13.0 ASSESSMENT OF EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Effects of the environment on the Project are associated with risks of natural hazards and influences of nature on the Project. These effects may arise due to forces of nature associated with weather, climate, climate change, flooding, forest fires, or seismic activity. Indirect effects may also arise (e.g., flooding causing industrial equipment to fail, accidental releases to the waterways) as a result of natural hazards and influences of nature on the Project; however, these effects are addressed in Section 14.0.

Potential effects of the environment on any project are typically addressed through design and operational procedures developed in consideration of expected normal and extreme environmental conditions. Effects of the environment, if unanticipated or unmanaged, could result in adverse changes to Project components, the schedules for construction or operation, or its economic viability.

13.1 REGULATORY POLICY AND SETTING

The assessment of the effects of the environment on the Project is based on professional judgment and experience with other similar recent projects in New Brunswick. In addition, the assessment includes a discussion relating to future climate conditions to address previous requests from the NBDELG that such conditions be considered by proponents.

13.2 POTENTIAL EFFECTS, PATHWAYS, AND MEASURABLE PARAMETERS

Potential effects of the environment relevant to conditions potentially found in New Brunswick include:

- climate and climate change considerations, including severe weather as measured by parameters including air temperature, precipitation, winds, extreme weather events (e.g., tornadoes, ice storms), and storm surges and waves;
- flooding;
- forest fires from causes other than the Project; and
- seismic activity.

These natural forces may result in the following effects of the environment on the Project:

- reduced visibility and inability to maneuver construction equipment;
- delays in receipt of construction materials or in carrying out construction activities;
- increased structural loading and damage to infrastructure;
- corrosion of exposed oxidizing metal surfaces and structures, perhaps weakening structures and potentially leading to malfunctions or inability to generate power; and/or
- loss of electrical power resulting in loss of power generation or transmission and the ability to transfer power to the grid.

It is recognized that climate change may directly or indirectly influence flooding, forest fires and potentially seismic events. The approach in this assessment is to consider climate and climate change as these may influence severe weather, and then specifically consider the potential for flooding, forest fires and seismic events to affect the Project, in separate but related sub-sections.

13.3 BOUNDARIES

13.3.1 Spatial Boundaries

The spatial boundaries for the assessment of effects of the environment on the Project are limited to the PDA, as the potential area of physical disturbance associated with the construction and operation of the Project, as defined in Section 2.1.

13.3.2 Temporal Boundaries

The temporal boundaries for the assessment of effects of the environment on the Project include:

- construction – scheduled to begin in the spring of 2018 and last for approximately 16 months; and
- operation – scheduled to begin in late 2019 and continue for the life of the new submarine cables, currently anticipated to be at least 40 years.

Decommissioning pertains to both the existing cables and the proposed cables. Decommissioning of the existing cables will occur at some time following the successful completion of the proposed installation of the new subsea cables as per current regulations and requirements. Decommissioning of the proposed new subsea cables will occur following the useful service life of the submarine cables, and will be carried out in accordance with regulations in place at that time.

13.4 SIGNIFICANCE DEFINITION

A significant adverse residual effect of the environment on the Project is one that would result in:

- a substantial change of the Project schedule (e.g., a delay resulting in the construction period being extended by more than one season);
- a long-term interruption in service during operation of the Project (e.g., interruption in power transmission requiring a long-term energy replacement solution); and/or
- damage to the Project infrastructure resulting in increased safety risk.

13.5 EXISTING CONDITIONS FOR EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Existing conditions are described for climate (including weather), seismic history, and forest fire activity. Climate change is discussed in Section 13.6.1.

13.5.1 Climate

Climate is defined as the statistical average (mean and variability) of weather conditions over a substantial period of time (typically 30 years), accounting for the variability of weather during that period. Climate change (discussed in Section 13.6.1) is an acknowledged change in climate that has been documented over two or more periods, each with a minimum of 30 years (Catto 2006). The relevant metrics used to characterize climate are most often surface weather variables such as temperature, precipitation, and wind, and others such as storm frequency.

The current climate conditions are generally described by the most recent 30-year period (1981 to 2010) for which the Government of Canada (2017a) has developed statistical summaries, referred to as climate normals. The closest weather station to the Project with available historic data is the Pennfield station, located approximately 25 km northeast of the Project. Limited historical climate data are available for the Pennfield station; therefore, data from the Saint John weather station, located approximately 75 km from the PDA, are also used to supplement information on regional conditions.

13.5.1.1 Air Temperature and Precipitation

The average daily temperature in Pennfield ranges between -7.1°C (January) and 15.6°C (July and August) (Table 13.1). The extreme maximum temperature was 37.2°C (May 1977) and the extreme minimum temperature was -36.5°C (January 1982).

