

5.9.1.1 Temporal Boundaries

The temporal boundaries for the environmental effects assessment of traditional land and resource use are defined through three phases:

- **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.

5.9.1.2 Spatial Boundaries

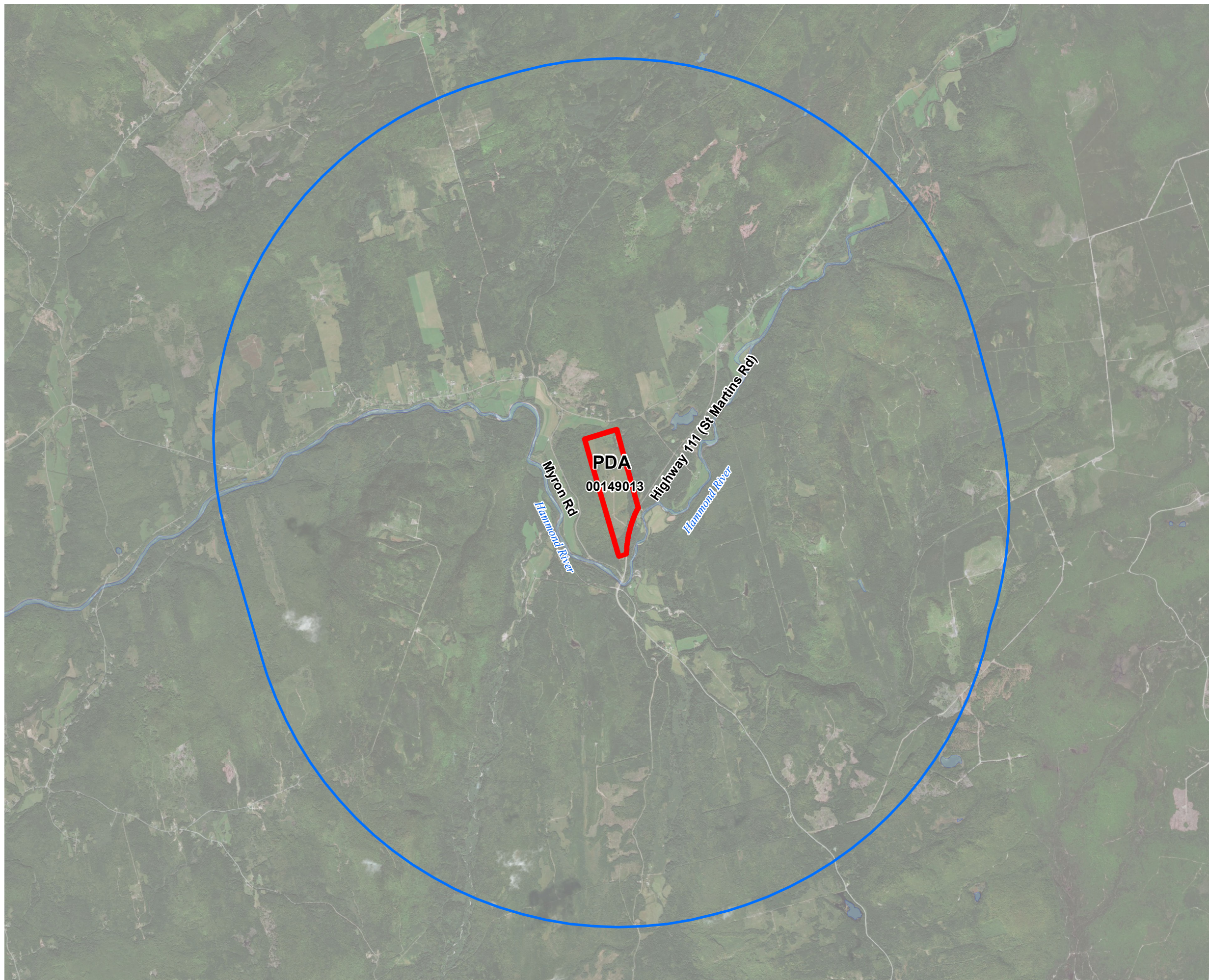
The spatial boundaries of the environmental effects assessment completed are shown in **Figure 5.9.1**, and are described as follows.

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, and is representative of Dillon's professional interpretation of the zone of influence of the Project on traditional land and resource use. Though development of the Project will be limited to the PDA, some areas contiguous to the PDA may be affected upon initiating construction and operation of the Project, even though they will not necessarily be physically disturbed (e.g., potential indirect effects on wetlands located on adjacent properties). In recognition of this, the LAA (**Figure 5.9.1**) for traditional land and resource use consists of an area of 24,417 ha, forming a 5 km radius surrounding the PDA and contiguous areas which traditional land or resource use may have occurred or may be occurring. For this reason, the LAA was conservatively defined as representing a 5 km radius to assess and consider potential biophysical and atmospheric effects from the PDA and areas where Project-related environmental effects might be expected to occur.

5.9.1.3 Significance Threshold

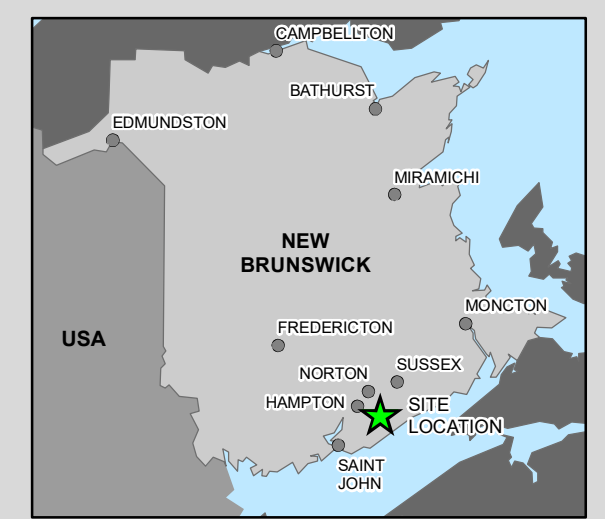
A significant adverse residual environmental effect on traditional land and resource use is defined as a permanent loss of the availability of, or access to, land and resources that are used by Aboriginal persons for traditional purposes within the LAA or PDA that cannot be mitigated.



HAMMOND RIVER HOLDINGS LIMITED
PROPOSED UPHAM EAST GYPSUM QUARRY

**SPATIAL BOUNDARIES FOR TRADITIONAL
LAND AND RESOURCE USE**
FIGURE 5.9.1

- LOCAL ASSESSMENT AREA (LAA)
- WATERCOURSE
- PROJECT DEVELOPMENT AREA (PDA)



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: DM
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

5.9.2 Existing Conditions

5.9.2.1 Project Context

The Project is located in the Local Service District (LSD) of Upham, within Kings County, New Brunswick. The Hammond River, a tributary of the Kennebecasis River, meanders through the LAA and is located within 1 km of the PDA. The PDA is also surrounded by agricultural and forested lands.

The Project is at an early developmental stage, and consultation with First Nations about the Project has only been recently initiated. The consultation process is intended to support an improved understanding of the traditional land use of the PDA, but given the early stages of such consultation at the time of submission of this EIA registration, no specific information has been obtained from First Nations in relation to potential concerns they may have or if or how they are/have been using the PDA or LAA for the practice of traditional activities. It is expected that such information will be gained over time through an understanding of current practices as engagement of First Nations is conducted, and perhaps through the development of a traditional land and resource use (TLRU) study, should one be requested by First Nations. As a result, in the absence of specific information from First Nations, it can be assumed that lands and resources near the Project could have been, and are currently being used for traditional purposes by the Wolastoqey (Maliseet) Nation (and possibly other First Nation communities). The Project site is located within what has been traditionally recognized as the Wolastoqey Nation's traditional territory, although the PDA is located within the Title Claim submitted to the Court of Queen's Bench of New Brunswick by the Elsipogtog First Nation. More specifically, the surrounding wetlands, watercourses, and agricultural and forested lands could have been used by Aboriginal peoples as part of their traditional territory, and it is possible that the Mi'kmaq peoples might have also used those lands for traditional practices. Construction and operation of the Project may affect or alter the ability of First Nations to use lands and resources surrounding the PDA and adjacent areas within the LAA to carry out their traditional activities, if they are being carried out there.

Documented details on how and where traditional activities have been or are taking place may exist, but they are normally held confidentially by First Nations and their representative organizations. This knowledge is both valuable and private to the rights holders (land users), and as such there is an expectation that this knowledge should not be freely available to proponents for the purposes of development of traditional territories. As such, information presented within this section has been collected from reliable secondary sources and will be confirmed with First Nation knowledge over the coming months, should the Nations decide to do so. First Nation knowledge of traditional land and resource use(s) within the PDA and LAA will be obtained from planned discussions with First Nation communities, to assist in identifying potential environmental effects and possible mitigation measures. Furthermore, data collected for other field disciplines (e.g., wildlife and wildlife habitats, vegetation and wetlands, fish and fish habitat, and heritage resources) will also be used to inform the availability of land and resources that could be used for traditional purposes within the LAA and PDA.

5.9.2.2 First Nation Community Context

New Brunswick's First Nations assert Aboriginal and treaty rights under Section 35(1) of the *Constitution Act, 1982*. The Supreme Court of Canada has held in several important decisions that the Crown (federal and provincial) has a duty to consult with potentially affected First Nations in respect of decisions made by the Crown that might affect these constitutionally-protected Aboriginal or treaty rights, including those that might relate to their current use of the land and resources for traditional purposes. The Province of New Brunswick has a duty to consult policy which is administered by the Aboriginal Affairs Secretariat (GNB 2011).

Historically, the lands of Central New Brunswick have been used by Aboriginal persons for traditional uses such as hunting, fishing, gathering, trapping, subsistence, and related purposes (Goddard 1996). As shown in **Figure 5.9.2**, according to secondary literature, Wolastoqey traditional territory is understood to be comprised of the greater Saint John River watershed as far north as the Gulf of St. Lawrence to Québec City, east through the state of Maine where it meets the Passamaquoddy territory, south to the Bay of Fundy, and west where it meets the neighboring Mi'kmaq nations (Goddard 1996). This interpretation of the traditional territories of New Brunswick originates from the "Ganong line" proposed by W.F. Ganong (a botanist, historian, and cartographer) in 1901, but this line is generally not accepted by First Nations in New Brunswick. While it has been common practice for these principles to be applied in understanding the traditional territories of the Nations of New Brunswick, the Wolastoqey and Mi'kmaq peoples have asserted that all of New Brunswick makes up part of their traditional territories.

Figure 5.9.2 shows the 15 First Nations communities within the province of New Brunswick, consisting of six Wolastoqey Nation communities and nine Mi'kmaq Nation communities. Wolastoqey communities and their traditional territory are generally located along the Saint John River valley, while the Mi'kmaq communities are predominantly located along the northern and eastern coastal regions of the province. Though the Project is thought to be located in Wolastoqey traditional territory, First Nations peoples migrated through the entirety of the lands in New Brunswick for millennia and as such, it is possible that the Mi'kmaq peoples might have also used the lands and resources of southern New Brunswick.

5.9.2.3 Population Demographics

The 2016 Census identified approximately 4% of the New Brunswick population as having Aboriginal identity, or the equivalent of 29,385 persons in New Brunswick. The population of Indigenous band members on-reserve, as reported by Indigenous and Northern Affairs Canada (INAC 2018), is provided in **Table 5.9.1**.

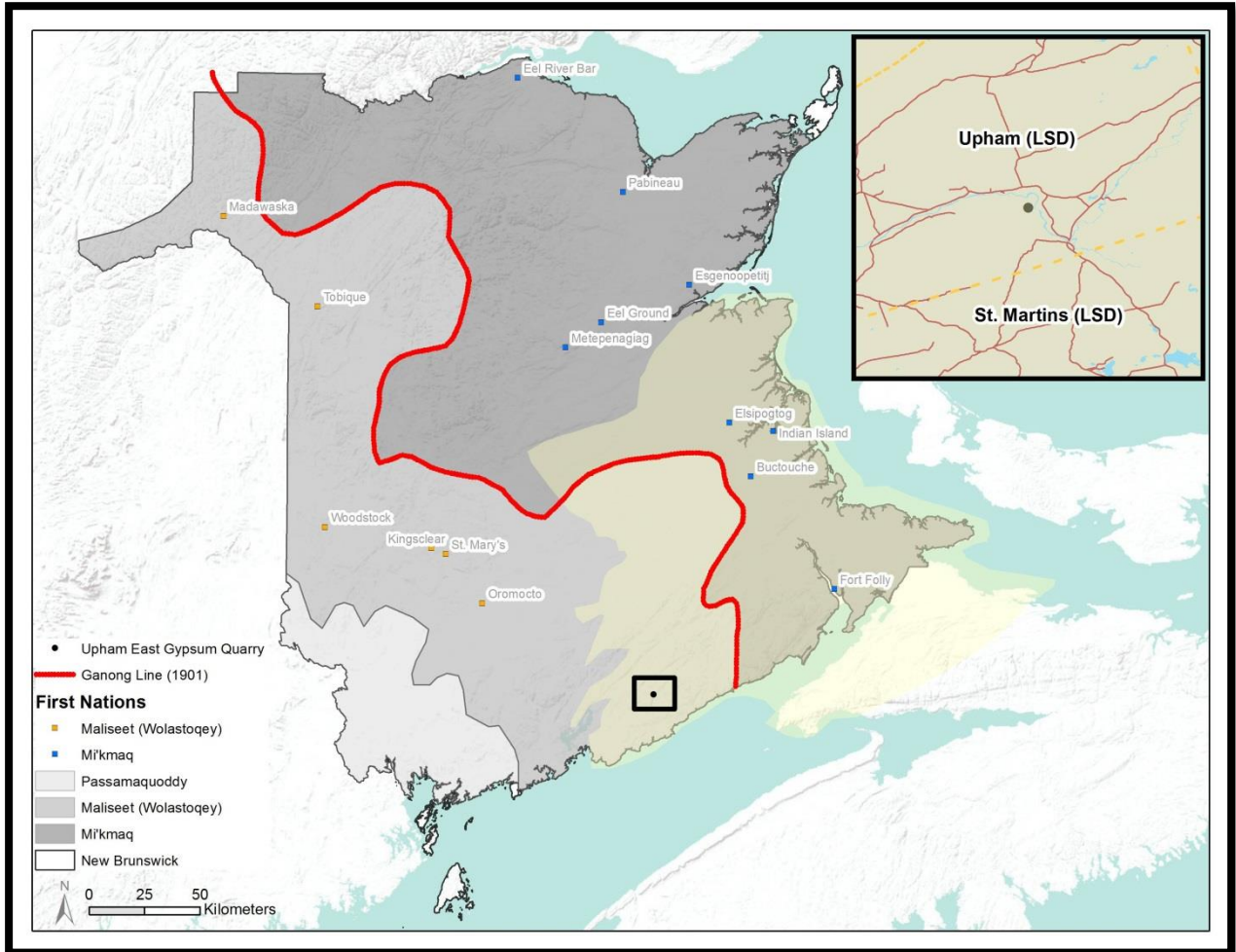


Figure 5.9.2: First Nations Communities in New Brunswick

Table 5.9.1: Population of Indigenous Band Members On-Reserve (2016)

First Nation Community	2016 Population (On-Reserve)
Wolastoqey (Maliseet) First Nations in New Brunswick	
Oromocto First Nation	707
St. Mary's First Nation	1,927
Kingsclear First Nation	1,040
Woodstock First Nation	1,079
Tobique First Nation	2,484
Madawaska Maliseet First Nation	374
Sub-total	10,611

Table 5.9.1: Population of Indigenous Band Members On-Reserve (2016)

First Nation Community	2016 Population (On-Reserve)
Mi'kmaq First Nations in New Brunswick	
Eel River Bar First Nation	750
Pabineau First Nation	324
Esgenoopetitj First Nation	1,923
Metepenagiag First Nation	698
Eel Ground First Nation	1,063
Indian Island First Nation	200
Elsipogtog First Nation	3,372
Buctouche First Nation	124
Fort Folly First Nation	132
Sub-total	8,586
Total On-Reserve First Nation Population in New Brunswick (2016)	19,197

Source: INAC (2018)

There are currently no First Nation communities located within or immediately near the PDA or LAA. The closest First Nation communities to the Project are the Oromocto First Nation, located approximately 88 km to the northwest of the PDA; the Fort Folly First Nation, located approximately 96 km to the northeast of the PDA; and St. Mary's First Nation, approximately 112 km to the northwest of the PDA. In addition to these identified First Nation communities, there is one additional reserve – The Brothers #18 – which consists of two small islands located within the Kennebecasis Bay, 4 km north of the City of Saint John and approximately 42 km southwest of the Upham East Project site. The Brothers #18 Reserve is jointly managed by Kingsclear, Madawaska, Tobique, and Woodstock First Nations. The Brothers #18 Reserve is a traditional gathering place, but contains no permanent residences.

