

HIGHWAY 104 TWINNING

Sutherlands River to Antigonish

Environmental Assessment Registration



CBCL LIMITED

Consulting Engineers



**Transportation and
Infrastructure Renewal**

Executive Summary

Highway 104 extends from the New Brunswick Border at Fort Lawrence to the Canso Causeway and is part of the Trans-Canada Highway. NSTIR has proposed the twinning of the section from Sutherlands River (Pictou County) to West of Antigonish (Antigonish County), a distance of approximately 38 km (the Project). Completion of the Project will result in a continuous twinned highway from the New Brunswick border to just east of Antigonish (Taylors Road), comprising a total distance of approximately 200 km.

The Project, as currently defined, will include the following key components:

- Twinning of existing lanes (approx. 28 km);
- Construction of a new four-lane highway section (approximately 10 km), diverting from the existing alignment at west of Barney's River Station and reconnecting west of James River;
- Approximately 25 structure additions or modifications, including interchanges and large watercourse crossings; this will also incorporate infrastructure to permit wildlife passage in key areas.

The Project will be delivered via a Design-Build-Finance-Operate-Maintain (DBFOM) contract which will engage a Proponent to carry out all of the above activities; construction is anticipated to be completed within 3 to 7 years and operations to be completed over a defined period (to be determined). Beyond this point, responsibility for the operations and maintenance of the highway will be handed back to the Province of Nova Scotia. The Project is estimated to be in operation for an indefinite period of time, with no plans for decommissioning.

NSTIR has only conducted preliminary design to this point, in order to have a general understanding of all of the Project components. All Project works, including site-specific design considerations, will be completed in accordance with Nova Scotia's *Construction of 100-Series Highways Environmental Protection Plan*, and subject to applicable regulatory approvals, authorizations and permits; this includes the site-specific terms and conditions arising from the Class 1 EA approval presently being sought.

This Project is considered to be a 'Class I Undertaking' per Nova Scotia Environment's (NSE) *Environmental Assessment Regulations* pursuant to the *Environment Act*, and requires ministerial approval under the Act. This Class 1 Environmental Assessment Registration document was

developed to meet these regulations, as articulated in *A Proponent's Guide to Environmental Assessment* (NSE, 2017). As part of this Environmental Assessment, the assessment of effects was completed for selected Valued Environmental Components (VECs). VECs selected for this Project included:

- Atmospheric Environment
 - Air Quality;
 - Noise; and
 - Climate Change and Greenhouse Gases.
- Physical Environment
 - Geology and Soil Quality;
 - Surface Water Quality; and
 - Hydrogeology and Groundwater Quality.
- Biological Environment
 - Flora;
 - Wildlife and Wildlife Habitat;
 - Wetlands;
 - Fish and Fish Habitat; and
 - Species at Risk.
- Socio-Economic Environment
 - Land Use; and
 - Human Health and Safety.
- Cultural Environment
 - Historical and Archaeological Resources.

Potential effects of the Project on the identified VECs were assessed for activities occurring during the Site Preparation, Construction, and Operations and Maintenance Phases of the Project, as well as removal of select sections of existing Highway 104, which will be removed from service once the Project is operational. VEC-specific spatial and temporal boundaries were determined for the geographical areas and time periods for which the VECs may interact or are likely to be influenced by the Project. Each identified environmental effect, either direct or indirect, was evaluated within these spatial and temporal boundaries. VEC-specific boundaries were selected, as they may vary among VECs.

Within the assessment, the main potential Project effects may be summarized as:

- Decreased air quality and increased Greenhouse Gas emissions;
- Increased noise levels within the area of the new four-lane alignment;
- Decreased surface water and groundwater quality;
- Direct and indirect effects on aquatic and terrestrial habitats and their contained species (including SOCC and SAR), via habitat alteration or removal, or modification of water quality;
- Modifications to current land use in the vicinity of the Project;
- Modifications to current access of lands by Mi'kmaq people for traditional purposes;
- Effects to human health and safety; and
- Disturbance to, or removal of, heritage and archaeological resources.

The majority of potential Project impacts will be of limited spatial and temporal duration. A broad range of suitable mitigation measures were developed to address the effects of the Project on the identified VECs. The application of these mitigation measures was taken into account when determining the significance of any residual environmental effects. Following the application of the recommended mitigation measures, the majority of effects to the identified VECs are considered 'Not Significant'.

