



GEMTEC

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Appendix C **VEC Atmospheric Environment**

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1.0 RATIONALE FOR THE VALUED ENVIRONMENTAL COMPONENT (VEC)

The atmospheric environment is impacted by concentrations of various natural and anthropogenic contaminants. Climatological processes can influence the transport or dispersal of airborne contaminants, as well as the deposition of contaminants in terrestrial and aquatic ecosystems. As such, Project related activities (*i.e.*, fuel combustion, particulate matter release, noise, *etc.*) may release contaminants into the atmosphere that could potentially impact human and/or ecosystem health.

In order to assess any potential impacts of the Project on the atmospheric environment, three components have been identified for this VEC:

- *Climate Conditions* are the long-term weather conditions of an area that are typically influenced by latitude, altitude and proximity to oceans. The climate conditions are measured by assessing the patterns of temperature, wind, precipitation, and other meteorological aspects.
- *Air Quality* is the concentration of naturally occurring or anthropogenic air pollutants that are present in the atmosphere. The concentration of the air pollutants is influenced by source location, meteorological processes (*i.e.*, wind, rain, air temperature) and topographical conditions. The air pollutant particles can be deposited on soil, water, vegetation, and other object surfaces.
- *Sound Quality* is the type, frequency, intensity and duration of ambient noise. Sound quality also encompasses any vibration related stress on nearby structures.

2.0 BOUNDARIES FOR THE ENVIRONMENTAL EFFECTS ASSESSMENT

2.1 Spatial Boundaries

The assessment of the atmospheric environment has been completed for two spatial boundaries:

- The Project Area is defined as the footprint of ground disturbance required for the Project activities (PIDs 40381345, 40381337, 40437121, 40445330, 40495780, 40164808, portion of 40163826, portion of 40143083, portion of 40336240, and portion of 40437139 (Figure C-1)); and
- The Assessment Area encompasses nearby sensitive receptors (*i.e.*, neighbouring residential dwellings, community centres, environmentally sensitive areas, *etc.*) within a 1 kilometre (km) radius of the Project Area (Figure C-1).

2.2 Temporal Boundaries

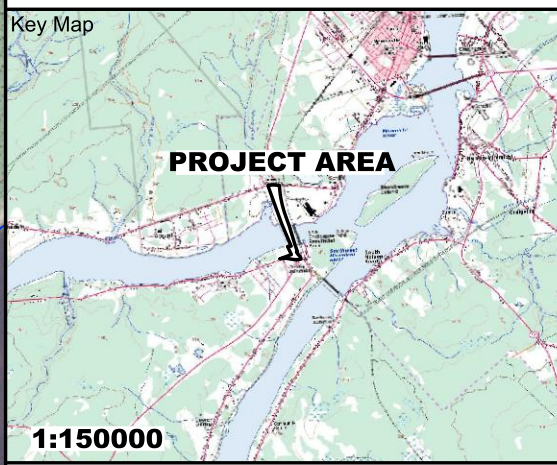
The assessment of the atmospheric environment has been completed for the following temporal boundaries:

- The construction phase of the Project; and
- The operational and maintenance phase of the Project.



Legend

●	SOUND MONITORING POINT
●	RESIDENCE
●	SPECIAL CARE HOME
+++++	RAILWAY
----	PROPERTY LINE
----	PROJECT AREA
-----	ASSESSMENT AREA 1km from project area



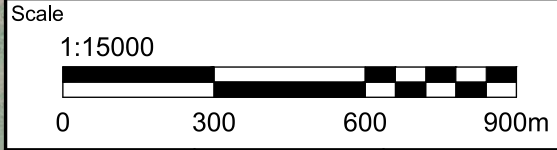
Note
 1. THIS DRAWING IS A SCHEMATIC REPRESENTATION. SIZES, LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

Drawn By CHG	Checked By JH
Calculations By ---	Checked By ---

Date
JUNE 2018

Project
**EIA - NORTHWEST MIRAMICHI RIVER
NO.1 ANDERSON BRIDGE REPLACEMENT**

Drawing
**ATMOSPHERIC ENVIRONMENT
SPATIAL BOUNDARIES AND
TOPOGRAPHY**



File No. 69214403	Drawing FIGURE C-1	Revision No. 0
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3.0 METHODOLOGY

A two-pronged approach was used to determine the existing atmospheric conditions and any potential interaction with the Project, including:

- A desktop study of existing information for climate conditions, air quality, and sound quality; and
- A field investigation to determine the existing sound quality conditions within the Assessment Area.