In 2016, the Elsipogtog Mi'kmaq First Nation made an Aboriginal Title Claim on behalf of the entire Mi'kmaq Nation over the portion of Mi'kma'ki known as Sikniktuk or District 6, including the land, airspace, land covered by water, offshore and inshore water bodies, foreshore, rivers, lakes and streams situated within its bounds (the "Claim Area") (Elsipogtog First Nation 2016). A map of the Claim Area (**Figure 5.9.2**) displays that the Project site (PDA) is currently situated within the Elsipogtog Mi'kmaq First Nation Land Claim. The assertion of title produced by the Elsipogtog Mi'kmaq First Nation is for the jurisdiction over how the land and water will be used on Crown land in Mi'kmaq territory. It is believed that the assertion of title is not likely to affect privately-owned land. However, associated effects to lands contiguous of the PDA (such as public lands located within the LAA) must be further considered.

5.9.2.4

Current Use in the PDA and LAA

Traditional activities (e.g., hunting, trapping, fishing, and gathering) may occur within the LAA; however, the specific traditional activities that may be taking place in the LAA (including their locations) are not readily available. Normally, information relating to traditional activities taking place or having taken place in a particular location would be obtained through engagement of Aboriginal persons as well as through the conduct of a traditional land and resource use (TLRU) study (sometimes called a traditional knowledge (TK) study). However, while First Nations were informed of planned exploration drilling activity for the Project as part of the issuance of a exploration permit by NBDERD, Hammond River Holdings has only recently begun engaging Aboriginal communities more formally in respect of the Project through an introduction letter sent to the Chiefs of the 15 First Nation communities in New Brunswick in mid-October 2018, to provide an initial introduction regarding the Project and to seek further engagement (if that is the desire of the Chiefs and/or their representative organizations). Furthermore, a TLRU study has not been requested or conducted at this time, though Hammond River Holdings will consider such requests if they are made by the Chiefs or representative organizations.

As such, specific information about which traditional activities may have historically been conducted or are currently occurring specifically in the PDA and LAA is not available. However, it can be expected that the watercourses near the Project (particularly the Hammond River and some larger tributaries) would have been used at some time for fishing and navigation by Aboriginal persons (although the use of on-site watercourses WC1-WC4 for such purposes is unlikely, given their small size), and that the lands would have been used by Aboriginal persons for hunting, trapping, and gathering for food, medicines, and plants of traditional importance. In the absence of specific information in this regard, though located on privately-owned land, it is conservatively assumed that the PDA has been and is being used for practicing traditional activities by Aboriginal persons, at the convenience of the landowner. Further specific information in this regard is expected to be obtained through engagement of Aboriginal communities, as engagement progresses.

5.9.2.5

Traditional Resources in the PDA, and Traditional Use Perspective of those Resources

The terrestrial and aquatic habitats present within the PDA were surveyed from a traditional knowledge perspective by a member of Tobique First Nation (TFN) who accompanied Dillon's biologists during the field surveys conducted on August 29 and 30, 2018. Based on the knowledge of the member of TFN, the Project area did not offer unique habitat or flora or fauna species of special significance to traditional activities or uses. However, although the PDA is virtually absent of mature vegetation, several common plant species that could be found in the remaining uncut portions of the PDA (and possibly formerly present in the cut portion of the PDA, based on observation of similar habitat types on adjacent properties) are known to be used for traditional medicinal and food purposes by many First Nations groups (Bear, D., pers. comm., 2018). These species include, but are not limited to:

- balsam fir (*Abies Balsamea*) and white pine (*Pinus Strobus*), both known to be a source of Vitamin C and providing a variety of medical uses; and,

- white ash (*Fraxinus americana*) and golden thread (*Coptis trifolia*), together traditionally used to treat deafness).

Additionally, many of the tree and shrub species present within the PDA (refer to the vegetation species lists provide in **Appendix C**) can provide seeds and fruits for seasonal food sources or are dried for winter consumption. The trees are also used as a famine food source by scraping the cambium layer for cooking. Other traditional uses for trees remaining in the uncut portions of the PDA (as well as for those thought to be formerly present within the PDA) include traditional canoes and storage containers that were often made from the bark of white birch (*Betula papyrifera*) (Bear, D., pers. comm., 2018). However, as these species are common and widely distributed throughout New Brunswick (except for golden thread, which is rare but not likely present in the PDA), the Project is not expected to adversely affect the practice of traditional gathering activities in the LAA.

There are no traditional activities such as hunting, snaring or gathering known to occur within the PDA.

5.9.3 Environmental Effects Assessment

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

5.9.3.1 Potential Effects

Any Project activity that results in change in the amount of land available to practice current activities, or that restricts access to an area that limits the use of the resources found in that area, can affect traditional land and resource use. Activities during the construction, operation, and reclamation and closure phases of the Project may affect traditional land and resource use, as follows.

- Upon initiating construction, access to the PDA will be restricted for safety and security purposes to prevent injury to individuals while numerous construction activities are taking place on the Project site. From this time onward, access to the PDA for the purpose of carrying out traditional activities will no longer be available, although the remainder of the LAA will remain available for such purposes (as currently). These access restrictions will continue throughout the construction and operation phases, but will be restored following reclamation so that traditional activities can return (if desired/available).
- During construction, most of the PDA will be cleared of remaining vegetation (except for areas remaining as buffers), and as such, natural resources that may be present on site (e.g., plants, wildlife, medicines) will no longer be available for harvesting or use. Outside the PDA, it is not expected that Project-related effects would interfere with the practice of traditional activities in the remainder of the LAA. This effect will continue throughout the construction and operation phases, but will be restored upon site reclamation.
- At closure, the Project site will be reclaimed and restored to as near natural conditions as possible. Although the open pit will remain as a water feature, the remainder of the Project site will be reshaped and allowed to naturally re-vegetate over time. Vegetation would be expected to begin growing naturally over time (e.g., within one or two growing seasons), and native

vegetation, hydroseed, and the planting of trees may be used to accelerate this as well as to assist in promoting regrowth and to stabilize soils to prevent erosion. As vegetation matures over the ensuing years and decades, the PDA may once again eventually harbour traditional resources of importance to Aboriginal peoples, thereby allowing a potential return of traditional land and resource use activities such as hunting, trapping, and gathering in the PDA, if so desired.

5.9.3.2

Mitigation

Traditional land and resource is connected to other VCs. Discussion of the potential environmental effects on natural resources and associated mitigation measures are outlined in **Section 5.3** (water resources), **Section 5.4** (fish and fish habitat), **Section 5.5** (vegetation and wetlands), **Section 5.6** (wildlife and wildlife habitat), and **Section 5.8** (heritage resources). Those mitigation measures are also applicable to this particular VC. In addition, the following mitigation measures through careful design and planning will be employed to avoid or reduce the environmental effects of the Project on traditional land and resource use within the LAA:

- Minimize the size of the PDA to that which is necessary to accomplish the Project objectives while minimizing environmental disturbance to the extent possible.
- Maintain natural vegetation along wetlands and watercourses, as well as along the property boundaries, to minimize effects on natural resources and to provide a buffer for reducing effects of the Project that could cause sensory disturbance to wildlife (i.e., noise, dust).
- Conduct ongoing engagement of First Nations throughout the Project to exchange information, address concerns, and assist in the development of management and reclamation plans for the Project.
- If requested, First Nation communities or individuals will be provided with the opportunity to harvest and gather species of importance to traditional activities on the PDA prior to construction, if the Project schedule allows. These opportunities to conduct harvesting and gathering activities should be timed where possible to coincide with the seasonality of the species of interest, if possible given the construction schedule.
- Reclamation of the PDA will consider traditional resources including the use of native species to ensure the land is accessible for traditional purposes at some time in the future following closure of the Project.
- Fish and fish habitat will be monitored to ensure water flows are appropriate to mitigate bank erosion.
- Affected fish habitat and wetland habitat that is lost to the Project will be authorized under federal and provincial legislation and compensated.
- Wildlife and wildlife habitats within the PDA will be re-vegetated upon closure, which will partially restore habitat conditions in the PDA, over time.

5.9.3.3

Characterization of Residual Effects

Though located on privately-owned land, the presence of Project-related facilities and infrastructure will interact with traditional land and resource use, causing potential residual effects primarily within the PDA. Though minor effects could occur outside the PDA but within the LAA (e.g., wildlife avoidance due to human activity), effects will be greatest in the PDA.

The potential environmental effects to traditional land and resource use would begin as soon as construction activities are initiated and would continue throughout the Project life, until the site is restored to as near natural conditions as possible during reclamation and closure. The greatest potential for environmental effects begins when initiating construction activities, after which time access to the PDA will be restricted for safety purposes. The resources present in the PDA (such as wildlife and fish habitats) will be lost during construction as clearing of the site and development of the open pit and ancillary facilities is conducted, resulting in such resources no longer being available for traditional purposes. The potential environmental effects on traditional land and resource use are thus conservatively assessed as occurring immediately when construction (site preparation) begins, and continuing until ultimate closure of the site.

Ground disturbance during construction and operation activities will result in a temporary localized loss of vegetation and potential displacement of species used for traditional purposes due to altered habitats or sensory disturbance. Where practicable, First Nation communities and individuals will be provided with the opportunity to harvest and gather species before site preparation and construction commences, if the timing of such harvesting is such that the activity does not interfere with site activities.

Traditional land uses which are likely currently being performed in the LAA, including hunting, fishing, camping, and timber harvesting, have not been confirmed, but have been conservatively assumed to be taking place for traditional purposes; and will be minimized through the careful design of Project-related facilities and infrastructure to ensure that the size of the PDA is limited to the area necessary for safe and efficient operation of the proposed quarry. The southern and southeast portions of the Project site will be left as is as much as possible, forming a vegetated buffer of mature trees, which will diminish noise levels extending outward to the LAA. Though indirect effects to wetlands and watercourses on neighbouring properties are possible, vegetation/tree buffers surrounding wetlands and watercourses on the southern end of the PDA will also be maintained to the extent possible to preserve habitat and reduce effects on the aquatic and wetland environments.

Furthermore, given the relatively small size of the PDA (i.e., 61.81 ha) in comparison to that of the LAA (i.e., 24,417 ha) or the much larger asserted traditional Wolastoqey territory (i.e., the Saint John River watershed, an area of approximately 55,000 km² or 5,500,000 ha), it is believed that the access to and availability of similar land and resources within the larger traditional territory within the LAA or beyond will not be impeded, and Aboriginal traditional activities that are currently practiced in the rest of the traditional territory will not be substantively interfered with. As noted in other VCs (e.g., fish and fish habitat, wildlife and wildlife habitat, vegetation and wetlands), there are no features of the LAA that are unique in terms of habitat, presence of wildlife, or presence of species at risk or species of conservation

concern; therefore the loss of access to land or resources in the PDA is not anticipated to affect the current use of traditional land and resource use in a substantive way, as these resources are available nearby as well as in other nearby parts of the Wolastoqey's traditional territory.

At closure, the quarry will be abandoned and the site will be restored to as near natural conditions as possible by allowing vegetation to re-grow naturally (supplemented by planting native vegetation, hydroseeding, and planting of trees to reduce potential erosion), with no anticipated substantive interactions between the Project and traditional land and resource use expected following reclamation. A short-term and temporary restriction in access to land and resources within the PDA would result during reclamation activities. Once decommissioning and reclamation is complete, this site restriction will be eliminated, resulting in improved access to the PDA and improvement of environmental features and other traditional purposes within the LAA.

Ongoing engagement with the First Nations communities (upon the advice of the Aboriginal Affairs Secretariat; Mann, M., pers. comm., 2018) will continue to take place, and they will be provided the opportunity to support the development of management and reclamation plans and/or to support reclamation activities at the site. If requested by First Nations, a TLRU study may be conducted to identify specific current traditional uses in the PDA that might require accommodation. Nonetheless, a reduction in the use of land, or the resources on the land within the LAA, is unavoidable throughout the life of the Project, and to a lesser extent after closure activities are complete.

5.9.4 Summary

The development of the Project will not result in the permanent loss of access or use of land or resources, as the site will be returned to near-natural conditions following reclamation.

Consultation with First Nations about the Project has only been recently initiated, and is intended to support an improved understanding of the traditional land use of the PDA. Ongoing engagement with the First Nations communities will continue to take place, and they will be provided the opportunity to support the development of management and reclamation plans and/or to support reclamation activities at the site. Nonetheless, a reduction in the use of land or the resources on the land within the PDA is unavoidable throughout the life of the Project. If requested by First Nations, a TLRU study may be conducted to identify specific current traditional uses in the PDA that might require accommodation.