Pennfield averages 1,429.7 mm of precipitation per year, of which, approximately 1,237.7 mm fell as rain and 192.0 cm as snow. Extreme daily precipitation at Pennfield ranged from 60.0 mm (May 1990) to 111.0 mm (August 1981). On average, there have been 11.7 days each year with rainfall greater than 25 mm, and snowfalls greater than 25 cm occur on average 0.63 days per year (Government of Canada 2017b).

Table 13.1 Air Temperature and Precipitation Climate Normals, Pennfield and Saint John, NB (1981-2010)

Month	Temperature (^{o}C)					Precipitation (mm)					Mean No. of Days with							
	Averages			Extreme		Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Extreme Daily Rainfall (mm)	Extreme Daily Snowfall (cm)	Temperature (^{o}C)				Snow (cm)		Rain (mm)	
	Max	Min	Avg	Max (Year)	Min (Year)						>=30*	>=20*	<=-20	<=-30	>=10	>=25	>=10	>=25
Jan	-1.9	-12.3	-7.1	14.4 (1979)	-36.5 (1982)	73.1	53.5	126.6	82.6	38.0	0	0	4.9	0.09	2	0.26	2.4	0.74
Feb	0.0	-10.9	-5.5	14.5 (1994)	-31.0 (1993)	60.6	40.7	101.3	83.3	36.0	0	0	3.3	0.05	1.5	0.14	2	0.59
Mar	3.4	-6.3	-1.5	19.5 (1998)	-28.5 (1989)	84.9	45.2	130.1	71.8	34.0	0	0	0.86	0	2.2	0.18	3	0.64
Apr	9.0	-1.0	4.0	23.0 (1982)	-14.0 (1995)	105.8	10.3	116.0	86.4	31.0	0	0.36	0	0	0.23	0	3.5	0.86
May	14.3	3.1	8.7	37.2 (1977)	-7.8 (1977)	130.2	0.0	130.2	60.0	8.1	0.05	2.4	0	0	0	0	4.4	1.3
Jun	18.5	7.0	12.8	33.5 (1983)	-2.2 (1976)	111.0	0.0	111.0	62.8	0.0	0.33	9.7	0	0	0	0	3.2	1.1
Jul	21.1	10.0	15.6	34.4 (1977)	2.2 (1976)	107.3	0.0	107.3	68.0	0.0	0.27	17.1	0	0	0	0	2.9	1.1
Aug	21.3	10.0	15.6	36.7 (1976)	-0.5 (1982)	98.0	0.0	98.0	111.0	0.0	0.55	18.1	0	0	0	0	2.6	0.91
Sep	18.1	6.8	12.4	34.0 (1989)	-5.0 (1995)	120.9	0.0	120.9	82.0	0.0	0.18	6.3	0	0	0	0	4.1	1.1
Oct	12.8	2.4	7.6	25.0 (2002)	-9.0 (1997)	115.8	0.1	115.8	75.9	12.2	0	0.73	0	0	0	0	4	1.1
Nov	7.0	-1.6	2.7	18.5 (1989)	-18.3 (1978)	132.2	8.3	140.4	84.3	22.9	0	0	0	0	0.32	0	4.4	1.4
Dec	1.4	-8.2	-3.4	16.5 (1982)	-35.5 (1989)	97.9	34.1	132.0	103.8	30.0	0	0	1.4	0.05	1.4	0.05	3.3	0.82
Annual	10.4	-0.1	5.2	-	-	1,237.7	192.0	1,429.7	-	-	1.4	54.7	10.5	0.19	7.6	0.63	39.6	11.7

NOTES:
Max = maximum
Min = minimum
Avg = average
* Data taken from the Saint John weather station, as these data are not available for Pennfield
SOURCE: Government of Canada 2017a

13.5.1.2 Winds

Monthly average wind speeds measured at the Saint John weather station range from 11.3 to 17.5 km/h (Figure 13.1). From November to February, the dominant wind direction is from the northwest, with winds predominantly blowing from the north during March and April, from the south during May to August, and from the southwest during September and October (Government of Canada 2017). Maximum hourly wind speeds measured at the Saint John weather station range from 61 km/h to 111 km/h, while maximum gusts for the same period range from 96 km/h to 148 km/h (Government of Canada 2017). Occurrences of extreme winds are uncommon at the Saint John station; over the last three decades, there has been an average of 17.3 days per year with winds greater than to 52 km/h and 3.8 days per year with winds greater than to 63 km/h (Government of Canada 2017).