With respect to the Environmental Impact Assessment (EIA) process, interactions or effects of the Project on the atmospheric environment have been identified and are discussed. Where residual effects are anticipated, the proposed methods for mitigating the potential effects have been presented.

3.1 Climate Conditions

The climate conditions of the Project Area are based upon Environment Canada climate normals recorded at the Miramichi Airport weather station (47.0095°, -65.4643°), located approximately 15.5 kilometres (km) east of the Project Area. Due to its proximity to the Project Area, the climate conditions measured at this monitoring station are assumed to be comparable to those within the Project Area boundaries.

3.2 Air Quality

Air quality is monitored by both provincial and federal agencies across New Brunswick. The air quality data at two monitoring stations closest to the Project Area (a NBDELG operated station in Lower Newcastle and a NB Power operated station in Millbank, located approximately 17 km and 16 km west of the Project Area, respectively) were reviewed for this VEC. Combined, these stations monitor ozone, sulfur dioxide, nitrogen dioxide and total suspended particulates. These stations are located along NB-Highway 11 and are considered to be representative of a rural community. Due to the rural setting of the Project Area, similar to the location of the monitoring stations, air quality at these locations are expected to be comparable.

3.3 Sound Quality

Noise monitoring was completed at three locations within the Project Area using a 3M SoundPro DL sound level reader (Figure C-1). The three locations selected for noise monitoring included:

- Sound Point 1: Located on the south side of the Northwest Miramichi River, east of Route 8, on PID 40381345. This location represents the current noise levels of the Project Area as heard by a nearby residential dwelling (located approximately 125 metres southeast of the sound point). The recorder was calibrated to 114 decibels (dB) as per the manufactures standard and stationed at a height of 2.10 metres, to avoid any influence of

dense ground vegetation. Noise levels were monitored from 10:12 on Monday, October 23, 2017 to 10:12 on Tuesday, October 24, 2017;

- Sound Point 2: Located on the north side of the Northwest Miramichi River, west of Route 8, on PID 40437121. This location represents the current noise levels of the Project Area within an environmentally sensitive area (*i.e.*, regulated wetland and watercourse). The recorder was calibrated to 114 dB and stationed at a height of 2.15 metres. Noise levels were monitored from 10:36 on Tuesday, October 24, 2017 to 10:36 on Wednesday, October 25, 2017; and
- Sound Point 3: Located on the north side of the Northwest Miramichi River, east of Route 8, on PID 40495780. This location represents the current noise levels of the Project Area within close proximity to the Northwest Miramichi River. The recorder was calibrated to 114 dB and stationed at a height of 2.15 metres. Noise levels were monitored from 09:30 on Tuesday, October 31, 2017 to 09:30 on Wednesday, November 1, 2017.

All noise monitoring was carried out over a 24 hour period during good weather conditions (*i.e.*, the absence of rain and high winds).

Details of the noise monitoring data are presented in Attachment C-1.

4.0 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 Climate Conditions

The Canadian Climate Normals (1981 to 2010) recorded from the Miramichi Airport climate station indicate an annual daily mean temperature of 4.9 degree Celsius (°C), with a daily maximum of 10.5°C and minimum of -0.8°C. An extreme maximum temperature was recorded in August, 1944 (37.8°C) and an extreme minimum temperature was recorded in February, 1962 (-35.0°C). According to the climate normals, January is typically the coldest month with a daily average temperature of -10.8°C and July is the warmest month with a daily average temperature of 19.1°C (Environment Canada, 2017).