In summary, the PDA represents a very small percentage of the lands in the Saint John River watershed (i.e., the Wolastoqey traditional territory), and given that the PDA consists of privately owned land and has been logged in the past decade, subject to confirmation by First Nations through engagement, it is unlikely that the Project site is considered to be important to the practice of Aboriginal traditional activities. The PDA will be inaccessible during construction and operation for such purposes, but will be restored upon closure with natural regrowth and replanting of vegetation and trees such that, at some time in the future, portions of the PDA may again provide opportunities for practicing traditional activities.

In light of the above, and with the careful implementation of environmental protection and mitigation measures, including accommodation for any demonstrated infringements of Aboriginal or treaty rights that might arise as a result of the Project, the residual environmental effects of the Project on traditional land and resource use during all phases of the Project are not anticipated to result in significant environmental effects on the use of land or resources by the Wolastoqey or Mi'kmaq peoples that may practice traditional activities in the LAA, subject to confirmation by First Nations through engagement. This prediction is made with a moderate level of confidence due to the limited engagement of First Nations conducted to date and the lack of specific information about potential traditional land and resource use activities that might be occurring (or have occurred) in the PDA. Ongoing engagement of First Nations and a TLRU study if requested by First Nations, will improve the level of confidence in this prediction.

There is no follow up or monitoring proposed for this VC, but monitoring approaches within both **Sections 5.4 and 5.5** will need to be addressed. Hammond River Holdings will continue to consult with First Nation communities to appropriately address Project-specific issues related to residual environmental effects, and additional work and/or monitoring may be required pending the results of the engagement process.

6.0 Effects of the Environment on the Project

The potential effects of the environment that could occur on the Project are assessed in this section.

6.1 Scope

Effects of the environment on the project are those effects related to risks of natural hazards and influences of the natural environment on the Project. Potential effects of the environment on any project are a function of project or infrastructure design in the context of its receiving environment, and ultimately how the project is affected by the natural environment. These effects may arise from physical conditions, land forms, and site characteristics or other attributes of the environment which may act on the project such that the project components, schedule, and/or costs could be substantively and adversely changed.

Based on the nature of the undertaking, the following environmental attributes have been selected for consideration in this assessment:

- climate and climate change;
- severe weather events, including wind, precipitation, floods, hail, electrical storms, and tornadoes;
- seismic activity; and,
- forest fires resulting from causes other than the Project.

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.

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 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.

As effects of the environment on the Project relates to potential influences of the forces of nature on the Project integrity and conduct, the Local Assessment Area (LAA) for effects of the environment on the Project is limited to the PDA.

6.1.3 Significance Threshold

A significant adverse effect of the environment on the Project is defined as one where:

- damage to the Project infrastructure results in a substantial increase in risks to the health and/or safety of the public, or substantial risks of a business interruption;
- damage to the Project infrastructure results in repairs that could not be technically or economically implemented;
- a long-term interruption in service occurs (e.g., an interruption in quarrying activities such that production targets cannot be met); or,
- a substantial change of the Project schedule is experienced (e.g., a delay resulting in the construction period being extended by one season).

6.2 Existing Conditions

6.2.1 Climate and Climate Change

Climate is defined as the statistical averages of precipitation, temperature, humidity, sunshine, wind velocity, and other phenomena such as fog, frost and hail storms for a particular region and time period, generally taken over a 30 year period (NASA 2017). Climate change is an acknowledged change in climate that has been documented over two or more 30 year periods. According to the Intergovernmental Panel on Climate Change (IPCC), climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014). The United Nations Framework Convention on Climate Change (UNFCCC) makes a distinction between climate change attributed to human activities and climate variability attributable to natural causes, by defining climate change as a change of climate directly or indirectly attributed to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods (IPCC 2014).

The definition of climate change dictates the context in which the effects of those changes are discussed. While it is appropriate to examine the effects of projected climate change on projects with long anticipated life spans (50 to 100 years from construction into post-closure of Project), it may not always be fitting to consider the effects of climate change projections on projects which will only take place over a relatively short period of time, and to be initiated in the near future. In the case of the Project, with an anticipated lifespan of 10 years, rather than considering the effects of long-term climate change on the Project, it is more appropriate to consider the effects of recent climatological conditions,

especially the potential adverse effects of weather variability and weather extremes (e.g., change in precipitation).

The technical boundaries for the establishment of climate conditions include the spatial coverage of weather stations across New Brunswick, the number of parameters monitored at each station, and the temporal coverage of data collection at each station. Technical boundaries for the prediction of effects of climate change relate to the inherent uncertainty of global climate models in predicting future changes in climate parameters, and specifically their application of global-scale prediction algorithms to a relatively localized scale through “downscaling”. Global climate models can provide relatively useful information for predicting and preparing for global and macro-level changes in climate, but their ability to pinpoint location-specific changes to climate on a localized level is limited.

Climate Normals

Current climate conditions are generally described by the most recent 30 year period for which Environment and Climate Change Canada has developed statistical summaries. These summaries are typically referred to as “climate normals”. The closest weather station to the Project with available historical data is the Saint John “A” weather station, located at the Saint John airport, approximately 27 km east of the PDA. The weather station provides historical data for wind, temperature and precipitation, amongst other variables. The most recent 30-year period for which climate normals data are available from the Saint John A weather station is for the period of 1981 to 2010, and data were summarized in **Table 5.2.2**. This period has been chosen as the most applicable period for summarizing current climate conditions for the Project (GOC 2018).

Monthly mean wind speeds measured at the Saint John A weather station range from 11.3 to 17.5 km/h, with an annual mean wind speed of 15.2 km/h. From May to August, the dominant wind direction is from the south, with winds predominantly blowing from the southwest and northwest from September to February (GOC 2018). Maximum hourly wind speeds, averaged from 1981 to 2010 for each month, range from 61 km/h to 111 km/h, while maximum wind gusts for the same period range from 96 km/h to 148 km/h. Occurrences of extreme winds are relatively uncommon at the reference weather station. From 1981 to 2010, there has been an average of 17.3 days per year with winds greater than or equal to 52 km/h and 3.8 days per year with winds greater than or equal to 63 km/h (GOC 2018).

Precipitation at the Project site, on average, is highest from Spring to early Summer and Fall through the early Winter period. From 1981 to 2010, the reference region has received an average of 1,295.5 mm of precipitation per year, of which 1,076.0 mm was rain and 239.6 mm was snowfall (as water equivalent). Extreme daily precipitation in the past century has ranged from 66.5 mm (May 1967) to 154.4 mm (November 1975). On average, there have been 12.7 days each year with rainfall greater than 25 mm, and snowfalls greater than 25 cm occur on average 0.63 days each year (GOC 2018).

6.2.2 Severe Weather Events

Extreme precipitation and storms can occur in New Brunswick throughout the year but tend to be more common and severe during the winter. Winter storms generally bring high winds and a combination of snow and rain, especially in low lying areas near the Bay of Fundy.

Extreme rainfall events occur when 50 mm or more rain falls over a 24-hour period. Environment Canada issues a rainfall warning when this is forecast to occur. In the 2000s, Fredericton and Moncton had more extreme rainfall events than any other decade on record, while Saint John had the highest number of events during the 1960s. The trends were different in all three communities. Recently, extreme storm events in December 2010 affected much of New Brunswick, where some areas received as much as 200 mm of rain; these events threatened public safety and transportation systems, and damages were estimated to be approximately \$50 million (NBDELG 2018c).

In New Brunswick, river valleys and flood plains can pose a risk because of ice jams, harsh weather and the floods of annual spring thaw (GOC 2018). Flooding in New Brunswick is rather common, especially along the Saint John River (ECCC 2017). While the Hammond River, located adjacent the Project site, is not known as being highly flood prone, ice jams and localized flooding are possible during spring freshet.

Electrical storms, or thunderstorms, which are more frequent in New Brunswick than the rest of Atlantic Canada, occur on average 10 to 20 times a year (NAV Canada 2001). Generally, only one of these storms (per year) is extreme enough to produce hail. Thunderstorms can produce extremes of rain, wind, hail and lightning; however, most of these storms are relatively short-lived (GOC 2018).

Tornadoes are rare in New Brunswick, but can occur. According to Environment and Climate Change Canada, western New Brunswick is considered part of Canada's Tornado zone, a region that stretches from the B.C.-Alberta border to the western portion of New Brunswick. The Project site is located within this area. However, no tornadoes have been documented at or near the PDA.

6.2.3 Seismicity

Seismic activity is dictated by the local geology of an area and the movement of tectonic plates comprising the Earth's crust. Natural Resources Canada monitors seismic activity throughout Canada and identifies areas of known seismic activity in order to document, record, and prepare for seismic events that may occur. The Project area is located in the Northern Appalachians Seismic Zone, which includes most of New Brunswick and extends into the northeastern United States, as far south as Boston, Massachusetts. Historical seismic data recorded throughout this zone has identified clusters of earthquake activity. However, historical seismic activity is considered low (Natural Resources Canada 2018a). Earthquakes in New Brunswick generally cluster in three regions: the Central Highlands (near Miramichi) region, the Moncton region, and the Passamaquoddy Bay region in the southeastern corner of the province.

The largest recorded earthquake ever recorded in New Brunswick was a magnitude 5.7 (on the Richter scale) event on January 9, 1982, located in the north-central Miramichi Highlands. Aftershocks following this earthquake reached magnitude 5.1 and 5.4. Between 1855 and 1937, other moderate earthquakes in these three regions, ranged from 4.5 to 6.0 (Basham and Adams 1984). The maximum credible earthquake magnitude for the northern Appalachians region is estimated to be magnitude 7.0, based on historical earthquake data and regional tectonics (Adams and Halchuk 2003). It is noted that there is potential for large earthquakes of up to an estimated magnitude 7.5 along fault zones in the St. Lawrence River region. However, any such events in this region would be close to 400 km from the

Project site, and therefore the amplitude of ground motions at the Project site would be low due to attenuation over a large distance.

In summary, a review of historical earthquake records and regional tectonics indicates that the Project area is situated in a region of low seismicity.

6.2.4 Forest Fires

The Fire Weather Index is a component of the Canadian Forest Fire Weather Index System. The index provides a numeric rating of fire intensity, and is the general index of fire danger throughout the forested areas of Canada (Natural Resources Canada 2018b).

The mean Fire Weather Index in Upham, New Brunswick for July (i.e., normally the driest month of the year), when risk of forest fire is typically greatest, is rated from 5-10, as shown in **Figure 6.2.1**, which is the second lowest rating on the scale of possible fire risk. This risk is based on Fire Weather Normals data, representing the average value of a fire weather code or index over the 30-year period from 1981 to 2010 (Natural Resources Canada 2018b).

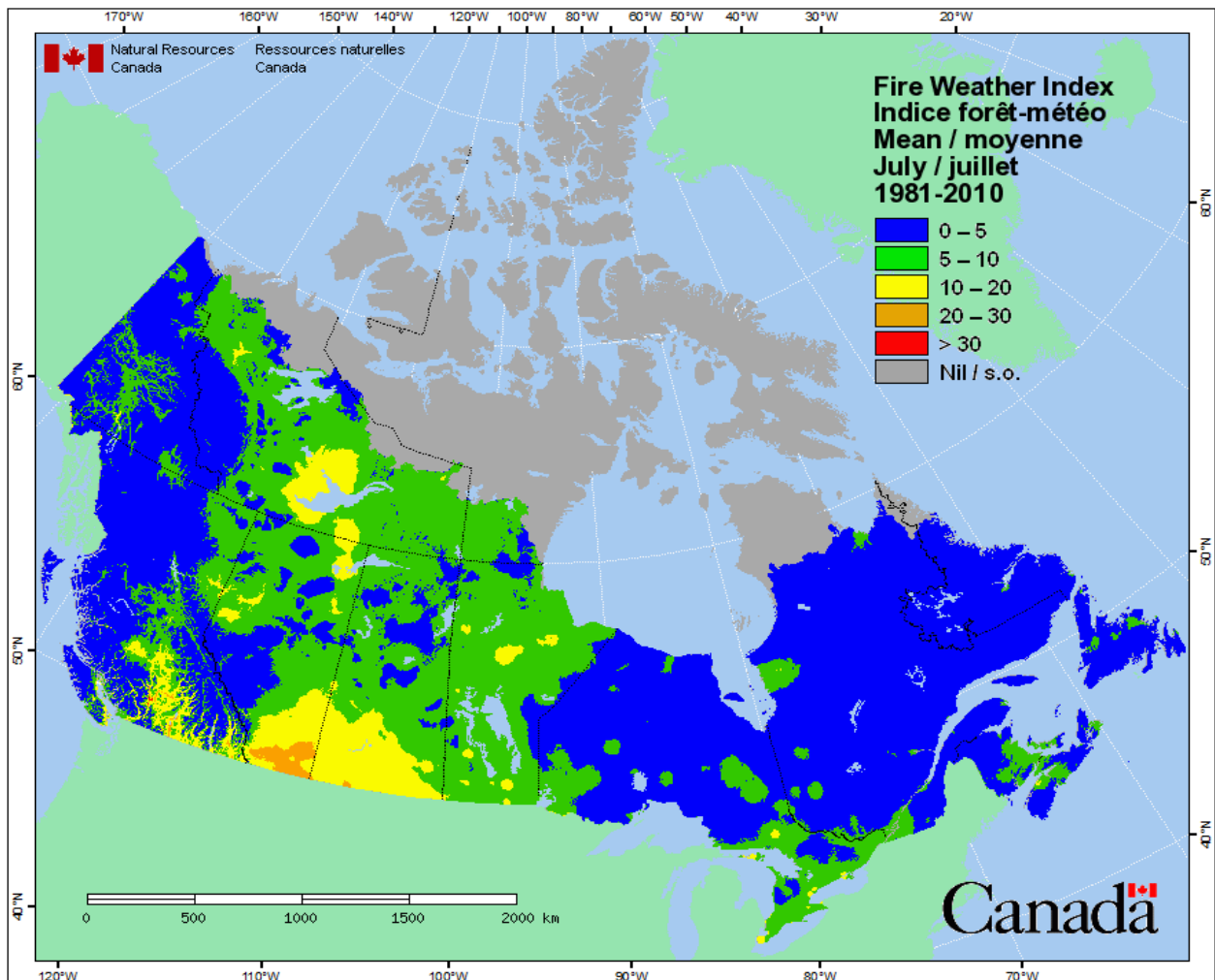


Figure 6.2.1: Natural Resources Canada Fire Weather Index

6.3 Effects Assessment

As a factor of safety, and a matter of responsible engineering practice, the design and materials to be chosen for construction of the Project will be selected so that the Project will withstand environmental stressors that could occur from various natural and environmental phenomena (e.g., extreme storms, increased precipitation and other factors arising from climate change, and others). The EIA has been carried out in parallel to Project design, and the results of the EIA have informed the design of the Project such that any potential concerns are addressed and the potential for significant adverse effects of the environment on the Project is minimized.