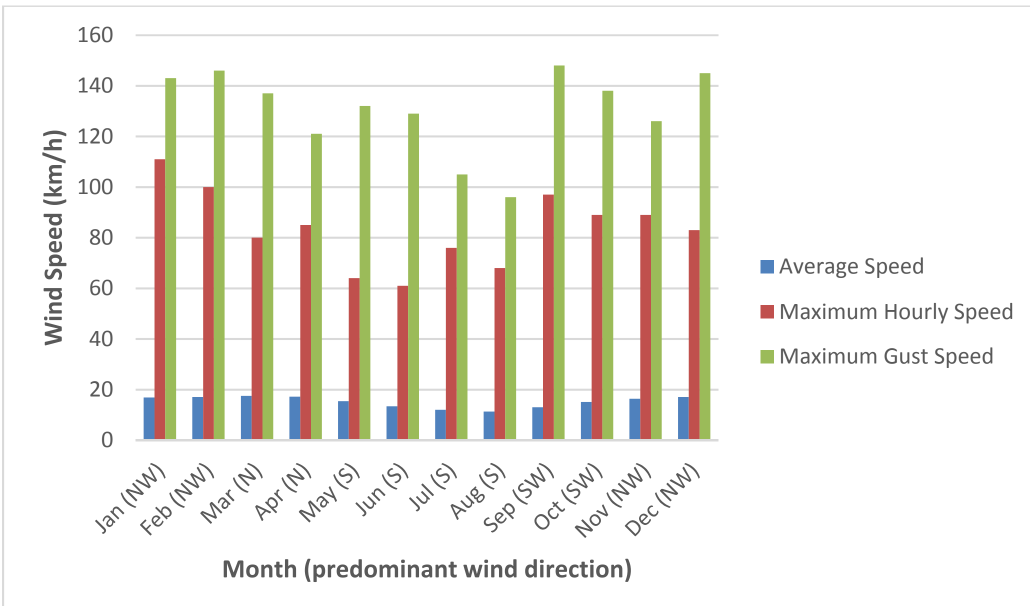

Figure 13.1 Predominant Monthly Wind Direction, Monthly Mean, Maximum Hourly and Maximum Gust Wind Speeds (1981 to 2010) at Saint John, NB Station

13.5.1.3 Extreme Storms

To establish existing conditions related to extreme storms, some of the most notable storms in the history of the province are described. Though most of these storms did not affect the Fundy Isles area directly, they are provided to establish context and to provide examples of extreme storm events in New Brunswick.

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 combination of snow and rain (Phillips 1990).

In February 2003, New Brunswick had an ice storm, that brought 40 to 60 mm of freezing rain, followed by cold temperatures and gusting wind more than 75 km/h, generating a wind chill of -27°C. Power lines and trees accumulated up to 33 mm of ice, and 60,000 people were without power for a week (The Weather Network, April 23, 2014).

In January 2017, a freezing rain storm left more than 130,000 people without power, broke approximately 600 transmission/distribution poles in the Acadian peninsula of New Brunswick (NB Power 2017), and sustained weather and ice cover made restoration of power difficult (CBC News, January 25 and 27, 2017). NB Power has estimated the cost of the restoration to be approximately $30 million, and says this is the largest, most expensive restoration effort in its history (CBC News, April 2, 2017).

Extreme weather can also occur in the summer and fall. In 2014, New Brunswick experienced widespread power disruption when post-tropical storm Arthur brought high winds and intense rainfall over two days, damaging tens of thousands of trees across the province and knocking out power to more than 195,000 NB Power customers at its peak (CBC News, January 25, 2017; Government of New Brunswick 2015). Winds recorded at the Fredericton Airport were 100 km/h with rainfall of 120-145 mm (Government of New Brunswick 2014). Widespread tree damage and damage to the electrical grid occurred from winds gusting to hurricane-force levels, with trees being snapped off and uprooted since they were in full leaf. Southern New Brunswick was hardest hit (Environment Canada 2015).

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 (Phillips 1990). 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 (Phillips 1990).

Tornadoes are rare, but do occur in New Brunswick. There have been 36 verified tornadoes in Atlantic Canada between 1980 and 2009: of these, four F2[1], thirteen F1, and three F0 probably occurred in New Brunswick (Government of Canada 2016). Of Canada's ten worst tornadoes on record, an F2 tornado occurred in eastern New Brunswick at Bouctouche on August 6, 1879 (Government of Canada 2016). In August 1989, three tornadoes touched down in New Brunswick, with one destroying a barn and uprooting some trees in Carlisle. In July 1995, a tornado in Fredericton blew the roof off a government building and damaged an indoor tennis court, and in July 1997, farmers' fields were damaged by a tornado in Grand Falls (The Weather Network 2013).

13.5.1.4 Storm Surges and Waves

Rising sea levels and more frequent and severe weather has also brought about an increase in frequency of storm surges. Storm surges are defined as the elevation of water resulting from meteorological effects on sea level. During the past 15 years, storm surges have resulted in property destruction in all four Atlantic Provinces (Vasseur and Catto 2008). In Atlantic Canada, storm surges have been higher in coastal waters and highest in the Gulf of St. Lawrence (Bernier et al. 2006).