Only two VECs may have possible negative residual effects;

- In the context of the 'Land Use' VEC: There may be a foreseeable loss of Mi'kmaq traditional use sites and loss of plant species of significance or harvesting areas as a result of Project development. A Mi'kmaq Ecological Knowledge Study (MEKS) is currently underway to determine if the proposed Project will have any residual effects on access to lands used by Mi'kmaq for traditional purposes; and
- In the context of the 'Noise' VEC: Within the new four-lane alignment portion of the Project, there is a foreseeable increase in sound levels beyond both provincial guidelines and municipal by-laws during the Site Preparation and Construction phases. Follow-up measures are also recommended to assess if the significance criteria for noise is exceeded. A complaint-based noise monitoring program will be implemented during Project activities to assess if the mitigation measures to address the residual effects are sufficient.

As a result of the effects assessment, the following Monitoring and Follow-up requirements have been identified:

- Execution of a complaint-based noise monitoring program during Site Preparation and Construction phases;
- Execution of a surface water quality monitoring program during Construction;
- Preparation of a wetland compensation plan, and execution of post-construction wetland monitoring of impacted wetlands;
- Implementation of a wildlife passage monitoring program during the Operations and Maintenance phase;
- Execution of a black ash management and monitoring plan;
- Onsite monitoring for presence of wood turtles prior to Site Preparation and Construction phases, within areas of Critical Habitat for this species;
- Preparation of offsetting plan for losses to fish and fish habitat;
- Monitoring of fish habitat during Site Preparation and Construction phases;
- Post-construction monitoring of fish habitat;
- Execution of an updated Mi'kmaq Ecological Knowledge Study (MEKS);
- Implementation of a land acquisition program;
- Completion of an archaeological shovel testing program;
- Execution of follow-up reconnaissance programs for heritage and archaeological resources; and
- Implementation of additional site-specific mitigation measures for heritage and archaeological resources.

The Proponent will be required to implement the site-specific terms and conditions of the Class 1 EA approval presently being sought, to conduct the required mitigation, and to develop and implement the required monitoring and follow-up plans per all applicable regulations, guidelines, standards, and approvals.

The sections of Highway 104 within the Project Area have been identified by the public, the municipalities and NSTIR as needing improvement, due to concerns over collisions and fatalities. NSTIR initiated the completion of an operations and safety review of Highway 104 which and prioritized a series of mitigation measures which were to have a positive impact on safety. The proposed improvements were identified as interim improvements until the Highway 104 could be twinned, which was found to ultimately address many of the existing safety concerns for operations and safety (OPUS, 2015). The proposed Project is expected to improve both the level of safety performance and service within this corridor. Divided medians and twinning highways for passing will provide safety improvements. The proposed Project will improve the current safety conditions, and may result in an approximately 30-35% reduction of intersection-related, angle, and head-on collisions, and some reduction in single vehicle, rear-end, and sideswipe collisions. The Project will result in an overall net benefit to communities and safety performance, while minimizing the effects to the atmospheric, physical, biological, socio-economic, and cultural environment.

Acronyms

| | |
|-------------------|--|
| AADT | Average annual daily traffic |
| ACCDC | Atlantic Canada Conservation Data Centre |
| ADT | Annual daily traffic |
| AMO | Abandoned mine openings |
| ARIA | Archaeological resource impact assessments |
| ASTM | American Society for Testing and Materials |
| BBS | Breeding bird survey |
| BMP | Best management practices |
| °C | Degrees Celsius |
| CAAQS | Canadian Ambient Air Quality Standards |
| CABIN | Canadian Aquatic Biomonitoring Network |
| cal BP | Calendar years Before the Present |
| CBCL | CBCL Limited |
| CCA | Canadian Construction Association |
| CCME | Canadian Council of Ministers of the Environment |
| CEAA | Canadian Environmental Assessment Act |
| CEPA | Canadian Environmental Protection Act |
| CEQG | Canadian Environmental Quality Guidelines |
| CHM | Canopy Height Model |
| CLC | Community liaison committee |
| cm | centimeter |
| CMM | Confederation of Mainland Mi'kmaq |
| CO | Carbon monoxide |
| CO ₂ | Carbon dioxide |
| CO ₂ e | Carbon dioxide emitted per year |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CRA | Commercial, recreational, or Aboriginal |
| CSR | Contaminated Sites Regulations |
| CWS | Canadian Wildlife Service |
| dB | decibels |
| dba | A-weighted decibels |
| DBFOM | Design-Build-Finance-Operate-Maintain |