The Project will be constructed to meet all applicable building, safety and industry codes and standards.

The engineering design of the Project will consider and incorporate potential future changes in the forces of nature that could affect its operation or integrity (e.g., climate change), and Project components and infrastructure will be designed and built to adapt to or withstand these effects.

Design requirements address issues associated with environmental extremes including:

- wind loads;
- storm water drainage from rain storms and floods;
- weight of snow and ice, and associated water;
- earthquake loads; and,
- erosion protection of slopes, embankments, ditches and open drains.

6.3.1 Potential Effects

Effects of Climate and Climate Change and Extreme Weather on the Project

To assess the environmental effects of climate on the Project, current climate and climate change must both be considered. Current climate conditions have been established by compiling relevant historical data and establishing a climatological background for the Upham, New Brunswick area. Climate change effects projected over the life of the Project are determined through reviewing the climate modelling research to establish the current state of understanding of likely trends in the Upham area over the next 50 to 100 years. However, as noted in **Section 6.2**, since the Project has an anticipated lifespan of only 10 years, rather than placing the most emphasis on the effects of long-term climate change on the Project, it is generally more appropriate to consider the effects of recent climatological conditions, especially the potential adverse effects of weather variability and weather extremes (e.g., change in precipitation).

Numerous climate-related conditions, linked primarily to global warming, have been observed across Atlantic Canada, the entire country and globally. Many believe that these changes to the climate regime will accelerate over the next century, as has been the case with global temperatures over the past two decades (IPCC 2014). Several changes in conditions have been projected to affect infrastructure in Atlantic Canada in the future, including changing precipitation patterns, higher temperatures, more storm events, increasing storm intensity, erosion and flooding.

The relatively short period of construction and the anticipated period of operation for the Project is not considered as a period over which the effects of future climate change can or should be considered. Rather, it is more important to consider recent climate trends (1981-2010 averages and extremes) and assess the likelihood and effect of severe and extreme weather events on the Project so that they may be accounted for in the design, construction, operation, and eventual reclamation and closure processes and timelines. The most relevant climate changes that could potentially have effects on the Project include:

- increased frequency and magnitude of heavy precipitation events; and,
- increased frequency of extreme storms accompanied by heavy and/or freezing precipitation, thunderstorms, and strong winds; and increased incidence of flooding and erosion.

Each of these effects must be considered in terms of how they may adversely affect the Project if they are not planned, engineered, and designed to account for such effects. The environmental attributes described have the potential to affect the Project in several ways, including but not limited to:

- a reduction in visibility and an inability to manoeuvre construction and operational equipment;
- changes to the ability of workers to access the work site (e.g., poorly designed culverts, erosion and road wash outs);
- damage to construction equipment and site infrastructure;
- increased structural loading from snow and ice build-up; or,
- reduce the ductility of construction materials used in Project components (e.g., weigh scale and associated building), and increase susceptibility to brittle fracture.

Extreme snowfall can also affect winter construction and operation by causing a delay in delivery of materials, and resulting in additional effort for snow clearing and removal. This additional effort, however, would not substantially change the Project schedule. Extreme snowfall contributing to unusual flooding during snowmelt and extreme rainfall events could also potentially lead to flooding and erosion. Heavy rain, snowfall and/or freezing rain events could also cause an interruption of services such as communications or on-site electrical power if power to site facilities (e.g., portable trailer/office) is primarily supplied by on-site solar panels.

During electrical storms, fault currents (defined as a current that is several times larger in magnitude than the current that normally flows) may result from a lightning strike and could result in danger to personnel and damage to infrastructure (e.g., weigh scale). Since a power line is not essential to the Project, it is not anticipated that lightning strikes will result in power outages.

Some effects, such as damage to infrastructure, can also result in consequential effects on the environment. These types of environmental effects are addressed as Accidents, Malfunctions, and Unplanned Events in **Section 7.0**.

Effects of Seismic Activity on the Project

Although the Project area is geographically situated within an identified seismic zone, the level of historical seismic activity near the PDA is low. Other areas of the province (such as the Passamaquoddy Bay region, the Miramichi region, and the Moncton region) have historically experienced relatively higher levels of seismic activity, but these are sufficiently distant to the Project that the risk that a major seismic event in these areas could adversely affect the Project in a significant way is low. Although past occurrence of seismic activity in an area is not necessarily an indicator that a significant seismic event could not occur in the future, the likelihood of a major seismic event in the immediate vicinity of the Project that could cause major Project damage or interrupt activities during any phase of the Project is low.

Effects of Forest Fires on the Project

New Brunswick has a forest fire control program in place to identify and control fires, minimizing the potential magnitude and extent of any forest fire, and their potential consequent effects on the Project. Local and provincial emergency response crews will provide for rapid detection and response to any identified fire threat. This includes fires that could start within the Project site perimeter as well as fires approaching from outside the area (i.e., forest fires). In addition, the large open cleared area (i.e., the 23 ha open pit) provides a safety and fire buffer, further decreasing the likelihood of a forest or brush fire causing substantive damage to the Project.

With respect to the effects of forest fires on the Project, the facility structures will be constructed primarily of concrete, asphalt, metal and steel (e.g., weigh scale, site trailer), which are not typically affected by fire, and the majority of materials handled (e.g., topsoil, grubbings, waste rock) are not flammable. Petroleum products, explosives, and other highly flammable substances are not planned to be stored at the PDA.

6.3.2 Mitigation

Mitigation strategies for minimizing the likelihood of a significant adverse effect of the environment on the Project are inherent in: the planning process being conducted, the application of engineering design codes and standards, construction practices, and monitoring. To address these environmental effects, proactive design, planning, and maintenance are required in consideration of the potential normal and extreme conditions that might be encountered throughout the life of the Project.

Mitigating Effects of Climate and Extreme Weather on the Project

- The materials specified for the Project will be in compliance with the applicable standards and codes and will maintain structural integrity at the anticipated minimum and ambient temperatures near the PDA to prevent damage to Project infrastructure that could pose a substantial health and safety risk, could delay the Project schedule and milestones, or could not be technically or economically repaired.
- Disruption of Project activities and delays to the Project schedule will be avoided by scheduling tasks that require precise and/or timely movements (e.g., storage area development, storm

water management pond development) for periods when the weather conditions are favourable. A disruption allowance will be considered in Project and operational scheduling.

- Extreme precipitation events are an expected work condition and the Project schedule allows for weather conditions typical for the Southern New Brunswick region. The Project is being designed with storm allowances for containment of largest design storm event (i.e., 1-in-100-year 24-hour flood event). These allowances are sufficiently conservative to account for extreme weather events and to take into account any increase in the frequency and/or severity of significant storm events that might arise from climate change over the life of the Project. As such, site water management features will be in place early in the construction phase to manage any potential increased site run-off from precipitation events that could occur.
- Erosion as a result of extreme precipitation and potential flooding is not anticipated to have a substantive adverse effect on the Project due to standard mitigation measures that will be implemented (e.g., collection and management of site water, use of erosion and sedimentation control structures, construction methods that stabilize erodible soils as early as possible after ground has been disturbed). Following construction, exposed soils will be stabilized, roadways will use suitable gravel bases and sub-bases to prevent erosion, and exposed areas will be vegetated where possible to prevent surface erosion.
- Any building structures (e.g., gatehouse, portable trailer) will be designed such that they will be able to withstand extremes of temperature, wind, rain, snow, and ice events through the life of the Project. Structures will be designed to withstand these weather-related factors and loads, in consideration of future climate changes, and to be in compliance with applicable codes and standards.
- Contingency plans, including emergency back-up power (e.g., solar panels, generator) for necessary operations, will be in place to manage temporary power outages.

As described above, environmental stressors potentially associated with climate change and severe weather would be more than adequately addressed by engineering design to comply with building codes and standards that incorporate factors of safety to account for these changes, and careful materials selection for Project-related infrastructure. The National Building Code of Canada provides for factors of safety to account for possible extreme weather (including allowances for future increased frequency and/or severity of these storms that could arise from climate change), and will form the basis of the design and construction of the Project-related infrastructure.

Mitigating Effects of Seismic Activity on the Project

The Project and related infrastructure will be designed to the applicable standard in consideration of the maximum credible earthquake magnitude for the region. The National Building Code of Canada provides for sufficient factors of safety to account for seismic activity in active seismic zones in Canada, and will form the basis of the design and construction of site infrastructure. The intent of these and other design standards is to maintain the integrity of the facilities based on the level of risk for an earthquake in the area of a magnitude up to the maximum credible earthquake. Therefore, seismicity is not considered to have the potential to substantively damage project infrastructure or components during all phases of

the Project, due to planned design mitigation and the application of the National Building Code of Canada and other applicable guidelines.

Mitigating Effects of Forest Fires on the Project

The Project and related infrastructure, including the facility structures will be constructed primarily of concrete, asphalt, metal and steel (e.g., weigh scale, portable trailer) , which are not typically affected by fire, and the majority of materials handled (e.g., topsoil, grubblings, waste rock) are not flammable. Petroleum products, explosives, and other highly flammable substances are also not planned to be stored at the PDA.

Through integrated and coordinated emergency response capabilities at the local and provincial levels, project personnel will mobilize away from the PDA if forest fires are affecting the local area, and will only return under clear and safe conditions, as determined by emergency response agencies in the province.

6.3.3 Characterization of Residual Effects

The potential effects of the environment on all project phases will be considered in the planning and design of the Project and in the scheduling of Project activities to limit delays, prevent damage to infrastructure and the environment, and to maximize the safety of staff. Compliance with design and building codes and standards are expected to account for weather extremes, seismicity, and forest fire threats through built-in factors of safety to prevent undue damage to infrastructure from such events. Although it is possible, even likely, for the PDA to experience extreme environmental conditions during the Project lifecycle, a substantive delay (e.g., a delay for more than one season) is not anticipated.

Further, no substantial damages to Project infrastructure are anticipated as a result of natural environmental conditions due to the design and type of activities proposed. Therefore, the effects of the environment are not expected to adversely affect the Project in a manner that cannot be planned for or accommodated through design and other mitigation and adaptive management strategies. As a result, the effects of the environment on the Project are expected to be not significant.

6.4 Summary

As a matter of generally accepted engineering practice, responsible and viable engineering designs tend to consistently overestimate and account for possible forces of the environment, and thus inherently incorporate several factors of safety to ensure that a project is designed to be safe and reliable throughout its lifetime.

For the Project, long-term environmental management and Project longevity (up to 10 years) are inherent considerations in the best management practices of the design and associated Project risk management. Equipment and materials that are able to withstand severe weather and other influences will be used. Environmental stressors, such as those that could arise as a result of climate change, severe weather, or other factors (e.g., seismic events, fires), would more than adequately be addressed by good engineering design, materials selection, best practices, and engineering foresight. As will be

demonstrated, while there is potential for natural forces to affect the Project, it is not likely to have a substantive effect due to planned mitigation and design.

Hammond River Holdings will continue to monitor changing information regarding climate change and design, and operations will be managed adaptively so that the effects of the environment on the Project will be mitigated if new situations develop. Accordingly, the effects of the environment on the Project are considered not significant.

7.0 Accidents, Malfunctions, and Unplanned Events

This section identifies accidents, malfunctions, and unplanned events that may occur during any phase of the proposed project. The assessment focuses on events that are considered credible based on the Project description and the experience of the EIA team in assessing similar projects.

7.1 Approach

The general approach to assessing the potential environment effects of the selected potential accident, malfunction, or unplanned event scenarios involves the following:

- describing the potential accident, malfunction, or unplanned event;
- considering if the potential accident, malfunction, or unplanned event could occur during the life of the Project, and during which phase(s) or activity(ies);
- determining with which valued component(s) (VCs) the potential accident, malfunction, or unplanned event may interact;
- describing the Project planning and safeguards established to minimize the potential for such occurrences to happen;
- considering of the contingency or emergency response procedures applicable to the event; and,
- in consideration of the above, assessing the residual environmental effects of accidents, malfunctions, and unplanned events on related VCs, and determining the significance of the potential residual environmental effects of these accidents, malfunctions, or unplanned events (and their likelihood of occurrence, as applicable).

Spatial and temporal boundaries for considering residual environmental effects of potential accidents, malfunctions, and unplanned events that may arise as a result of the Project are the same as those for each VC to which they apply, presented earlier in this document. Similarly, criteria used for determining the significance of residual environmental effects with respect to potential accidents, malfunctions, and unplanned events are the same as those for each applicable VC.

7.2 Description of Potential Credible Accidents, Malfunctions, and Unplanned Events

Based on the nature of the Project, knowledge of the environment within which the Project is located, as well as the experience of the Proponent, the following credible accidents, malfunctions, and unplanned events have been selected for this assessment, and are described in greater detail in the following sections.

Slope Failure: A slope failure may occur due to two principal reasons: failure of working faces of the open pit due to improper design and/or operational procedures; or failure of overburden slopes above the working face. Improperly designed and operated open pits could result in a slope failure that could pose a safety hazard to workers or damage to equipment located within the quarry during construction or operation.

Failure of Erosion and Sediment Control (ESC) Measures: Erosion and sedimentation control (ESC) measures prevent exposed soil from mobilizing and entering undisturbed areas as a result of rainfall or spring runoff. This event includes a structural failure of the water management pond (settling pond) on-site. A failure of an ESC measure could result in mass wasting of soil or siltation of receiving watercourses. The discharge of sediment to watercourses during storm events or spring runoff following the failure of ESC measures could occur during the construction or operation phases of the Project.

Uncontrolled Explosion: Explosives will be periodically used to blast rock from the open pit during the operation phase. An uncontrolled explosion refers to either the timing of the explosion (i.e., premature or late detonation) or the magnitude of the blast beyond what was planned. An uncontrolled explosion could pose a risk to the safety of workers on site or the public, or cause damage to equipment or property, either as a result of the force of the blast or from fly rock arising from it. An uncontrolled explosion could only occur during the operation phase of the Project.

Vehicle Accident: A vehicle accident is possible during the construction or operation phases at the proposed quarry site or in transit on provincial roads. A vehicle accident includes a collision with other vehicles, pedestrians, wildlife, or structures/objects, and potentially pose a risk to the health and safety of workers, the public, or wildlife. A fire or fuel spill could also occur as a consequence of a vehicle collisions, compounding the initial effects by potentially threatening surface water, groundwater, fish and fish habitat, wildlife and wildlife habitat, vegetation, and wetlands.

Accidental Release of a Hazardous Material: An accidental release of fuel used in vehicles or mobile equipment on-site may occur during refuelling of machinery or trucks as a result of human error or equipment malfunction, potentially affecting surface water, groundwater, fish and fish habitat, wildlife and wildlife habitat, vegetation, and wetlands. Refuelling of on-site equipment will be by mobile delivery trucks on a daily basis during construction and operation phases of the Project.