Average annual precipitation in the area is 1072.4 millimetres (mm). An extreme daily precipitation event was recorded in July, 1996 (93.0 mm) and an extreme daily snowfall event was recorded in December, 1967 (58.7 centimetres (cm)). On average, May and July are the rainiest months and January is the snowiest (Environment Canada, 2017).

The prevailing winds are generally from the south, year-round. The strongest maximum hourly wind speeds are typically observed in September and February (89 km/hour (km/h) and the weakest maximum hourly wind speeds (56 km/h) are typically observed in August¹.

4.2 Air Quality

The Province of New Brunswick has Air Quality Objectives (Table C-1) for regulated air contaminants under the *Air Quality Regulation of the Clean Air Act*.

Table C-1 New Brunswick Air Quality Objectives

Pollutant	Averaging Period			
	1 Hour	8 Hours	24 Hours	1 Year
Carbon Monoxide	35,000 µg/m ³	15,000 µg/m ³	-	-
Hydrogen Sulphide	15 µg/m ³	-	5 µg/m ³	-
Nitrogen Dioxide	400 µg/m ³	-	200 µg/m ³	100 µg/m ³
Sulphur Dioxide	900 µg/m ³	-	300 µg/m ³	60 µg/m ³
Total Suspended Particulate	-	-	120 µg/m ³	70 µg/m ³
Notes: µg/m ³ = micrograms per cubic metre				

¹ Environment Canada and Climate Change 1981 to 2010 Canadian Climate Normals recorded at the Miramichi Airport. Average daily wind speeds were not recorded (Environment Canada, 2017).

No exceedances of air quality daily standards have been logged at either of the two monitoring stations closest to the Project Area (as discussed in Section 3.2) since 1997 (NBDELG, 2012).

4.2.1 Emission Sources

There are no major industrial sources of emissions located in the Project Area. The former Miramichi Pulp & Paper Mill is located east of the Project Area and within the Assessment Area. The mill has been out of operation for approximately 10 years.

A rail line is located approximately 100 metres east of the Project Area, within the Assessment Area. The rail line is maintained by the Canadian National Railway Company (CN) who implements fuel conservation practices to reduce their carbon footprint from train traffic. An inactive aggregate quarry is located to the northwest of the Project Area. Emissions from home heating systems, motor vehicles, trucks, trains, boat traffic, and air contaminants transported by prevailing winds to the Project Area, are the predominant contributors to ambient air contaminant concentrations in the Project Area.

The Arbec Forest Product Mill is located approximately 9.5 km northeast of the Project Area, outside the Assessment Area. The NBDELG considers the Arbec Mill to be a Class 1 major industry and as such, the Mill is required to comply with the *Air Quality Regulation* under the *New Brunswick Clean Air Act* and the terms outlined in their Approval to Operate.

4.3 Sound Quality/Noise Monitoring

4.3.1 Assessment Area Sound Quality

The Assessment Area is situated within a mixed - land use area consisting of a residential subdivision, a rural forested area, the former Miramichi Pulp & Paper Mill industrial site, and an inactive aggregate quarry. Several noise sensitive areas (NSAs) are located in the vicinity of the Assessment Area including developed residential properties and a nearby special care home, located approximately 150 metres east of the Project Area. A religious institution is located approximately 150 metres south of the Project Area boundary and the Miramichi Valley Bible Camp and Conference Centre is located approximately 800 metres south of the Project Area. No additional NSAs, such as schools, daycares or hospitals are known to be in close proximity to the Assessment Area.

4.3.2 Noise Monitoring Results

The results of the sound monitoring suggest that Sound Point 1 is the loudest location within the Project Area, followed by Sound Point 3, then Sound Point 2 (Table C-2). This is consistent with on-site findings of Sound Point 1 and Sound Point 3 being in close proximity to Route 8, Northwest Miramichi boat traffic and the CN rail line. Details of the noise monitoring data are presented in Attachment C-1.