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1 Tornadoes are classified on a scale known as the Fujita scale. F2 Tornadoes have winds ranging between 180 to 240 km/h. F1 Tornadoes have winds ranging between 120-170 km/h. F0 Tornadoes have winds ranging between 60 to 110 km/h (Environment Canada 2013).

At Saint John, where the vertical difference between the average high water level and the extreme high water level is in the order of 2.3 m, the risk from storm surge flooding is much less than in areas with lower tidal amplitude (Parkes et al. 1997). Conditions are likely to be similar in the Fundy Isles area. Two important storm surges that happened close to the occurrence of tidal high water caused considerable damage throughout the Bay of Fundy. The Groundhog Day storm in 1976 caused a surge off the coast of Saint John estimated at 1.6 m, with maximum wave heights (trough to crest) of 12 m with swells as high as 10 m. The famous Saxby Gale of 1869 is estimated to have created a storm surge between 1.2 m and 2.1 m (Parkes et al. 1997), with the higher surges occurring in the upper Bay of Fundy between Moncton, New Brunswick and Burncoat, Nova Scotia.

13.5.1.5 Flooding

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 (Government of Canada 2015). Flooding in New Brunswick is rather common, especially along the Saint John River (Phillips 1990, Beltaos and Burrell 2000).

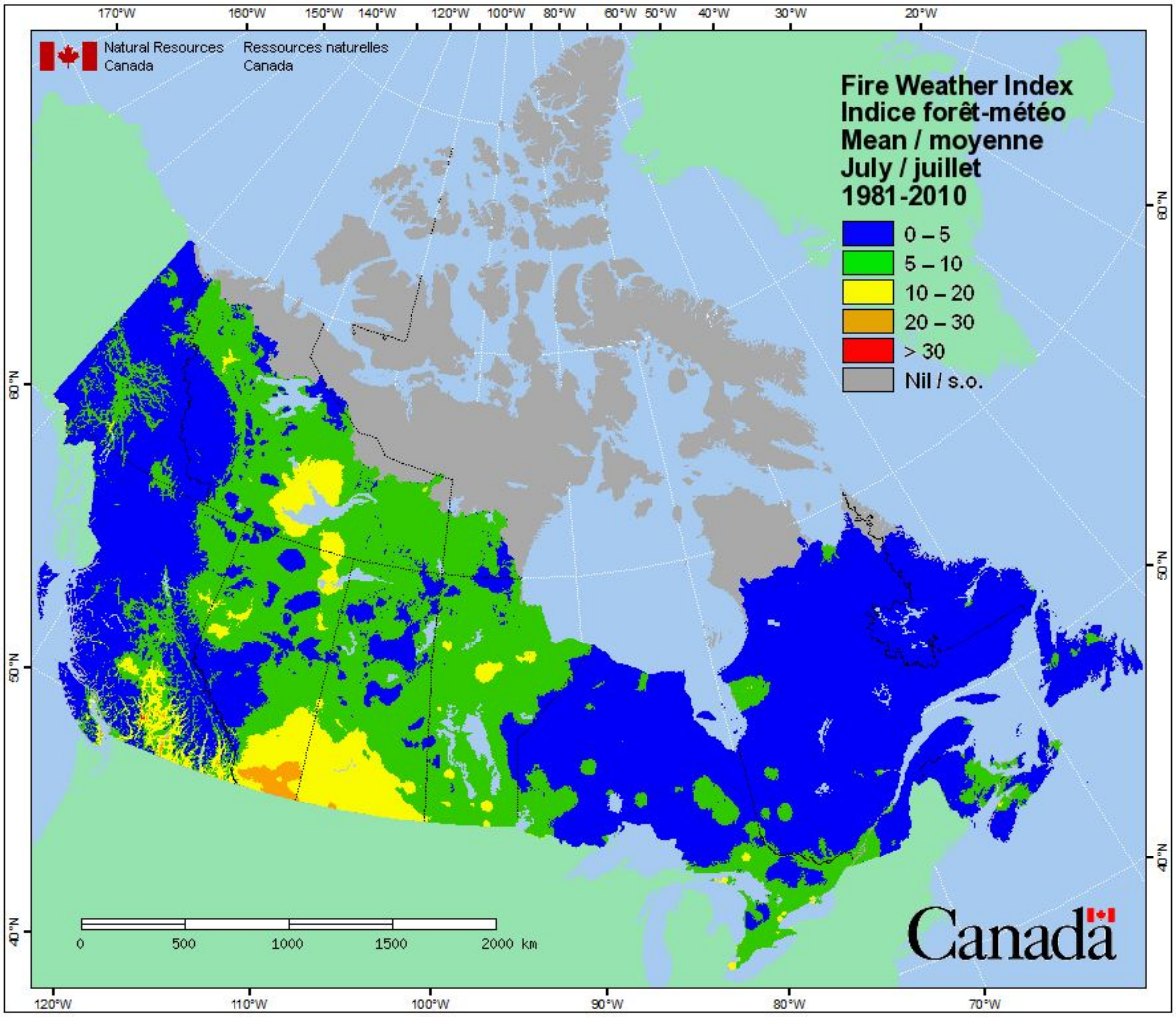
Evidence suggests that approximately one-third of flooding events in New Brunswick are caused by ice jams (Beltaos and Burrell 2000). Ice Jams form in rivers during the freeze up and breakup periods, when moving ice floes are stopped by congestion or obstacles, they pose a major threat to riverside communities. Break up ice jams can result in extreme events that cause flooding, damage to property and infrastructure and inhibit hydropower generation (Beltaos and Burrell 2000).