Discovery of a Heritage Resource: Previously undiscovered archaeological resources (i.e., artifacts) could be uncovered during excavation of topsoil and overburden as well as from other earth moving activities on the site during the construction phase. Similarly, if present, palaeontological resources (i.e., fossils) could be uncovered during gypsum extraction in the operation phase of the Project as the underlying bedrock (gypsum) is exposed for removal.

7.3 Potential Interactions between Accidents, Malfunctions, and Unplanned Events and Related Valued Components

Based on the nature of the above credible events and the study team's knowledge of their potential to interact with the environment, the VCs with a reasonable potential to interact with these potential

accidents, malfunctions, or unplanned events that could result in residual environmental effects are identified in **Table 7.3.1**.

Table 7.3.1: Potential Interactions of Accidents, Malfunctions, and Unplanned Events with Valued Components

Accident, Malfunction, or Unplanned Event	Atmospheric Environment	Water Resources	Fish and Fish Habitat	Vegetation and Wetlands	Wildlife and Wildlife Habitat	Socioeconomic Environment	Heritage Resources	Traditional Land and Resource Use
Slope Failure						✓		
Failure of Erosion and Sediment Control Measures		✓	✓	✓	✓			✓
Uncontrolled Explosion						✓		
Vehicle Accident	✓	✓	✓		✓	✓		
Accidental Release of a Hazardous Material	✓	✓	✓	✓	✓			✓
Discovery of a Heritage Resource							✓	

Legend: ✓ indicates a potential interaction

Those accidents, malfunctions, or unplanned events that may result in an interaction with a specific VC are identified with a checkmark in the table above, and are therefore carried for further assessment below.

Accidents, malfunctions, or unplanned events that are not identified with a checkmark in the table above are not expected to result in an interaction with a specific VC or VCs. For those accidents, malfunctions, or unplanned events, the residual environmental effects of the Project with the VCs for which an interaction was not identified in the above table during all phases are not significant, with a high level of confidence.

7.4 Assessment of Potential Environmental Effects from Accidents, Malfunctions, and Unplanned Events

This section assesses the environmental effects of each of the credible accidents, malfunctions, and unplanned events for which an interaction was identified with a related VC (or VCs), and identifies mitigation measures to address the potential residual environmental effects. The significance of potential residual environmental effects following the implementation of mitigation or consideration of emergency or contingency response procedures is also discussed.

7.4.1 Slope Failure

A slope failure could pose a risk to workers or equipment within the working area of the Project (particularly within the open pit), or may lead to worker injury or possibly death as well as damage to equipment. Potential related effects could include interruption or suspension of quarry operations during investigations by regulating agencies. Such an interruption could cause an adverse effect on the socioeconomic environment.

7.4.1.1 Mitigation

Key mitigation to prevent a slope failure includes:

- Slope angles established using industry standard practices and methods;
- The Project will be constructed and operated in accordance with provincially regulated overburden setbacks and pit face angles for removal of material;
- Operation of the open pit will be in compliance with the *General Regulation 91-191* under the *New Brunswick Occupational Health and Safety Act*;
- Quarry face inspections will occur daily to ensure compliance; and,
- An Emergency Response Plan will be in place as part of the Environmental Protection Plan (EPP) for the Project.

7.4.1.2 Potential Residual Environmental Effects

The risk of slope failure during the construction or operation of the Project is expected to be low with the implementation of good working practices and preventative measures, and adherence to applicable provincial regulations and guidelines for the safe operation of quarries.

With preventive and mitigative measures, safe working practices, compliance with occupational health and safety legislation, and the low probability of slope failure, the potential residual environmental effects of a slope failure on the socioeconomic environment during construction and operation of the Project are not significant, with a high level of confidence.

7.4.2 Failure of Erosion and Sediment Control Measures

Erosion and sediment control (ESC) measures prevent erosion of surface soils and the resulting surface runoff from directly entering surface water bodies. Failure of ESC measures could be a result of the measures being insufficient to manage a given runoff event (e.g., rainfall or spring runoff exceeding capacity) or the implementation was poorly constructed.

A failure of ESC measures could affect primarily fish and fish habitat. The discharge of runoff containing sediment to watercourses during storm events or spring runoff could result in the degradation of adjacent surface water bodies, wetlands, and fish and fish habitat those environments support. The effects on fish and fish habitat could include a temporary reduction in water quality due to increased sediment load. If the release were to occur during spawning, spawning beds could be negatively affected as sediment may cover the gravel beds and suffocate the eggs. Aquatic organisms may be adversely

affected by a sediment release, potentially reducing the fish's food supply. Consequential environmental effects could result to surface water, vegetation and wetlands, and wildlife and wildlife habitat.

In addition, a failure of ESC measures could affect traditional land and resource use as a consequential environmental effect. Aboriginal communities that practice traditional activities near the Project site could be affected if the fish and fish habitat affected by an ESC failure were being used for traditional purposes.

7.4.2.1 Mitigation

Key mitigation to prevent a failure of erosion or sedimentation control measures includes:

- Contingency plans will be developed for extreme rainfall or spring runoff events including:
 - monitoring of surface runoff conditions during heavy rainfall/spring runoff and operational observations to evaluate the need for improvements in surface runoff control;
 - cover will be applied to highly erodible areas;
 - clean-out of settling ponds and check dams will be conducted, and,
 - provision of a stockpile of sediment and erosion control materials.
- Contingency may also include temporary pumping of surface water back into the open pit if temporary inflow of water to the pit floor during storm events is not an operational concern.
- A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a failure of an ESC measure will be developed and implemented.

Note that approaches will vary depending upon season, and the Site Manager shall indicate approaches for summer low flow periods, spring-fall high flow periods, and frozen ground high flow periods.

7.4.2.2 Potential Residual Environmental Effects

The installation, maintenance, and monitoring of erosion and sedimentation control structures is a routine activity on construction sites and industrial operations, and is well understood by site managers and construction personnel. With daily visual monitoring of erosion and sedimentation control devices, conducting maintenance of them as necessary, periodically removing accumulated sediment, and active water management on-site, the risk of a failure of erosion and sediment control measures occurring is expected to be very low. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of a failure of erosion and sedimentation control measures on surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resources during all phases of the Project are not significant, with a high level of confidence.

7.4.3 Uncontrolled Explosion

An uncontrolled explosion has the potential to interact with the socioeconomic environment. An uncontrolled explosion has the potential to injure or kill workers on the site, damage equipment or machinery at the Project site as a result of the force of an explosion. An uncontrolled explosion also has the potential to injure or kill people and damage property off-site as a result of fly rock. Fly rock is rock ejected from an explosion that travels outside the blast site and can vary in size and distance travelled. Minor consequential environmental effects could occur to the atmospheric environment and possibly wildlife and wildlife habitat.

Incidents related to uncontrolled blasts could result in interruptions in operations at the Project site, in addition to other potential consequences.

7.4.3.1 Mitigation

Key mitigation to prevent an uncontrolled explosion includes:

- Explosives will either be transported to the Project site by a licensed blasting subcontractor on a daily basis, or stored on site in an approved and properly designed explosives magazine that meets setback and security requirements of the *Explosives Act*, thereby removing the risk of unauthorized access to explosives.
- The contractor will follow a blasting schedule laid out by the Site Manager.
- Only licensed blasting contractors with the appropriate qualifications for the nature of the Project activities will be used.
- 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.
- An audible alarm will be sounded prior to all blasts to provide advance warning to workers and residents, in accordance with *General Regulation 91-191* under the *New Brunswick Occupational Health and Safety Act*.
- 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.
- Transportation of explosives will be in compliance with the federal *Explosives Regulations* under the *Explosives Act* and the *Transportation of Dangerous Goods Regulations* under the *Transportation of Dangerous Goods Act*.
- Blasts will be carried out in sequence using best available industry techniques for avoiding the risk of an uncontrolled explosion (including fly rock).

- The risk of an uncontrolled explosion will be further reduced by the use of current technologies, best industry practices, and strict legislative requirements through regulatory requirements or permitting.
- A Blast Monitoring Plan will be developed to identify the appropriate procedures and monitoring requirements to be implemented during blasting activities.

7.4.3.2 Potential Residual Environmental Effects

The use of explosives on an industrial site for quarrying operations by experienced licensed blasting contractors is a routine activity that is well understood and managed in a manner to prevent the risk of uncontrolled explosions. Additional mitigation measures to be implemented as part of the Project are expected to further reduce the likelihood of an uncontrolled explosion. With these measures and the relative distance between the Project site and the nearest residences, the risk of an uncontrolled explosion is expected to be negligible. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of an uncontrolled explosion on the socioeconomic environment during all phases of the Project are not significant, with a high level of confidence.

7.4.4 Vehicle Accident

A vehicle accident could affect the socioeconomic environment, the atmospheric environment, water resources, fish and fish habitat, and/or wildlife and wildlife habitat.

Vehicles will be active across the Project site throughout the construction and operation phases as well as on the transportation route between Upham East and East Saint John. Vehicle collisions have the potential to risk human health and safety and other property such as project infrastructure or private property. This could have an adverse effect on the socioeconomic environment.

Consequential environmental effects of a vehicle accident could occur on the atmospheric environment, as fires or fuel spills arising from a vehicle accident could result in a temporary and localized reduction in air quality. Fuel spills resulting from a vehicle accident could adversely affect water resources or fish and fish habitat, as surface or groundwater resources may become contaminated by fuel, potentially threatening potable water supplies and fish and fish habitat. Finally, a vehicle accident could have a direct effect on wildlife in the event of vehicle-to-wildlife collision, and an indirect effect in the event of a fuel spill or fire resulting from a vehicle collision.

7.4.4.1 Mitigation

Key mitigation to prevent a vehicle accident includes:

- The preferred transportation route was chosen to optimize safety by using roads that are designed to accommodate the vehicle weights that will be associated with the Project and by accessing the four-lane Route 1 for much of the transportation route length, thereby minimizing trucking time on smaller provincial roads;

- Vehicles travelling to and from the Project site will adhere to posted speed limits, weight restrictions, and other traffic safety rules, and drivers will adjust their speed to conditions accordingly;
- Drivers will also heed wildlife warning signs and reduce speed in areas identified as posing a potential risk of wildlife collision;
- Safety zones with posted speeds will be identified throughout the Project site;
- Pedestrian zones will be identified to allow workers access throughout the work area on foot;
- Signage will be erected along Route 111 and Route 865, indicating that it is a trucking route;
- A communications plan will be established to engage with local communities potentially affected by Project-related traffic; and,
- A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a vehicle accident will be developed and implemented.

7.4.4.2

Potential Residual Environmental Effects

Though vehicle accidents may occur with any project, particular attention will be paid to conducting Project operations in a careful and safe manner so as to reduce the risk of a serious vehicle accident. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of a vehicle accident on the socioeconomic environment, atmospheric environment, water resources, fish and fish habitat, and wildlife and wildlife habitat during all phases of the Project are not significant, with a high level of confidence.

7.4.5

Accidental Release of Hazardous Materials

The accidental release of a hazardous material through spills could affect primarily water resources and fish and fish habitat, with consequential environmental effects possible to the atmospheric environment, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resources.

Other than for small quantities of emulsion explosives (which are viscous and do not readily flow) which will be carefully managed by a licensed explosives contractor on a daily basis, and the amount of fuel and lubricants present within mobile equipment on-site, there are no liquid hazardous materials anticipated to be present on-site. Though no hazardous materials or liquid fuels will be permanently stored on the Project site, vehicles and mobile equipment used to carry out earth moving, excavation, loading, hauling, and transportation operations on-site will need to be refuelled on a daily basis for their continued operation. Fuels will be brought on-site daily by mobile tankers operated by approved refuelling contractors, and refuelling activities will be carried out in a designated area (at least 30 m away from watercourses or wetlands) using defined procedures to prevent the occurrence of a spill.

An accidental spill of hydrocarbons or other substances during construction and operation of the Project may contaminate air, soils and groundwater and, through runoff, contaminate watercourses. Contaminants may adversely affect both terrestrial and aquatic habitat and migratory birds. Loss of

petroleum hydrocarbons, hazardous materials, or other substances may volatilize and adversely affect ambient air quality on a temporary and localized basis.

Chemical and fuel spills may enter a watercourse directly, potentially affecting water quality and fish and their habitat, with the extent of effects depending upon the nature of the material and the quantity released. The effects could range from a small localized spill, which is contained and remediated quickly, to a large release of a highly soluble material that affects the receiving watercourse and downstream watersheds. Possible negative effects to fish and fish habitat could include direct mortality of fish and aquatic organisms that fish feed upon, degradation of surface water quality, and potential injury or death of wildlife in the event of exposure. If natural resources affected by a spill are used for traditional purposes by Aboriginal persons, a consequential environmental effect of a spill could also occur to traditional land and resource use.

Effects on vegetation and wetlands from an accidental hazardous materials release include a physical harm or death of vegetation species, a reduction or loss of wetland function as a habitat for fish and wildlife, and accretion of contaminants in wetland sediments. Contaminants are less likely to move through a wetland system at the same rate as riparian systems due to the low mobility of water and sediments. Contaminants may build up in the sediments and be released into the ecosystem over time, rather than being flushed out over a season as with a riparian system.

7.4.5.1

Mitigation

Key mitigation to prevent an accidental release of a hazardous material includes:

- A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a hazardous material spill will be developed and implemented.
- No storage of hazardous materials will occur on-site; all hazardous materials will be brought to the site by mobile tankers on a daily basis for vehicle refuelling in a designated area, and leave the site following the refuelling activities.
- A Spill Contingency Plan will be developed as part of the EPP for substances anticipated to be brought on-site during the construction and operations activities.
- Fuelling operations will be conducted in designated areas located at a minimum distance of 30 m from wetlands and surface water bodies.
- Vehicle maintenance, including the changing of oil and lubricants, will not be permitted on-site.
- Releases potentially caused by motor vehicle accidents are addressed initially by local emergency response agencies and directed by the NBDELG. Subsequently, site contractors will contain the spill and remove contaminated soils and sediment for disposal.
- Emergency spill kits will be available on-site.

- Small spills can typically be cleaned up effectively with minimal long-term impacts, and larger spills are not likely to occur based on limited quantities of hydrocarbons anticipated to be present on-site during construction/operation.

7.4.5.2 Potential Residual Environmental Effects

With no planned storage of liquid hazardous materials on-site and careful implementation of best practices during refuelling of equipment from mobile tankers on a daily basis, the risk of spills resulting during construction or operation of the Project is expected to be low. The risk of contamination from spills and leaks during the operation phase will be reduced further by preventive measures, contingency planning and spill response and mitigation. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of an accidental release of a hazardous material on the atmospheric environment, water resources, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, and traditional land and resource use during all phases of the Project are not significant, with a high level of confidence.

