in response to the accidental discovery of heritage resources will be documented and implemented as part of the EPP for the Project.

5.8.3.3

Characterization of Residual Effects

Any ground breaking or earth moving activity has the potential to uncover previously undiscovered heritage resources. Archaeological resources (i.e., artifacts) tend to be found in surficial soils and when discovered, whereas palaeontological resources (i.e., fossils) tend to be found in bedrock. The discovery of these resources can provide valuable information about human activity or use in the distant past (in the case of artifacts), or the presence of wildlife and vegetation in earlier eras (in the case of fossils). With respect to the Project, it is possible that previously undiscovered heritage resources in the form of artifacts could be found in the surficial soils (including topsoil and overburden) during construction of the Project. Moreover, it is possible that fossils could be found in the underlying gypsum rock during operation of the Project.

Based on the early results of the AIA being developed for the Project, the Project site generally has a low potential for harbouring archaeological resources, although the presence of the nearby Hammond River approximately 100-600 m from the Project site (depending on direction) could indicate potential for heritage resources to be found in the general area of the Project. A site walkover and associated shovel testing of the Project site will confirm the low to moderate archaeological potential. For palaeontological resources, given the presence of 10-20 m of overburden currently covering the gypsum

deposit, the presence of fossils in the underlying gypsum rock is highly unlikely. No built heritage resources are located in the PDA.

Based on these observations, and with the implementation of planned mitigation, substantive interactions between the Project and heritage resources are unlikely to occur.

5.8.4 Summary

Based on the preliminary desktop assessment conducted by CRM Group and Dillon, the PDA is located within an area that is believed to be of lower archaeological potential. The potential for heritage resources to be present within the PDA is therefore also considered low; therefore, substantive interactions between the Project and heritage resources are thus unlikely to occur.

In light of these observations, and with the implementation of the mitigation and environmental protection measures described in this section, it is not anticipated that there will be any substantial unmitigated interaction between the Project and heritage resources during the Project. Pre-construction archaeological surveys, and/or archaeological monitoring and/or examination during all ground breaking activities will result in the identification of any archaeological resources, and development of appropriate mitigation in the event that any archaeological resources are present in areas identified for ground disturbing construction or operation activities. Therefore, in consideration of the above, the residual environmental effects of the Project on heritage resources during all phases of the Project are rated not significant, with a moderate level of confidence. The conduct of an AIA including walkover and shovel testing (as required) will improve the level of confidence of this prediction.

5.9 Traditional Land and Resource Use

The potential environmental effects of the Project on traditional land and resource use are assessed in this section.

5.9.1 Scope of VC

Traditional land and resource use refers to the practice of traditional activities by Aboriginal persons, including hunting, fishing, trapping, and gathering in pursuit of a moderate livelihood. Traditional land and resource use has been selected as a valued component (VC) in order to:

- Acknowledge the lands and resources historically used for traditional purposes by Aboriginal persons;
- Assess the potential environmental effects of the Project as required under the New Brunswick Environmental impact Assessment Regulation; and,
- Assist the Province in fulfilling its duty to consult with First Nation communities regarding the Project.

This section of the EIA Registration is intended to provide the Crown with information about the potential environmental effects of the Project on traditional land and resource use, as well as measures taken or recommended that would mitigate such environmental effects.