While floods can happen at any time, they are most common during the spring freshet, and can be costly in terms of damage to infrastructure. A search of the Flood History Database maintained by NBDELG (2012a) returned three historical records (in 1976, 1978, and 2006) associated with flooding on Grand Manan Island, with the top event (1978) valuing approximately $250,000,000 in damage.

13.5.1.6 Forest Fire

The Fire Weather Index is a component of the Canadian Forest Fire Weather Index System. It is a numeric rating of fire intensity. It combines the Initial Spread Index and the Buildup Index, and is a general index of fire danger throughout the forested areas of Canada. Fire Weather Normals represent the average value of a fire weather code or index over the 30-year period from 1981 to 2010 (NRCan 2017).

The mean Fire Weather Index for the Fundy Isles region for years 1981 to 2010 for July (i.e., normally the driest month of the year, when risk of forest fire is typically the greatest) is rated from 0 to 5 (Figure 13.2); this is in the lower range of possible risk (NRCan 2017).



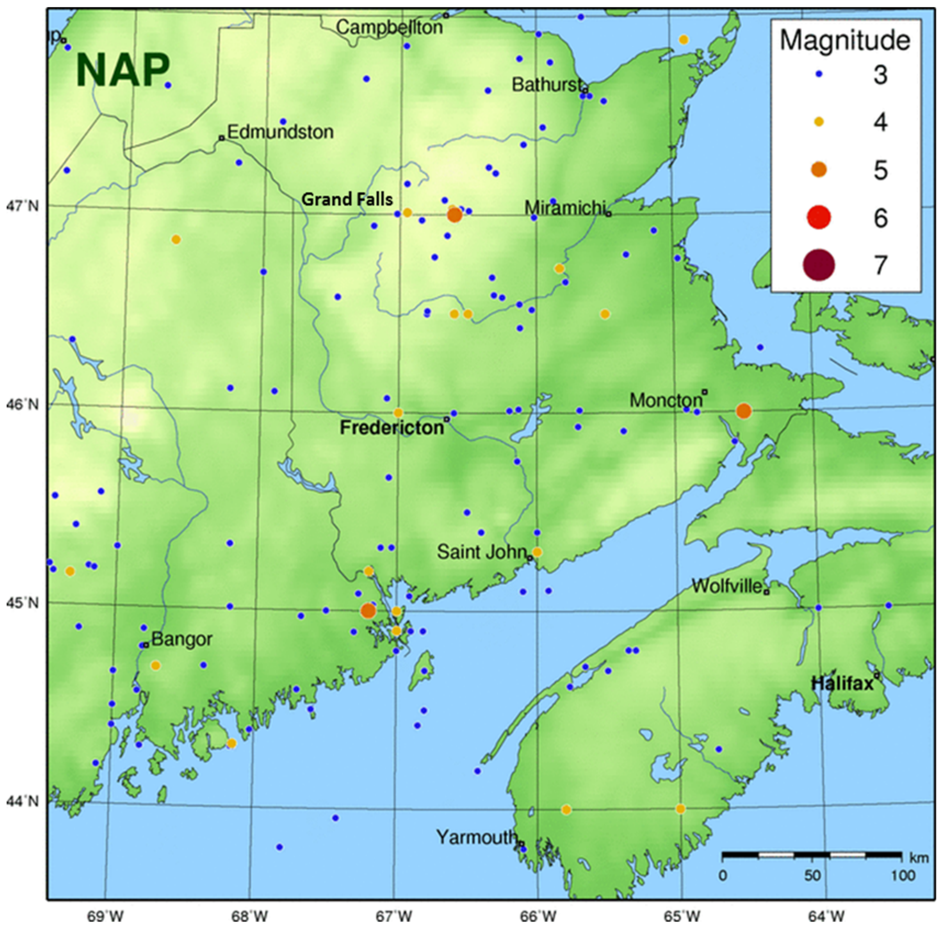
SOURCE: NRCan (2017)