Table C-2 Summary of Noise Monitoring Results

Sound Point Location Sound Monitoring	1		2		3		Average dB
	dB	Time	dB	Time	dB	Time	
Maximum Daytime	89.00	16:51	78.80	07:54	81.00	12:31	82.93
Minimum Daytime	44.20	16:16	44.20	06:17, 06:49	44.50	9:24	44.13
Maximum Nighttime	83.70	18:26	81.00	04:06	88.10	18:12	84.27
Minimum Nighttime	43.70	Multiple times between 00:48 to 04:17	43.90	Multiple times between 23:49 to 05:00	43.70	04:56	43.77
Average Equivalent Daytime	53.24	-	55.74	-	58.11	-	57.70
Average Equivalent Nighttime	52.38	-	50.02	-	50.68	-	51.03
Average Equivalent 24-Hours	55.81	-	52.88	-	54.40	-	54.36

Health Canada data states that sound levels below 70 A-weighted decibel (dB_A) pose no known risk to hearing (Health Canada, 2017). In the A-weighted system, the decibel values of sounds at low frequencies are reduced, compared with unweighted decibels, in which no correction is made for audio frequency.

The NBDTI 24-hour average equivalent noise guideline is 65 dB_A (NBDTI, 2010).

All averaged noise levels at Sound Point Locations 1, 2 and 3 were below the NBDTI guideline and the Health Canada value.

5.0 SUMMARY OF POTENTIAL EFFECTS

5.1 Construction Phase Potential Effects

Potential Project effects on air and sound quality components are detailed in the following subsections for the construction phase of the Project.

5.1.1 Climate Conditions

It is not expected that the Project will affect climate conditions (*i.e.*, ambient temperatures, precipitation amounts and wind patterns); therefore, this component is not discussed further. The effects of climate on the project are discussed in Appendix J.

5.1.2 Air Quality Potential Effects

Potential effects to air quality as a result of the construction phase of the Project include:

- A short-term increase in particulate matter and dust within the Project Area during ground disturbance activities; and
- A short-term increase in exhaust fumes within the Project Area from heavy machinery and construction equipment.

Air quality potential effects are limited to active construction periods when ground is disturbed and machinery is operating within the Project Area.

5.1.3 Sound Quality Potential Effects

Potential effects to sound quality as a result of the construction phase of the Project include increased noise levels from construction equipment and increased construction-related truck traffic. Increased vibration from construction equipment is also a potential effect. Sound quality potential effects are limited to active construction periods when machinery is operating within the Project Area.

Sound pressure levels of commonly used construction and operation equipment are outlined in Table C-3. It should be noted that not all equipment required for the Project will be in operation at once.

Table C-3 Typical Construction and Operation Equipment Noise Levels

Equipment	Sound Level (dB_A) at 15 metres distance (USDOT, 2017)
Backhoe	78
Blasting	94
Chain Saw	84
Crane	81
Drill Rig Truck	84
Dozer	82
Dump Truck	76
Excavator	81
Front End Loader	79
Generator	81
Paver	77
Pickup Truck	75
Rock Drill	81
Roller	80
Scraper	84
Notes: dB _A = Decibels on an “L _{max} ” weighted scale. L _{max} is the highest value measured on a sound meter over a given period of time.	

5.2 Operational and Maintenance Phase Potential Effects

Potential effects for the atmospheric environment component are detailed in the following sub-sections for the operational and maintenance phase of the Project.

5.2.1 Air Quality Potential Effects

Potential effects to air quality as a result of the operational and maintenance phase of the Project include:

- A short-term increase in particulate matter and dust within the vicinity of the Project Area during road repairs and resurfacing of the bridge;
- A short-term increase in gaseous emissions from machinery and maintenance equipment; and

- The release of particulate matter and gaseous emissions from regular vehicle use/travel within the Project Area.

The operational and maintenance phase of the Project may result in a reduction of gaseous emissions (as compared to current conditions) within the Project Area due to a decrease of idling vehicles and improved traffic flow (currently the bridge is restricted to one lane, and there are traffic lights at each end). The implementation of mitigation measures and best management practices will further reduce the potential effects to air quality.