7.4.6 Discovery of a Heritage Resource

The discovery of a heritage resource would interact with the heritage resources VC.

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 (though unlikely) that fossils could be found in the underlying gypsum rock during operation of the Project.

Based on the early results of the archaeological impact assessment (AIA) conducted for the Project, the Project site generally has a generally 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 a potential for heritage resources to be found in the general area of the Project. A site walkover and associated shovel testing (as required) 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.

7.4.6.1 Mitigation and Response

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.

In the unlikely event that an archaeological, palaeontological, or cultural resource or artifact is discovered during the construction or operation phases of the Project, the following procedure will be followed, to be updated as part of the development of the EPP:

- Work will be immediately stopped, and the area will be marked to prevent further disturbance. An exclusion zone of 100 m surrounding the find will be established.
- The Site Manager will immediately contact the Archaeological Services Branch of the New Brunswick Department of Tourism, Heritage and Culture to notify them of the discovery and establish a mitigation plan. For fossils, the New Brunswick Museum will be contacted.
- No additional work will be permitted at the site until approval has been received from the appropriate regulatory agency to resume the work.
- If bones or human remains are found, work in the area must cease, and the RCMP shall be immediately notified.
- No one shall disturb, move or rebury any uncovered human remains.
- If the discovered resources are related to Aboriginal culture, the New Brunswick Aboriginal Affairs Secretariat will be contacted to determine how best to proceed with respect to repatriation of the resources.

7.4.6.2

Potential Residual Environmental Effects

Given the low archaeological potential of the Project site, the potential to encounter previously undiscovered heritage resource during construction and operation of the Project is believed to be very low. With the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of a discovery of a heritage resource on heritage resources during all phases of the Project are 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.

7.5

Summary

The potential occurrence of accidents, malfunctions, or unplanned events has been considered as part of the Project design. The potential for accidents, malfunctions, or unplanned events to occur will be carefully considered during planning for the Project, and measures will be developed and implemented

such that their potential is reduced. Safeguards will be implemented throughout the construction, operation and reclamation and closure phases. Contingency and emergency response plans will be developed before any work is initiated on the proposed Project so that incidents can be managed effectively. By ensuring that all aspects of the Project adheres to applicable codes and standards and implementing the mitigative measures outlined above, the potential for adverse environmental effects arising from accidents, malfunctions, or unplanned events is greatly reduced.

Hammond River Holdings will also develop an Environmental Protection Plan for the management and prevention of such accidents, as well as develop effective response mechanisms for accidents, malfunctions, or unplanned events.

Given the nature of the Project and the credible accident and malfunction scenarios, their low likelihood of occurrence, and proposed mitigation and response planning, the potential residual environmental effects of all identified Project-related accidents, malfunctions, and unplanned events on the atmospheric environment, water resources, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, socioeconomic environment, heritage resources, and traditional land and resource use during all phases of the Project are rated not significant, with a high degree of confidence.

8.0 Summary of Residual Effects and Mitigation

8.1 Overall Summary

The environmental effects assessment of the VCs described throughout **Section 5.0** of this report concluded that there would be no significant adverse residual environmental effects from the Project during all phases assessed and in consideration of normal activities of the Project, as planned. The potential residual environmental effects of accidents, malfunctions, and unplanned events were also found to be not significant. A limited number of follow-up or monitoring initiatives have been developed to verify the predictions of this EIA Registration or to verify the effectiveness of mitigation.

Overall, based on the results of this EIA Registration, it is concluded that, with planned mitigation and the implementation of best practices to avoid or minimize adverse environmental effects, the residual environmental effects of the Project, including the effects of the environment on the Project and from accidents, malfunctions and unplanned events, during all phases are rated not significant.

Positive environmental effects were predicted for the socioeconomic environment as they relate to employment during the operation phase of the Project.

The following table summarizes the environmental effects assessment for each VC (refer to **Section 5.0** for details) and for each identified potential accident, malfunction or unplanned event (refer to **Section 7.0** for details). A concise summary of project phase(s) and potential interactions, identified mitigation, and significance of residual effects and follow-up measures that were identified are provided in **Table 8.1.1** below.

Table 8.1.1 - Summary of Residual Effects and Mitigation

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Atmospheric Environment (refer to Section 5.2)			
<p>Construction, Operation, Reclamation and Closure</p>	<ul style="list-style-type: none"> • Emissions of combustion gases and fugitive dust from earth moving activities and transport of materials on site during construction could result in air contaminants that could disperse in the atmosphere to off-site receptors; • Emissions of combustion gases and fugitive dust from quarrying activities including blasting, excavating, crushing, on-site transport, and storage of gypsum on-site during operation could result in air contaminants that could disperse in the atmosphere to off-site receptors; • Noise emissions from on-site equipment during construction could result in off-site receptors experiencing a change in ambient sound; • Noise emissions from on-site equipment and blasting activities during operation could result in off-site receptors experiencing a change in ambient sound; and • The operation of heavy mobile equipment and on-site trucks during construction and operation could result in emissions of greenhouse gases. • Emissions during reclamation and closure are expected to be similar to those during construction. 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • Maintaining a tree buffer between on-site activities and nearby receptors to mitigate the effect of sound and emissions; • Application of dust suppressants via water truck during dry periods when appropriate; • Instituting and following a non-idling policy; • Vehicles and equipment will be maintained in proper working order; • Hours of operation of the quarry and crusher will be limited to daytime hours; and • Blasting will be limited to daytime hours. 	<p>No significant residual effects identified.</p> <p>Confidence level: High</p> <p>Magnitude: Low</p> <p>Spatial Extent: Local</p> <p>Duration: Short term</p> <p>Reversibility: Reversible</p>
Water Resources - Groundwater and Surface Water (refer to Section 5.3)			
<p>Construction, Operation, and Reclamation and Closure</p>	<ul style="list-style-type: none"> • Surface drainage patterns will be altered with the reshaping of the Project site during construction and from the creation of the open pit quarry, and several wetlands and unnamed streams are likely to be affected. • The ongoing presence of the open pit could result in groundwater seepage from surrounding bedrock to drain into the open pit, requiring periodic dewatering and management and potentially changing groundwater availability and/or quality on a localized basis throughout the life of the Project. • Localized water balance may be disrupted through groundwater flow redirection towards the open pit rather than towards the Hammond River. Localized groundwater flow change is not anticipated to cause negative water quality or quantity issues within the LAA and regional groundwater flow in the area is expected to remain unchanged. • There is a potential for Project-related activities to affect localized groundwater quality and quantity due to the presence of the open pit, within which groundwater is expected to seep. • Blasting has the potential to cause damage and increased turbidity in potable wells as a result of vibration in the ground. • Water quality could be affected by accidental spills of lubricants, fuels, or residual chemical effects from blasting. • Many of the wetlands on the site will either be reduced in size or be destroyed during the construction and operation phases of the Project. 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • Where possible, avoid construction within 30 m of watercourses or wetlands. • The area of disturbance will be minimized to the extent possible to limit the associated environmental effects. • 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. • Exposed soils will be stabilized as soon as practical to minimize emissions of particulate matter, erosion, and the release of sediment-laden runoff. • Wetlands and unnamed tributaries that are affected as a result of the construction of the open pit mine will be compensated for under the New Brunswick Clean Water Act and New Brunswick Wetlands Conservation Policy (NBDNRE-NBDELG 2002). • An Environmental Protection Plan (EPP) including spill response measures will be put in place to establish procedures to minimize the potential for spills or uncontrolled releases. • It is planned that up to 20 potable wells in the LAA will be sampled to establish baseline water quality data (subject to landowner permission). These results be tabulated and compared to the Canadian Drinking Water Quality Guidelines (Health Canada 2017) prior to the beginning of construction. • Four shallow monitoring wells and four deep bedrock wells will be drilled in the LAA to establish baseline conditions on the site and to monitor changes in the water level, over time. Water levels will be monitored through the use of pressure transducers (data loggers) that can be programmed to record water levels at set time intervals, or by taking manual water level readings at set time intervals, during during construction and operation of the Project. A groundwater monitoring plan will be developed as part of the permitting phase of the Project. 	<p>No significant residual effects identified.</p> <p>Confidence level: Moderate</p> <p>Follow up monitoring recommended.</p> <p>Magnitude: Low</p> <p>Spatial Extent: Local</p> <p>Duration: Short term</p> <p>Reversibility: Reversible</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Fish and Fish Habitat (refer to Section 5.4)			
<p style="text-align: center;">Construction, Operation, Reclamation and Closure</p>	<ul style="list-style-type: none"> • Construction activities have the potential to result in the direct loss of fish and/or fish habitat in areas to be occupied by the open pit or other surface facilities and related flow diversions; • Construction and operation could also result in the indirect loss of fish and/or fish habitat in areas where the presence of Project-related facilities cause a change in surface water availability (e.g., draining into the open pit); • Removal of surface materials including vegetation and soils (i.e., topsoil and overburden) could increase erosion rates or alter natural drainage patterns in proximity to the aquatic receptors; • Storage of site runoff in the pit sump or settling ponds during operation may result in a change in surface water hydrology and a change in surface water levels in receiving waters from sequestering water in these features; • Release of untreated surface water, or out of specification treated water, could result in a change in water quality in the receiving environment; • Loss of wetland area or function(s) (such as hydrological regime, habitat and water quality maintenance) could occur due to clearing of trees and vegetation within the wetland(s) which may affect the quality and quantity of water to watercourses; and, • A spill or fire could occur as an accident or unplanned event which could affect water quality and fish habitat. 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • The area to be disturbed by the Project will be minimized to the extent possible; • Design surface water drainage to minimize changes in drainage; • Potential installation and/or upgrades to watercourse crossings (culverts) will be designed as per the New Brunswick Watercourse and Wetland Alteration (WAWA) Guidelines; • Maintaining a 30 m buffer around watercourses and wetlands, or if not possible, obtaining a watercourse and wetland alteration (WAWA) permit for any alterations of watercourses and their 30 m buffers; • Obtaining an authorization under Section 35(2) of the Fisheries Act for any Project activities that would result in the loss of fish habitat or other activities that result in serious harm to fish (as determined by DFO), with appropriate offsetting; • Efforts will be made to maintain as much mature vegetation that remains along the edges of the site as possible; in particular buffers around watercourses and wetlands located on the southeastern and southwestern portions of the PDA will be maintained to the extent possible; • Where direct loss of fish habitat may occur, a fish rescue program will be implemented prior to undertaking construction activities, and fish will be removed and relocated as per DFO guidance and consultation; • Implement a water management plan that incorporates measures aimed at retaining site water in a pit sump and settling pond; • Release of surface water from the Project site will target a total suspended sediment (TSS) concentration of less than 25 mg/L above background levels of the receiving watercourse and a pH of between 6.5 and 9.0, as a monthly average of grab samples; • Implement requirements for blasting as outlined in the DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters; • 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; and, • An emergency response plan (ERP) for accidental spill and emergencies 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. 	<p>No significant residual effects identified.</p> <p>Confidence level: Moderate Follow up monitoring recommended.</p> <p>Magnitude: Low Spatial Extent: Local Duration: Short term Reversibility: Considered reversible through the implementation of required habitat compensation</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Vegetation and Wetlands (refer to Section 5.5)			
Construction, Operation and Reclamation and Closure	<ul style="list-style-type: none"> • 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; no regulated (mapped) wetlands are located in the PDA; • 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; and, • 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). 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • The area to be disturbed by the Project will be minimized to the extent possible; • 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; • Potential installation and/or upgrades to watercourse crossings (culverts) will be designed as per the New Brunswick Watercourse and Wetland Alteration (WAWA) Guidelines; • Efforts will be made to maintain as much mature vegetation along the edges of the site as possible; in particular buffers around 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; • Obtaining a watercourse and wetland alteration (WAWA) permit for any alterations to regulated wetlands (and their 30 m buffers); • 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; • All construction equipment will be properly cleaned prior to mobilizing to site; • Implement a water management plan that incorporates measures aimed at retaining site water in a pit sump and settling pond; • 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 2018 to confirm <i>Spiranthes</i> species for proper identification of the potential SOCC <i>Spiranthes lucida</i>. 	<p>No significant residual effects identified.</p> <p>Confidence level: Moderate Follow up monitoring recommended.</p> <p>Magnitude: Low Spatial Extent: Local Duration: Short term (Construction and Operation) Reversibility: Reversible over time</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Wildlife and Wildlife Habitat (refer to Section 5.6)			
Construction, Operation and Reclamation and Closure	<ul style="list-style-type: none"> • 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; • 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; • Clearing and grubbing of vegetation (habitat) during construction will cause a change in immature (and limited mature) vegetation (flora) quality and/or quantity (i.e., a disturbance to wildlife habitat); • 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; • Heavy mobile equipment use during the construction or operation activities may cause direct injury or death of wildlife, through collisions or destruction of dens and food sources; • Medium and large sized mammals are unlikely to suffer direct mortality from construction 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 history cycle processes; • Following vegetation clearing, there will be local habitat fragmentation while the quarry is operational; and, • Loss of foraging habitat may occur from wetland alterations, should they be used for such purposes. 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • 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). 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. • 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. • 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. 	<p>No significant residual effects identified.</p> <p>Confidence level: Moderate 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.</p> <p>Magnitude: Low Spatial Extent: Local Duration: Short term Reversibility: Reversible</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Socio-Economic Environment (refer to Section 5.7)			
<p>Construction, Operation and Reclamation and Closure</p>	<ul style="list-style-type: none"> • 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 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 the single home-based business (if in existence) are expected to be similar to those on residences in that vicinity; • 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; • 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; • The Project will result in the unavailability of the PDA for use for recreational hunting, trapping or gathering. During operation, approximately 30-335-405 trucks per day will added to the existing traffic on the preferred transportation route. • During operation, approximately 30-335-405 trucks per day will added to the existing traffic on the preferred transportation route; and, • The Project will generate employment for up to 10 employees or contractors. 	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • Hammond River Holdings is committed to engaging with local residents prior to construction of the Project to identify and consider areas of concern and find possible ways to address residents' concerns through design or mitigation; • 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; • Where possible, efforts will be made to maintain as much mature vegetation that remains along the edges of the site as possible; • 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; • Periodic pre-blast surveys will be conducted at the nearest residences, and blasts will be carefully periodically monitored using seismographs 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; • Hammond River Holdings will work with NBDTI to conduct a condition assessment of a upgrade a 9 km section of Route 111 to confirm its weight bearing capacity; • Truck drivers will adhere to posted speed limits and warning signage and adjust driving to meet weather and road conditions. • Transportation of oversized loads (very wide or heavy loads) 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. 	<p>Occasional nuisance effects to nearby residents may be possible; however, no significant residual effects were identified.</p> <p>Confidence level: High Magnitude: Low Spatial Extent: Local Duration: Short term (Construction and Operation) Reversibility: Reversible</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Heritage Resources (refer to Section 5.8)			
<p>Construction, Operation, and Reclamation and Closure</p>	<p>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.</p>	<p>In addition to the standard mitigation measures and best management practices, the following mitigative measures will be employed:</p> <ul style="list-style-type: none"> • Planned avoidance of areas of elevated archaeological potential, to the extent practical; • Undertake an archaeological evaluation 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. • 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. 	<p>No unmitigated interaction between the Project and heritage resources is expected to occur during the Project.</p> <p>Confidence level: Moderate. an AIA including walkover and shovel testing (as required) will improve the level of confidence of this prediction.</p> <p>Magnitude: Low</p> <p>Spatial Extent: Local</p> <p>Duration: Permanent</p> <p>Reversibility: Irreversible</p>
Traditional Land and Resource Use (refer to Section 5.9)			
<p>Construction, Operation, and Reclamation and Closure</p>	<ul style="list-style-type: none"> • Upon initiating construction, access to the PDA for the purpose of carrying out traditional activities will no longer be available; • During construction, most of the PDA will be cleared of remaining vegetation (except for areas remaining as buffers), and as such, natural resources that may be present on site (e.g., plants, wildlife, medicines) will no longer be available for harvesting or use; • At closure, the Project site will be reclaimed and restored to as near natural conditions as possible. As vegetation matures over the ensuing years and decades, the PDA may once again eventually harbour traditional resources of importance to Aboriginal peoples, thereby allowing a potential return of traditional land and resource use activities such as hunting, trapping, and gathering in the PDA. 	<ul style="list-style-type: none"> • Minimize the size of the PDA to that which is necessary to accomplish the Project objectives while minimizing environmental disturbance to the extent possible; • Maintain natural vegetation along wetlands and watercourses, as well as along the property boundaries, to minimize effects on natural resources and to provide a buffer for reducing effects of the Project that could cause sensory disturbance to wildlife (i.e., noise, dust); • Conduct ongoing engagement of First Nations throughout the Project to exchange information, address concerns, and assist in the development of management and reclamation plans for the Project; • If requested, First Nation communities or individuals will be provided with the opportunity to harvest and gather species of importance to traditional activities (timed to coincide with seasonality where possible) on the PDA prior to construction; • Reclamation of the PDA will consider traditional resources including the use of native species; • Fish and fish habitat will be monitored to ensure water flows are appropriate to mitigate bank erosion; • Affected fish habitat and wetland habitat that is lost to the Project will be authorized under federal and provincial legislation and compensated; • Wildlife and wildlife habitats within the PDA will be re-vegetated upon closure, which will partially restore habitat conditions in the PDA, over time. 	<p>No significant residual effects identified.</p> <p>Confidence level: Moderate</p> <p>Ongoing engagement of First Nations and a TLRU study if requested by First Nations, will improve the level of confidence in this prediction.</p> <p>Magnitude: Low</p> <p>Spatial Extent: Local</p> <p>Duration: Short term (Construction and Operation)</p> <p>Reversibility: Reversible over time</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
Accidents, Malfunctions and Unplanned Events (refer to Section 7.0)			
<p>Pit Slope Failure</p>	<p>A pit slope failure could pose a risk to workers or equipment within the working area of the Project (particularly within the open pit), or may lead to worker injury or possibly death as well as damage to equipment. Potential related effects could include interruption or suspension of quarry operations during investigations by regulating agencies. Such an interruption could cause an adverse effect on the socioeconomic environment.</p>	<ul style="list-style-type: none"> • Pit slope angles established using industry standard practices and methods; • The Project will be constructed and operated in accordance with provincially regulated overburden setbacks and pit face angles for removal of material; • Operation of the open pit will be in compliance with the General Regulation 91-191 under the New Brunswick Occupational Health and Safety Act; • Workers moving about the work site on foot will maintain a separation distance from the working areas of 1.3 times the height of the working face of the pit, unless the working face is sloped at its angle of repose or benched no more than 1.2 m (as per Section 205 of the General Regulation 91-191 under the New Brunswick Occupational Health and Safety Act); • Quarry face inspections will occur daily to ensure compliance; and; • An Emergency Response Plan will be in place as part of the Environmental Protection Plan (EPP) for the Project. 	<p>No significant residual effects anticipated.</p> <p>Confidence level: High Magnitude: Low to Moderate Spatial Extent: Local Duration: Short term Reversibility: Reversible</p>
<p>Failure of Erosion and Sediment Control Measures</p>	<ul style="list-style-type: none"> • The discharge of runoff containing sediment to watercourses during storm events or spring runoff could result in the degradation of adjacent surface water bodies, wetlands, and fish and fish habitat those environments support. • A failure of ESC measures could affect traditional land and resource use as a consequential environmental effect. 	<ul style="list-style-type: none"> • Contingency plans will be developed for extreme rainfall or spring runoff events including: <ul style="list-style-type: none"> - monitoring of surface runoff conditions during heavy rainfall/spring runoff and operational observations; - cover will be applied to highly erodible areas; - clean-out of settling ponds and check dams will be conducted, and; - provision of a stockpile of sediment and erosion control materials. • Contingency may also include temporary pumping of surface water back into the open pit if temporary inflow of water to the pit floor during storm events is not an operational concern. • A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a failure of an ESC measure will be developed and implemented. <p>Note that approaches will vary depending upon season, and the Site Manager shall indicate approaches for summer low flow periods, spring-fall high flow periods, and frozen ground high flow periods.</p>	<p>No significant residual effects anticipated.</p> <p>Confidence level: High Magnitude: Low to Moderate Spatial Extent: Local Duration: Short term Reversibility: Reversible</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
<p>Uncontrolled Explosion</p>	<ul style="list-style-type: none"> • An uncontrolled explosion has the potential to injure or kill workers on the site, damage equipment or machinery; • Minor consequential environmental effects could occur to the atmospheric environment and possibly wildlife and wildlife habitat; • Incidents related to uncontrolled blasts could result in interruptions in operations at the Project site, in addition to other potential consequences. 	<ul style="list-style-type: none"> • Explosives will either be transported to the Project site by a licensed blasting subcontractor on a daily basis, or stored on site in an approved and properly designed explosives magazine that meets setback and security requirements of the Explosives Act; • The contractor will follow a blasting schedule laid out by the Site Manager; • Only licensed blasting contractors with the appropriate qualifications for the nature of the Project activities will be engaged; • 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; • An audible alarm will be sounded prior to all blasts to provide advance warning to workers and residents, in accordance with General Regulation 91-191 under the New Brunswick Occupational Health and Safety Act; • Periodic pre-blast surveys will be conducted at the nearest residences, and blasts will be periodically monitored using seismographs; • Transportation of explosives will be in compliance with the federal Explosives Regulations under the Explosives Act and the Transportation of Dangerous Goods Regulations under the Transportation of Dangerous Goods Act; • Blasts will be carried out in sequence using best available industry techniques for avoiding the risk of an uncontrolled explosion (including fly rock); • The risk of an uncontrolled explosion will be further reduced by the use of current technologies, best industry practices, and strict legislative requirements through regulatory requirements or permitting. 	<p>No significant residual effects identified.</p> <p>Confidence level: High Magnitude: Low to Moderate Spatial Extent: Local Duration: Short term Reversibility: Reversible</p>
<p>Vehicle Accident</p>	<ul style="list-style-type: none"> • Vehicle collisions have the potential to risk human health and safety and other property such as project infrastructure or private property. • Environmental effects of a vehicle accident could occur on the atmospheric environment, as fires or fuel spills arising from a vehicle accident could result in a temporary and localized reduction in air quality. • Fuel spills resulting from a vehicle accident could adversely affect water resources or fish and fish habitat, as surface or groundwater resources may become contaminated by fuel, potentially threatening potable water supplies and fish and fish habitat. • A vehicle accident could have a direct effect on wildlife in the event of vehicle-to-wildlife collision, and an indirect effect in the event of a fuel spill or fire resulting from a vehicle collision. 	<ul style="list-style-type: none"> • The preferred transportation route was chosen to optimize safety by using roads that are designed to accommodate the vehicle weights that will be associated with the Project; • Vehicles travelling to and from the Project site will adhere to posted speed limits, weight restrictions, and other traffic safety rules, and drivers will adjust their speed to conditions accordingly; • Drivers will also heed wildlife warning signs and reduce speed in areas identified as posing a potential risk of wildlife collision; • Safety zones with posted speeds will be identified throughout the Project site; • Pedestrian zones will be identified to allow workers access throughout the work area on foot; • Signage will be erected along Route 111 and Route 865, indicating that it is a trucking route; • A communications plan will be established to engage with local communities potentially affected by Project-related traffic; and • A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a vehicle accident will be developed and implemented. 	<p>No significant residual effects identified.</p> <p>Confidence level: High Magnitude: Low to Moderate Spatial Extent: Local Duration: Short term Reversibility: Reversible</p>