Figure 13.2 Average Fire Weather Index for the Month of July (1981-2010)

13.5.2 Seismic Activity

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 Fundy Isles are located within the Northern Appalachians seismic zone (Figure 13.3) (NRCan 2016), which includes most of New Brunswick and extends southward into New England. It is one of five seismic zones in southeastern Canada, where the level of historical seismic activity is low. Historical seismic data recorded throughout eastern Canada has identified clusters of earthquake activity. Earthquakes in New Brunswick generally cluster in three regions: the Passamaquoddy Bay region, the Central Highlands (Miramichi) region, and the Moncton region (Burke 2011). The Project is located adjacent to the Passamaquoddy Bay region. There has been one recorded seismic activity of magnitude 4 in the Western Passage (an inlet off the Bay of Fundy, just north of Eastport, Maine), and records of seismic activity of magnitude 3 on Deer Island, off the coast of Deer Island and Grand Manan Island, as well as on Grand Manan Island.



SOURCE: NRCan (2016)

Figure 13.3 Northern Appalachians Seismic Zone

13.6 ASSESSMENT OF RESIDUAL EFFECTS OF THE ENVIRONMENT ON THE PROJECT

13.6.1 Effects of Climate and Climate Change on the Project

In assessing the potential effects of the environment on the Project, both current climate and climate change must be considered.

As discussed in Section 13.5.1, while climate is defined as average weather conditions over 30 years, climate change is the change in climate over two or more 30 year periods (Catto 2006). The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.

A combination of observed trends, theoretical understanding of the climate system, and numerical modeling demonstrates that global warming is increasing the risk of extreme weather events today (Huber and Gulledge 2011). Numerous climate-related conditions, linked primarily to global warming, have been observed across Atlantic Canada and globally. Many believe that these changes to the climate regime will accelerate over the next century, as has occurred with global temperatures over the past two decades (IPCC 2007). For example, increased temperatures, and changing precipitation patterns and intensity, could lead to more storm events, increasing storm intensity, rising sea levels, storm surges, and coastal erosion and flooding, all of which could affect infrastructure. Those most relevant to the Project over the next 50 to 100 years are changing precipitation patterns, increased number and intensity of extreme storms, and flooding (Vasseur and Catto 2008), which are described further in Section 14.6.2.

Predicting the future environmental effects of climate change for a specific area using global data sets is problematic due to generic data and larger scale model outputs that do not take into account local climate. The Canadian Climate Change Scenarios Network combined data from 24 international climate models to calculate new projections for Canada (CCCSN 2009). This ensemble approach (multi-model means/medians) has been demonstrated to likely provide the best projections for climate change because using a mean or median of many models reduces the uncertainty associated with any individual model. The mean monthly temperature and precipitation values were predicted for three levels of projected climate change (low, moderate, and high) for the period of 2041-2070 compared to the baseline period of 1961-1990 (Environment Canada 2016).

The overall mean annual maximum temperature increases projected, under the ‘high’ scenario, for New Brunswick between years 2041 and 2070 range from a 2.6°C to 2.9°C increase. The projected increases in average summer and winter temperatures for the Fundy Isles area are 2.6°C and 3.2°C, respectively (Government of Canada 2016).

The overall mean changes in annual average precipitation (% increase) projected, under the ‘high’ scenario, for New Brunswick between years 2041 and 2070 range from a 3.69% to 5.45% increase. The projected increases in average summer and winter precipitation for the Fundy Isles area are 1.22% and 9.2%, respectively (Government of Canada 2016).

Climate change predictions include increased temperature, and precipitation, changes in seasonal patterns, along with the possible increase in magnitude and frequency of extreme weather events and flooding (Government of New Brunswick 2017). New Brunswick has already been affected by increased temperatures and extreme weather events, and will continue to be affected in the future as today's trends continue.

Considering the potential pathways of effects related to current climate and climate change, and based on the data reviewed, the most relevant and important pathways to assess for this Project are the potential effects of severe weather on the Project.

13.6.1.1 Pathways for the Effects of Climate and Climate Change on the Project

Severe weather and the potential effects of climate and climate change must be considered during infrastructure development. Extreme temperatures and severe precipitation, winds, and extreme weather events could potentially cause:

- reduced visibility and inability to manoeuver equipment;
- delays in construction/operation activities and delays in receipt of materials;
- inability of personnel to access the site (e.g., if a road were to wash out);
- damage to infrastructure; and
- increased structural loading.