5.2.2 Sound Quality Potential Effects

Potential effects to sound quality as a result of the operational and maintenance phase of the Project include the following:

- A short-term increase in noise levels from construction equipment and construction-related truck traffic during maintenance activities;
- A short-term increase in vibration from construction equipment and construction-related truck traffic during maintenance activities; and
- Noise generated from regular vehicle use/travel within the Project Area.

The operational and maintenance phase of the Project may result in a reduction of noise levels within the Project Area (as compared to current conditions) due to a decrease of idling vehicles and improved traffic flow. The implementation of mitigation measures and best management practices will further reduce the potential effects to sound quality.

5.3 Accidents, Malfunctions and Unplanned Events

There is a potential for accidents to occur during all phases of the Project. Accidents that may impact the atmospheric environment include:

- Fire, which could result in a reduction of air quality via smoke emissions; and
- Accidental releases of chemicals or spills (e.g., evaporation/volatilization of chemicals).

6.0 PROPOSED MITIGATION MEASURES

The potential effects, standard NBDTI Environmental Management Manual (EMM) mitigation measures and any additional mitigation measures recommended by GEMTEC in order to minimize the potential adverse effects to the atmospheric environment during the construction and operational and maintenance phases of the Project, as summarized in Table C-4. Additionally, an Environmental Management Plan (EMP) will be developed following the Technical Review Committee (TRC) comments for all phases of the Project to summarize the commitments of the EIA report, to identify any environmental sensitive features and to identify any specific contingency or emergency response measures for the Project.

Table C-4 Summary of Mitigation Measures for the Atmospheric Environment

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures ¹	Additional Recommended Mitigation Measures
Construction Phase			
Air Quality	Increased particulate matter and dust.	<ul style="list-style-type: none"> • 5.5 Detouring; • 5.6 Dust Control; • 5.7 Erosion Control; • 5.8 Excavation, Blasting and Aggregate Production; • 5.10 Fire Prevention and Contingency; and • 5.17 Temporary Ancillary Facility Management. 	No additional mitigation measures are recommended by GEMTEC.
	Increase in gaseous emissions from construction equipment and truck traffic.	<ul style="list-style-type: none"> • 5.10 Fire Prevention and Contingency; • 5.17 Temporary Ancillary Facility Management; and • 5.19 Vehicle and Equipment Management (including 5.19.2 Idling). 	
Sound Quality	Increased noise levels and vibration from construction equipment and truck traffic.	<ul style="list-style-type: none"> • 5.8 Excavation, Blasting and Aggregate Production; • 5.17 Temporary Ancillary Facility Management; • 5.19 Vehicle and Equipment Management; and • 5.23 Working Near Environmentally Sensitive Areas. 	It is recommended that high noise-generating construction activities be restricted to daylight hours, when feasible.

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Operational / Maintenance Phase			
Air Quality	Increased particulate matter and dust within the vicinity of the Project Area during operational / maintenance activities.	<ul style="list-style-type: none"> • 5.6 Dust Control; • 5.7 Erosion Control; • 5.10 Fire Prevention and Contingency; • 5.15 Structures; • 5.16 Summer Maintenance; • 5.17 Temporary Ancillary Facility Management; and • 5.19 Vehicle and Equipment Management. 	No additional mitigation measures are recommended by GEMTEC.
	Use of construction equipment and truck traffic during road repairs or resurfacing of the bridge.	<ul style="list-style-type: none"> • 5.10 Fire Prevention and Contingency; • 5.17 Temporary Ancillary Facility Management; and • 5.19 Vehicle and Equipment Management (including 5.19.2 Idling). 	
	The release of particulate matter and gaseous emissions from vehicles travelling within the Project Area.	<ul style="list-style-type: none"> • 5.16 Summer Maintenance; and • 5.21 Winter Maintenance. 	
Sound Quality	Increased noise levels and vibration from construction equipment and construction-related truck traffic.	<ul style="list-style-type: none"> • 5.19 Vehicle and Equipment Management; and • 5.23 Working Near Environmentally Sensitive Areas. 	