| | |
|------------------|--|
| DEM | Digital elevation model |
| DFO | Fisheries and Oceans Canada |
| DO | Dissolved oxygen |
| DSM | Digital surface model |
| DWA | Deer Wintering Area |
| EA | Environmental Assessment |
| ECCC | Environment and Climate Change Canada |
| ECM | Environmental compliance monitoring |
| ECPs | Environmental control plans |
| EEM | Environmental effects monitoring |
| EGSPA | Environmental Goals and Sustainable Prosperity Act |
| EPP | Environmental protection plan |
| ESC | Erosion and sediment control |
| FEC | Forest Ecosystem Classification |
| FHWA | Federal Highway Administration |
| FNA | Flora of North America |
| FSA | Field survey area |
| ft. | feet (imperial measurement) |
| FWAL | Freshwater Aquatic Life |
| g | Gram |
| GCDWQ | Guidelines for Canadian Drinking Water Quality |
| GDE | Groundwater Dependent Ecosystem |
| GHG | Greenhouse gas |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| GUDI | Groundwater under the Direct Influence |
| H ₂ S | Hydrogen Sulphide |
| ha | Hectare |
| hmvk | Hundred million vehicle kilometers |
| Hz | Hertz |
| IPCC | Intergovernmental Panel on Climate Change |
| IRVM | Integrated Roadside Vegetation Maintenance |
| ISQG | Interim Sediment Quality Guidelines |
| ka BP | Kilo annum Before Present |
| Km | Kilometer |
| Km/h | Kilometer per hour |
| KMKNO | Kwilmu'kw Maw-klusuaqn Negotiation Office |
| L | Litre |
| LAA | Local Assessment Area |
| L _{eq} | Equivalent Continuous Sound Level |
| m | Meters |
| m/s | Meters per second |
| mASL | Meters above sea level |
| MBBA | Maritimes Breeding Bird Atlas |

| | |
|-------------------|---|
| MBCA | Migratory Birds Convention Act, 1994 |
| ME | Maine |
| MEKS | Mi'kmaq Ecological Knowledge Study |
| mm | Millimeter |
| Mt | Megatonnes |
| NaCl | Sodium chloride |
| NAPS | National Pollutant Surveillance Program |
| NDVI | Normalized Differential Vegetation Index |
| NH | New Hampshire |
| NHS | National Highway System |
| NIR | Near-infrared |
| NO ₂ | Nitrogen dioxide |
| NO _x | Nitrogen oxides |
| NPA | Navigation Protection Act |
| NRCan | Natural Resources Canada |
| NSCCH | Nova Scotia Department of Communities, Culture and Heritage |
| NSDA | Nova Scotia Department of Agriculture |
| NSDMA | Nova Scotia Department of Municipal Affairs |
| NSDNR | Nova Scotia Department of Lands and Forestry (formerly Department of Natural Resources) |
| NSE | Nova Scotia Environment |
| NSESA | Nova Scotia <i>Endangered Species Act</i> |
| NSOAA | Nova Scotia Office of Aboriginal Affairs |
| NSTIR | Nova Scotia Transportation and Infrastructure Renewal |
| NSTPW | Nova Scotia Transportation and Public Works |
| O ₃ | Ozone |
| PA | Project Area |
| PAHs | Polycyclic aromatic hydrocarbons |
| PDO | Property damage only |
| PEL | Probable Effect Level |
| P-ELC | Project Ecological Land Classification |
| PGI | Pellet Group Inventory |
| PM | Particulate matter |
| PM ₁₀ | Particulate matter less than 10 microns |
| PM _{2.5} | Particulate matter less than 2.5 microns |
| POLs | Petroleum, oils, lubricants |
| ppb | Parts per billion |
| ppm | Parts per million |
| RAA | Regional Assessment Area |
| ROW | Right-of-way |
| RWIS | Road weather information system |
| SANS | Snowmobilers Association of Nova Scotia |
| SAR | Species at Risk |
| SARA | <i>Species at Risk Act</i> |