During construction, weather events with extreme low temperatures have the potential to reduce the pliability of construction materials used in Project components (e.g., ancillary facilities) and increase susceptibility to brittle fracture.

Snow and ice have the potential to increase loadings on Project infrastructure (e.g., transmission lines, cable riser structures). Extreme snowfall can also affect winter construction activities by causing a delay in construction or a delay in delivery of materials, and resulting in additional effort for snow clearing and removal.

During operation, the PDA could experience heavy rain, snowfall and freezing rain events that are capable of causing an interruption of services such as electrical power for extended periods of time, thus stalling generation or transmission capacity, or increasing structural loading on the Project components causing damage.

Reduced visibility due to fog could make manoeuvring of equipment difficult in the early part of the day. Likewise, extreme storm events could cause reduced visibility (due to blowing snow or rain) and interfere with maneuvering of equipment or transporting materials or staff movements. High winds also have the potential to increase loadings on Project infrastructure and cause possible damage. However, these short delays are anticipated and can often be predicted. Tasks that require precise movements can be scheduled during periods when unfavourable weather conditions are less likely to be experienced.

During electrical storms, fault currents may arise in electrical systems, potentially resulting in danger to personnel and damage to infrastructure. This can occur where Project infrastructure is close to the grounding facilities of electrical transmission line structures, substations, generating stations, and other facilities that have high fault current-carrying grounding networks. A lightning strike could also ignite a fire (see Section 14.3.1 for a discussion of fire as an accidental event).

13.6.1.2 Mitigation for Climate and Climate Change

The effects of severe weather (including as these may change with a change in climate) will be mitigated through:

- careful and considered design in accordance with factors of safety, best engineering practice, and adherence with standards and codes (e.g., Canadian Standards Association Standards (CSA C22.3 NO.1-10));
- engineering design practices that will consider predictions for climate and climate change (e.g., the Public Infrastructure Engineering Vulnerability Committee (PIEVC) "Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate" (PIEVC 2014)); and
- inspection and maintenance programs that will reduce the deterioration of the infrastructure and will help to maintain compliance with applicable design criteria and reliability of the transmission system.

Further to responsible design and construction of the Project, and ongoing inspection and maintenance, the selection of materials that are able to withstand temperatures and loads will more than adequately address climate concerns. The selection of materials that withstand potential environmental stressors related to climate will include engineering specifications of the CSA Standards and other construction standards that contain design specific provisions, such as:

- critical structures (e.g., cable riser station structures) that will be constructed with resilient materials to prevent brittle fracture at low ambient temperature conditions; and
- critical structures (e.g., cable riser station structures) that will be constructed to withstand the structural loading expected with high winds and weight associated with ice and snow.

13.6.1.3 Residual Effects of Climate and Climate Change on the Project

The potential effects of climate and climate change on the Project associated with severe weather during the construction, operation, and decommissioning phases will be considered and incorporated in the planning and design of Project infrastructure and scheduling. This will be done to reduce the potential for a change in Project schedule, or damage to infrastructure, by considering predictions for climate change in the region.

In light of these many design considerations and related mitigating measures, significant residual adverse effects of climate and climate change on the Project, or interruption to the Project schedule, are not anticipated.

Effects related to flooding, forest fires, and seismic events, although may be influenced by climate change, are assessed separately below.

13.6.2 Effects of Flooding on the Project

13.6.2.1 Pathways for the Effects of Flooding on the Project

Severe weather, like that discussed above, can contribute to unusual flooding during snowmelt and extreme rainfall events, which could potentially lead to flooding and land erosion. Flooding and land erosion could damage and cause failure of Project infrastructure (e.g., structures, access roads), which in turn could lead to the release of total suspended solids (TSS) in surface runoff and other related environmental effects.

Mitigation for Flooding

As discussed in Section 13.6.1.2, long term environmental management and Project longevity are inherent considerations in the best practices of Project design, development, and management. To address the effects flooding, design, construction and planning of operation will consider the potential normal and extreme conditions that might be encountered both now and in the future.

Flooding and erosion at the existing landfall sites have long been a factor of consideration, adaptation, and mitigation for NB Power. By continuing to develop ongoing adaptive and mitigation strategies, environmental stressors such as flooding will be inherently addressed.

Residual Effects of Flooding on the Project

The potential effects of flooding on the Project will be considered and incorporated in the planning and design of Project infrastructure and scheduling. This will be done to reduce the potential for Project delays and long-term damage to infrastructure and risk to workers, considering predictions for flooding in the region.

Inspection and maintenance programs will help to reduce the deterioration of the infrastructure and will help to maintain compliance with applicable design criteria and reliability to the transmission system. Significant residual adverse effects of flooding on the Project are not anticipated.