Project Component	Summary of Potential Interaction	Standard NBDTI EMM Mitigation Measures	Additional Recommended Mitigation Measures
Accidents, Malfunctions and Unplanned Events			
Fire	Increased potential of smoke to reduce air quality.	<ul style="list-style-type: none"> • 5.10 Fire Prevention and Contingency; • 5.13 Storage and Handling of Petroleum Products; and • 5.14 Storage and Handling of Other Hazardous Materials. 	No additional mitigation measures are recommended by GEMTEC.
Accidental Release of Chemical or Spill	Increased potential of emissions of chemical and fuel vapors to reduce air quality.	<ul style="list-style-type: none"> • 5.10 Fire Prevention and Contingency; • 5.13 Storage and Handling of Petroleum Products; and • 5.14 Storage and Handling of Other Hazardous Materials. 	

1. Indicates the section of the EMM document where written mitigation measures are presented for each component.

7.0 SUMMARY OF POTENTIAL RESIDUAL EFFECTS

A significant residual effect to the atmospheric environment can be defined as a permanent or sustained change in air quality or sound quality such that adverse impacts are observed within the Project Area or the Assessment Area.

The construction phase of the Project is expected to temporarily affect the air quality within the Project Area. Air quality may be influenced by increased particulate matter and exhaust fumes from heavy machinery and equipment required for the construction activities. However, the increase in airborne contaminants within the Project Area and/or Assessment Area is expected to be localized and will not exceed regulatory limits and/or the New Brunswick Air Quality Objectives. Furthermore, the proposed mitigation measures will reduce the risk of any residual effects to air quality.

Increased noise levels within the Project Area and/or Assessment Area are likely during the construction phase of the Project. As per Table C-2, the operation of construction equipment and machinery may exceed the NBDTI and Health Canada noise guidelines; however, these noise levels will be of short duration and not all equipment will be operating at the same time. With the implementation of the proposed mitigation measures, significant residual effects to NSAs and other noise receptors are not anticipated.

The operational and maintenance phase of the Project is not anticipated to have a significant effect on the atmospheric environment. The operational air quality and sound quality conditions are expected to be similar to those currently observed within the Project Area and Assessment Area; therefore, this interaction is considered to be non-significant. Due to improved traffic flow and the reduction of idling vehicles within the Project Area, a reduction of gaseous emissions may be observed following the construction of the new bridge.

8.0 REFERENCE

Greenhouse gas emissions by province and territory. 2017. Environment and Climate Change Canada. Accessed online March 2, 2018. Website: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions/province-territory.html>

Air Quality Monitoring Results 2012 & 2013. 2015. New Brunswick Department of Environment and Local Government.

Construction Noise Handbook. 2017. US Department of Transportation Federal Highway Administration (USDOT). Accessed October 4, 2017. Website: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Environment Canada and Climate Change (ECCC). 2017. Canadian Climate Normals (1981-2010). Accessed November, 2017. Website: http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html

GeoNB Wetland Mapping. Accessed October, 2017. Website: <http://geonb.snb.ca/geonb/>

Health Canada. 2017. Noise-Induced Hearing Loss. December 2012. Website: <https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/noise-induced-hearing-loss.html>

Natural Resources Canada (NRCAN). 2017. Toporama Mapping. Accessed October, 2017. Website: <http://atlas.nrcan.gc.ca/site/english/toporama/index.html>

New Brunswick Department of Environment and Local Government (NBDELG). 2012a. A Guide to Environmental Impact Assessment in New Brunswick. April 2012.

New Brunswick Department of Environment and Local Government (NBDELG). 2018. Air Quality Regulation. February 2018.

New Brunswick Department of Transportation and Infrastructure (NBDTI). 2010. Environmental Management Manual.

Service New Brunswick (SNB). 2017. Registry and Mapping Services. Accessed November, 2017. Website: <https://www.planet.snb.ca/PLANET/index.html>



ATTACHMENTS

C-1 Sound Point Data