Project Phase(s)	Potential Effects	Mitigation	Significance of Residual Effect(s)
<p>Accidental Release of Hazardous Materials</p>	<ul style="list-style-type: none"> • An accidental spill of hydrocarbons or other substances during construction and operation of the Project may contaminate air, soils and groundwater and, through runoff, contaminate watercourses; • Contaminants may adversely affect both terrestrial and aquatic habitat and migratory birds; • Loss of petroleum hydrocarbons, hazardous materials, or other substances may volatilize and adversely affect ambient air quality on a temporary and localized basis; • Chemical and fuel spills may enter a watercourse directly, potentially affecting water quality and fish and their habitat; • If natural resources affected by a spill are used for traditional purposes by Aboriginal persons, a consequential environmental effect of a spill could also occur to traditional land and resource use; • Effects on vegetation and wetlands include a physical harm or death of vegetation species, a reduction or loss of wetland function as a habitat for fish and wildlife, and accretion of contaminants in wetland sediments. 	<ul style="list-style-type: none"> • A Project-specific Environmental Protection Plan (EPP) with defined contingency and emergency response procedures in the event of a hazardous material spill will be developed and implemented; • No storage of hazardous materials will occur on-site; all hazardous materials will be brought to the site by mobile tankers on a daily basis for vehicle refuelling in a designated area, and leave the site following the refuelling activities; • A Spill Contingency Plan will be developed as part of the EPP for substances anticipated to be brought on-site during the construction and operations activities. • Fuelling operations will be conducted in designated areas located at a minimum distance of 30 m from wetlands and surface water bodies. • Vehicle maintenance, including the changing of oil and lubricants, will not be permitted on-site. • Releases potentially caused by motor vehicle accidents are addressed initially by local emergency response agencies and directed by the NBDELG. Subsequently, site contractors will contain the spill and remove contaminated soils and sediment for disposal. • Emergency spill kits will be available on-site. • Small spills can typically be cleaned up effectively with minimal long-term impacts, and larger spills are not likely to occur based on limited quantities of hydrocarbons anticipated to be present on-site during construction/operation. 	<p>No significant residual effects anticipated.</p> <p>Confidence level: High</p>
<p>Discovery of a Heritage Resource</p>	<ul style="list-style-type: none"> • Any ground breaking or earth moving activity has the potential to uncover previously undiscovered heritage resources. 	<ul style="list-style-type: none"> • Work will be immediately stopped, and the area will be marked to prevent further disturbance. An exclusion zone of 100 m surrounding the find will be established; • The Site Manager will immediately contact the Archaeological Services Branch of the New Brunswick Department of Tourism, Heritage and Culture to notify them of the discovery and establish a mitigation plan. For fossils, the New Brunswick Museum will be contacted. • No additional work will be permitted at the site until approval has been received from the appropriate regulatory agency to resume the work. • If bones or human remains are found, work in the area must cease, and the RCMP shall be immediately notified. • No one shall disturb, move or reburial any uncovered human remains. • If the discovered resources are related to Indigenous Aboriginal culture, the New Brunswick Aboriginal Affairs Secretariat will be contacted to determine how best to proceed with respect to repatriation of the resources. 	<p>No significant residual effects anticipated.</p> <p>Confidence level: Moderate</p> <p>An AIA including walkover and shovel testing (as required) will improve the level of confidence.</p> <p>Magnitude: Low to Moderate</p> <p>Spatial Extent: Local</p> <p>Duration: Short term</p> <p>Reversibility: Reversible</p>

Aboriginal Consultation

The entire province of New Brunswick is currently unceded territory and is subject to the Peace and Friendship Treaties signed by the British with the Wolastoqey (Maliseet), Mi'kmaq, and Peskotomuhkati (Passamaquoddy) Nations in 1752 and renewed in specific agreements thereafter. Section 35 of the *Constitution Act, 1982* recognizes and affirms the existing Aboriginal rights and title of the Aboriginal peoples of Canada, and the Supreme Court of Canada has confirmed that Mi'kmaq and Wolastoqey First Nations continue to have treaty rights to carry out traditional activities (including the right to hunt, trap, fish, and gather towards earning a moderate livelihood). The Supreme Court of Canada has also held that the Crown (including the Governments of Canada and New Brunswick) has a duty to consult with First Nations, and accommodate them as necessary, for any power, duty or function they may exercise that may affect Aboriginal or treaty rights. Along with these treaty rights, First Nations maintain that they continue to hold Aboriginal rights and title throughout their traditional territory, including on privately-owned land.

Thus, the Province of New Brunswick has a legal duty to consult, and where appropriate accommodate, with First Nations when it makes a decision that may affect Aboriginal or treaty rights. Several aspects of the duty to consult that can be delegated to the proponent by the Crown include:

- Notification of a project, and information exchange;
- Assessment of the potential adverse effects from the project;
- Responding to concerns raised by First Nation communities; and,
- Revisiting project plans to avoid or minimize negative effects posed by the Project.

The planned approach to the delegated aspects of the duty to consult in respect of the EIA of the Project is described in this section.

Overall Approach

The proposed Project is located within the Peace and Friendship Treaty (INAC, undated) boundaries, for which both the Wolastoqey Nation and the Mi'kmaq Nation are signatories. As such, during a meeting on September 13, 2018, the New Brunswick Aboriginal Affairs Secretariat recommended that consultation in respect of the Project be conducted with both the Wolastoqey and Mi'kmaq Nations (Mann, M., pers. comm., 2018). As such, Hammond River Holdings will initiate and seek to pursue consultation with the five member communities included in the Wolastoqey Nation in New Brunswick (WNNB) (i.e., Madawaska Maliseet First Nation, Tobique First Nation, Kingsclear First Nation, St. Mary's First Nation, and Oromocto First Nation), the Woodstock First Nation, the eight member communities of Mi'gmawe'l Tplu'taqnn Inc. (MTI) (i.e., Fort Folly First Nation, Esgenoopetitj (Burnt Church) First Nation, Indian Island First Nation, Metepenagiag (Red Bank) First Nation, Eel Ground First Nation, Buctouche First Nation, Eel River Bar First Nation, and Pabineau First Nation), and the Elsipogtog (Big Cove) First Nation.