13.6.3 Effects of Forest Fires on the Project

13.6.3.1 Pathways for the Effects of Forest Fires on the Project

The effects of forest fire on the Project may include:

- reduced visibility and inability to manoeuver construction and operation equipment due to smoke;
- delays in receipt of materials and supplies (e.g., construction materials) and in delivering products;
- changes to the ability of workers to access the site (e.g., if fire blocks access to transportation routes);
- damage to infrastructure; and
- loss of electrical power resulting in potential loss of power production or transmission.

13.6.3.2 Mitigation for Forest Fires

In the event of a forest fire in close proximity to Project components, there is potential risk of damage to exposed Project infrastructure. If a forest fire were to break out in direct proximity to the Project, emergency measures would be in place to quickly control and extinguish the flames prior to any contact to flammable structures (i.e., wood).

New Brunswick has a forest fire control program in place to identify and control fires, reducing the potential magnitude and extent of any forest fire, and their potential consequential effects on the Project during any phase. The proposed safety and security programs for the Project are capable of rapid detection and response to any forest fire threat. A cleared buffer will be maintained around Project infrastructure, where feasible, to reduce the potential for a fire to affect the structures (which given the nature of the materials they contain are inherently fire resistant).

Safety and security programs will be in place in conjunction with facility, community, and provincial emergency response crews to provide for rapid detection and response to any fire threat. This includes fires that could start within the cable riser station perimeter, as well as fires approaching from outside the cable riser stations (i.e., forest fires).

13.6.3.3 Residual Effects of Forest Fires on the Project

If a forest fire were to occur in direct proximity to the Project, emergency measures would be in place to quickly control and extinguish the flames prior to contact with Project components. In addition, the cleared safety buffer zone established around Project components further decreases the likelihood of a forest or a brush fire causing substantive damage to the Project.

Although there is potential for natural forest fires to occur in or near the PDA, it is not likely to have a substantive effect on the Project due to the emergency measures put in place, the ability to extinguish the flames, and the cleared safety buffer zone around Project components.

13.6.4 Effects of Seismic Activity on the Project

13.6.4.1 Pathways for the Effects of Seismic Activity on the Project

Areas of the province (the Passamaquoddy Bay region, the Miramichi region, and the Moncton region) have historically experienced relatively higher levels of seismic activity than the rest of New Brunswick. Seismic activity could potentially damage Project infrastructure, as the Project is located in the Passamaquoddy Bay region.

13.6.4.2 Mitigation for Seismic Activity

The Project and related facilities and infrastructure will be designed according to the Canadian Standards Association and other applicable standards and guidelines for earthquakes in this area.

13.6.4.3 Residual Effects of Seismic Activity on the Project

The Project is located in the Passamaquoddy Bay region; however, past seismic activity in an area is not necessarily an indicator that a major seismic event will or will not occur in the future. The Project, and related infrastructure, will however be designed to the applicable standard for earthquakes in this area (i.e., National Building Code of Canada and Canadian Standards Association). The intent of these design standards is to maintain the integrity of the facilities based on the level of risk for an earthquake in the area. An earthquake with a magnitude substantively greater than the design-base earthquake could result in damage to the Project facilities. However, design-base earthquake magnitude values are selected based on probability of occurrence of such an earthquake. It is therefore unlikely that the design-base earthquake would be exceeded during the life of the Project. As a result, the likelihood of a major seismic event occurring in the vicinity of the Project, that could cause substantive Project damage or interrupt operations during any phase, is relatively low and is not likely to cause adverse effects that are substantive.

Seismicity is not considered to have the potential to substantially damage Project infrastructure or components during any phase of the Project, due to planned design mitigation and the application building codes, standards and guidelines. Therefore, significant residual adverse effects of seismic activity on the Project are not anticipated.

13.7 DETERMINATION OF SIGNIFICANCE

The effects of the environment on the Project are considered in all infrastructure decisions and the lifecycle assessment including the design, construction, and operation of the Project. The Project would be designed, constructed, and operated to maintain safety, integrity, and reliability in consideration of existing and reasonably predicted environmental forces in New Brunswick.

Given the mitigation measures described above, especially the life cycle design approach, there are no environmental attributes that, at any time during the Project, are anticipated to result in:

- a substantial change to the Project construction schedule (e.g., a delay resulting in the construction period being extended by one season);
- a long-term interruption in service (e.g., interruption in power generation activities in the Fundy Isles area requiring a long-term energy replacement solution); and
- substantive damage to Project infrastructure resulting in increased safety risk.

NB Power would use an adaptive management approach in its activities throughout the life of the Project to monitor any observed effects of the environment and adapt (e.g., repair/replace) the Project infrastructure or operations and closure as needed. The residual adverse effects of the environment on the Project are therefore rated not significant.