In consultation with the Aboriginal Affairs Secretariat, the following objectives have been established to ensure meaningful consultation is carried out:

1. Consult frequently with the First Nations communities that wish to be engaged in respect of the Project in a timely manner through meaningful information updates that occur throughout the life of the Project.
2. Conduct meetings with First Nations as requested to openly discuss the potential effects of the Project, and consider appropriate mitigative measures as determined by, or in consultation with, the Aboriginal Affairs Secretariat.

To effectively consult with First Nation communities regarding the Project, consultation will be conducted as described below.

Direct Written Communication

Each First Nation community and/or organization will be initially introduced to the Project through a written introduction letter that describes the Project. The basic project description will include an overview the Project; summary of Project components and activities; description of the Project location and map; and status of the provincial regulatory approval process. In the introduction letter, Hammond River Holdings will extend an invitation for face to face meetings, via telephone or further written communications to each community to be arranged at their convenience. The intention is to provide this initial introduction letter prior to, or immediately following, registration of the Project under the EIA Regulation. Through this initial introduction, it is hoped that Hammond River Holdings will be able to clearly determine which (if any) First Nations wish to be further consulted, and in what form.

Questions, concerns, and comments from the rights holders will be recorded and responded to (as appropriate) in a timely manner.

In Person Meetings

Through the introduction letter, an invitation will be extended to each community and/or organization for an in-person meeting. It is understood that each community has a preferred method of consultation that can range from open house style meetings to focused discussions with community representatives (consultation coordinators or council members). Hammond River Holdings will afford each community the opportunity to determine which style of consultation would best suit their needs. Future meetings and other consultation activities will be defined on a case-by-case basis by each community and/or organization.

Questions, concerns and comments from the rights holders will be recorded and responded to (as appropriate) in a timely manner.

Electronic Input

Following submission of the EIA registration document, an electronic copy of the document will be submitted to each community and/or organization for review and feedback. The EIA registration document will also be available on the NBDELG website (https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) and on the Hammond River Holdings website (www.hammondriverholdings.com, link available after

November 13, 2018). Should paper copies of the report be requested, they will be made available by Hammond River Holdings. Questions, comments and concerns can be submitted in writing via the Project email address (info@hammondriverholdings.com) as well as verbally to the Project hotline (506-632-4494). Each comment or question will be recorded in a registry, and responses to address the comments will be provided in a timely manner on behalf of Hammond River Holdings.

9.2 Engagement Activities Conducted

The introduction letter (refer to **Appendix E**) was submitted to the following communities and/or organizations in mid-October 2018:

- Madawaska Maliseet First Nation (carbon copied WNNB);
- Tobique First Nation (carbon copied WNNB);
- Kingsclear First Nation (carbon copied WNNB);
- St. Mary's First Nation (carbon copied WNNB);
- Oromocto First Nation (carbon copied WNNB);
- Woodstock First Nation;
- MTI; and,
- Elsipogtog First Nation (carbon copied Kopit Lodge).

9.3 Key Issues Identification and Management

As part of the First Nations consultation process, a database will be created where each comment, question, and concern (if any are received) will be recorded along with a summarized response to thoroughly document the consultation process. An example is shown in **Table 9.3.1**.

Table 9.3.1: Sample First Nations Consultation Log

Activity	Individual or Organization	Date	Feedback, Question, Comment or Concern	Summary of Response	Follow Up Action

9.4 Summary Report

In accordance with the EIA Guide (NBDELG 2018a), Hammond River Holdings will record and report on comments received from Aboriginal communities in respect of the Project. A summary report documenting the engagement efforts and feedback received during the first 45 days of the comment period following submission of the EIA Registration document will be prepared and submitted to

NBDELG for review within 60 days following registration of the Project, so that the information can be considered in the course of decision-making in respect of the Project. It is anticipated that consultation activities will extend beyond this.

The summary report will include: type of consultation activity, individual or organization that was involved and the dates completed; a summary of the feedback received; output from the database as shown in **Table 9.3.1** above; and a summary of planned future consultation activities (if any). Additional mitigative measures or revisions to the Project that may arise throughout the consultation process will be flagged for further consideration by NBDELG.

10.0 Public and Stakeholder Consultation

The planned approach to public and stakeholder consultation in respect of the EIA of the Project is described in this section.

In accordance with the EIA Regulation, direct communication with stakeholders (local residents, elected officials, service groups, businesses, etc.) is required. Evidence of notification will be provided to the NBDELG within 60 days of registration of the Project.

10.1 Objectives and Overall Approach

The following objectives have been established to ensure effective communications with the stakeholders and public in respect of the Project:

1. Keep the public informed about the Project through timely and meaningful information updates.
2. Consult with affected stakeholders in a timely manner in an effort to mitigate potential impacts.
3. Provide the public and interested stakeholder groups with opportunities to learn more about the Project, and to share their issues and concerns about the Project.

To effectively inform the public, local residents, key stakeholders, community groups and elected officials of the Project, consultation will be conducted utilizing a four-pronged approach as escribed below.

“Kitchen Table” Discussions

Representatives from Hammond River Holdings plan to visit each residence within 2 km of the centre of the Project site to introduce the project through an informal ‘kitchen table style’ meeting. This will provide local residents with an opportunity to gain a better understanding of the Project, from which more detailed future discussions can be based. At this time, it is expected that such discussions would occur immediately prior to, or shortly following, registration of the Project with NBDELG.

Direct Written Notification

Direct written communications describing the Project and the anticipated environmental effects and mitigation will be hand delivered to local residents and landowners within 2 km of the Project, the Hammond River Anglers Association (as a key stakeholder), other key stakeholders identified through engagement, and federal, provincial, and municipal elected officials (refer to **Appendix F**). Additionally, a basic Project description will be posted in the community newsletter and/or newspaper.

The written notification will contain the following information:

- Brief description of the Project;
- Description of the Project location and map;
- Status of the Provincial Regulatory Approval process;
- Information on how to view the EIA registration document;

- Statement indicating that members of the general public can ask questions and/or raise concerns with the Proponent regarding any and all environmental impacts;
- Contact information for Hammond River Holdings; and,
- Date that the public comment period expires.

Initial thoughts and questions from stakeholders will be recorded. Stakeholders with further questions about the Project will be invited to an open house or provided with alternate contact information.

The EIA registration document will be made available at the NBDELG Saint John Regional Office, in addition to the NBDELG website (https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) and on the Hammond River Holdings website (www.hammondriverholdings.com, link available after November 13, 2018).

Open House

One open house information session on the Project will be conducted in the local community, to provide additional project information to interested stakeholders. The open house is anticipated to occur following the submission of the EIA Registration document to the NBDELG so that environmental findings are available for discussion. An invitation to the open house, along with a basic project overview, will be placed in the local community newsletter (if available) and the newspaper.

In addition to having a hard copy of the EIA registration document available at the open house for viewing, the location of the electronic EIA Registration document will be provided via a link to the NBDELG website at the meeting.

During the meeting, verbal question and comments will be recorded by project representatives. In addition, forms will be made available to the public where feedback on the project can be submitted in writing, and an email address will be provided where questions and comments can be posed at a later date.

Electronic Input

An electronic copy of the EIA registration document will be made available on the NBDELG EIA webpage, (https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) and on the Hammond River Holdings website (www.hammondriverholdings.com, link available after November 13, 2018). Questions, comments and concerns can be submitted in writing via the Project email address (info@hammondriverholdings.com) as well as verbally to the Project hotline (506-632-4494). Each comment or question will be recorded in a registry, and responses to address the comments will be provided in a timely manner on behalf of Hammond River Holdings.

10.2 Engagement Activities Conducted

During the period leading up to registration of the Project, consultation has primarily focused on regulatory agencies and those involved with the project through the TRC. A meeting was held on September 13, 2018 to engage technical authorities on providing guidance on the regulatory

requirements for the Project. In addition, nearby residents were notified in advance of planned exploration activities on the Project site.

Once registration has been completed, additional engagement of the public and key stakeholders will be initiated in accordance with the approach outlined above.

10.3 Key Issues Identification and Management

As part of the Public Consultation process, a database will be created where each comment, question, and concern, if any are received, will be recorded along with a summarized response, an example of which is shown in **Table 10.3.1**.

Table 10.3.1: Sample Public Consultation Log

Question	Individual or Organization	Date Received	Summary of Response	Follow Up Action

10.4 Summary Report

In accordance with the EIA Guide (NBDELG 2018a), Hammond River Holdings will record and report on comments received from the public in respect of the Project. A summary report documenting the engagement efforts and feedback received during the first 45 days of the comment period following submission of the EIA Registration document will be prepared and submitted to NBDELG for review within 60 days following registration of the Project, so that the information can be considered in the course of decision-making in respect of the Project.

The summary report will include: the dates and types of involvement activities; identification of stakeholders; a summary of the output from the database as shown in **Table 10.3.1** above, if comments/questions are received; and a summary of planned future consultation activities (if any) will be provided to NBDELG following the fulfillment of the public consultation requirements of the EIA process. Additional mitigative measures or revisions to the Project that may arise throughout the public consultation process will be flagged for further consideration by NBDELG.

11.0

Other Information

11.1

Project-Related Documents

This EIA registration document includes other relevant documents as **Appendices A to F** of this document, as follows:

- Atlantic Canada Conservation Data Centre Data Report 6215: Upham, NB, attached as **Appendix A**.
- Wetland delineation and functional assessment data sheets, provided in **Appendix B**.
- Field data acquired for plants and vegetation, attached as **Appendix C**.
- Desktop analysis data acquired for migratory birds, attached as **Appendix D**.
- An information package related to the Project, provided to First Nations to inform them of the Project, attached as **Appendix E**.
- An information package related to the Project which will be provided to landowners, is attached as **Appendix F**.

Other than this EIA registration document and the appended information, there are no additional Project-related documents that are publicly accessible.

Following completion of the EIA review for the Project and the receipt of a Certificate of Determination, a number of other authorizations, approvals, permits, licenses, or leases may be required from provincial or federal agencies. Refer to **Sections 1.3.1.2** and **1.3.2.2** of this document for more information.

11.2

Funding

The Project will be funded entirely by Hammond River Holdings Limited and related private companies, and does not involve the receipt of any funds, loans, loan guarantees, land transfers, or other types of financial support from any federal or provincial government department or agency.

11.3

Signature

This document is submitted on behalf of Hammond River Holdings Limited.



R. Bruce Eddy



Date of Signature

Summary and Conclusion

This environmental impact assessment (EIA) registration document describes the planned development of, and provides an environmental effects assessment for, the Upham East Gypsum Quarry Project (the “Project”) proposed by Hammond River Holdings Limited (Hammond River Holdings) in the community of Upham, Kings County, New Brunswick. The Project consists of the development of a new open pit quarry for the extraction of gypsum to be used in the production of gypsum wallboard at manufacturing facilities in New Brunswick.

This document is being submitted to the New Brunswick Department of Environment and Local Government (NBDELG) as part of the EIA process under the New Brunswick *Environmental Impact Assessment Regulation 87-83* of the *Clean Environment Act*. A federal environmental assessment (EA) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) is not believed to be required for the Project.

The Project is intended to supply natural gypsum rock for the production of gypsum wallboard at New Brunswick based wallboard manufacturing facilities. Natural gypsum, currently imported into New Brunswick from a quarry in Nova Scotia, is experiencing an increased demand due to growth in the North America wallboard industry, and this increased demand is resulting in increased costs of the raw material. The increasing cost of this raw material, as well as the elevated transportation costs from Nova Scotia to New Brunswick, necessitate an economically viable source of locally-procured natural gypsum for wallboard facilities to maintain their competitiveness in the North American marketplace.

The Project involves many of the following components, subject to further definition and design:

- an open pit (quarry), and related use of explosives;
- a portable crusher;
- heavy mobile equipment (e.g., front end loader, excavators, bulldozer, dump trucks);
- a storage area for gypsum;
- storage areas for overburden and topsoil;
- facilities for pit dewatering and runoff management;
- an optional truck scale, security gate, and portable trailer; and,
- an access road from the provincial Route 111 to the site, and internal roads between various components of the Project.

In accordance with the requirements the New Brunswick *Environmental Impact Assessment Regulation–Clean Environment Act*, this EIA Registration provided Project-related information available at the early stage of its conceptual development, and has assessed the environmental effects of the Project. The key elements of this report are as follows:

- A description of the proposed components of the Project, including a discussion of how the Project would be constructed, operated, and ultimately reclaimed and closed at the end of its life as well as consideration of alternative means of carrying out the Project. Project-related emissions and wastes were also described. Project planning and management strategies to minimize the environmental effects of the Project were also introduced.
- A high-level summary of the environmental setting for the Project was provided to introduce general physical, biological, and socioeconomic conditions applicable in the general area of the Project.
- The scope of the EIA, including the scope of the Project, factors to be considered, and scope of those factors were described. The methods that were to be used to conduct the environmental effects assessment of the Project were discussed.
- An assessment of potential environmental effects of the Project on each valued component (VC) of relevance and importance to this EIA was conducted. Eight VCs were identified as relevant and important to the EIA of the Project: atmospheric environment; water resources; fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, socioeconomic environment; heritage resources; and traditional land and resource use. Additionally, effects of the environment on the Project, as well as accidents, malfunctions, and unplanned events, were assessed. Where applicable, follow-up or monitoring measures to verify the environmental effects predictions of this EIA or to verify the effectiveness of mitigation to avoid or minimize environmental effects were identified.
- Planned Aboriginal and public engagement activities in respect of the Project were described.

The environmental effects assessment concluded that there would be no significant adverse residual environmental effects from the Project during all phases assessed and in consideration of normal activities of the Project as planned. Positive environmental effects were predicted for the socioeconomic environment as they relate to employment during the operation phase. Effects of the environment on the Project were predicted to be not significant due to the nature of the Project and design features that incorporate factors of safety and other mitigation to minimize the likelihood of a significant adverse effect of the environment on the Project. The potential residual environmental effects of accidents, malfunctions, and unplanned events were also found to be not significant. A limited number of follow-up or monitoring initiatives have been developed to verify the predictions of this EIA Registration or to verify the effectiveness of mitigation.

Overall, based on the results of this EIA Registration, it is concluded that, with planned mitigation and the implementation of best practices to avoid or minimize adverse environmental effects, the residual environmental effects of the Project, including the effects of the environment on the Project and from accidents, malfunctions and unplanned events, during all phases are rated not significant.

Closing

This report was prepared by Dillon Consulting Limited (Dillon) on behalf of Hammond River Holdings Limited. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

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This report has been prepared by a team of Dillon professionals on behalf of Hammond River Holdings Limited.

Respectfully submitted,

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