| | |
|-----------------|---|
| SECP | Sediment and Erosion Control Plan |
| SMP | Salt Management Plan |
| SO ₂ | Sulphur dioxide |
| SOCC | Species of conservation concern |
| SO _x | Sulphur oxides |
| TAC | Transportation Association of Canada |
| TC | Transport Canada |
| TDG | Transportation of Dangerous Goods |
| TDS | Total dissolved solids |
| TDGA | <i>Transportation of Dangerous Goods Act</i> |
| TSP | Total suspended particulates |
| TSS | Total suspended solids |
| µg | Microgram |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VEC | Valued Environmental Component |
| VES | Visual encounter surveys |
| VOCs | Volatile organic compounds |
| Vpd | Vehicles per day |
| VT | Vegetation Type |
| WC | Watercourse |
| WESP-AC | Wetland Ecosystem Services Protocol for Atlantic Canada |
| WESPUS | Wetland Ecosystem Services Protocol for the United States |
| WET | Wetland Evaluation Technique |
| WSS | Wetland of Special Significance |

Contents

| | |
|---|-----------|
| Executive Summary | i |
| Acronyms | v |
| CHAPTER 1 Introduction | 1 |
| 1.1 Project Background..... | 1 |
| 1.2 Purpose and Need for the Undertaking..... | 3 |
| 1.3 Identification of the Proponent | 7 |
| 1.4 Funding | 8 |
| 1.5 Regulatory Context | 8 |
| 1.6 Property Ownership..... | 15 |
| 1.7 Environmental Assessment Concordance | 16 |
| CHAPTER 2 Project Description | 19 |
| 2.1 Overview of the Project | 19 |
| 2.2 Project Components | 22 |
| 2.2.1 Roadway / Existing Infrastructure | 22 |
| 2.2.2 Interchanges and Grade Separation Structures..... | 23 |
| 2.2.3 Watercourse Crossings | 23 |
| 2.2.4 Service Roads | 25 |
| 2.2.5 Secondary / Existing Road Modifications | 27 |
| 2.2.6 Temporary Ancillary Project Elements | 27 |
| 2.2.7 Wildlife Passage | 30 |
| 2.3 Project Activities | 31 |
| 2.3.1 Site Preparation | 31 |
| 2.3.2 Construction..... | 35 |
| 2.3.3 Operation and Maintenance..... | 46 |
| 2.3.4 Deactivation of Portions of Current Highway 104 | 48 |
| 2.4 Environmental Design Considerations..... | 49 |
| 2.5 Environmental Management | 49 |
| 2.6 Project Schedule | 50 |
| CHAPTER 3 Aboriginal Consultation and Engagement | 52 |
| 3.1 Overview | 52 |
| 3.2 Regulatory Consultation | 52 |
| 3.3 Aboriginal Engagement..... | 54 |

| | | |
|------------------|--|-----------|
| 3.4 | Public Consultation | 55 |
| 3.4.1 | Nova Scotia Highway Twinning Consultations..... | 55 |
| 3.4.2 | Public Information Session | 55 |
| 3.4.3 | Consultation during Design, Construction and Operation and Maintenance ... | 56 |
| 3.4.4 | Other Stakeholder Consultation | 57 |
| 3.5 | Summary of Engagement Activities | 57 |
| CHAPTER 4 | Environmental Assessment Scope and Methods | 61 |
| 4.1 | Scope of the Assessment | 62 |
| 4.1.1 | Scope..... | 62 |
| 4.1.2 | Valued Environmental Components (VEC) Identification..... | 63 |
| 4.2 | Environmental Assessment Methods | 65 |
| 4.2.1 | Boundaries | 65 |
| 4.2.2 | Significance Determination..... | 67 |
| 4.2.3 | Description of Existing Conditions | 81 |
| 4.3 | Assessment of Project-Related Environmental Effects | 82 |
| CHAPTER 5 | Description of the Project Environment | 83 |
| 5.1 | Atmospheric Environment..... | 83 |
| 5.1.1 | Air Quality | 83 |
| 5.1.2 | Noise | 86 |
| 5.1.3 | Climate Normals | 91 |
| 5.1.4 | Greenhouse Gas Emissions | 93 |
| 5.2 | Physical Environment..... | 94 |
| 5.2.1 | Terrain, Geology, and Soils | 94 |
| 5.2.2 | Surface Water Quality..... | 98 |
| 5.2.3 | Hydrogeology and Groundwater Quality..... | 106 |
| 5.3 | Biological Environment – Flora | 107 |
| 5.3.1 | Project Ecological Land Classification (P-ELC)..... | 107 |
| 5.3.2 | Vascular Plants..... | 113 |
| 5.3.3 | Lichens and Other Non-Vascular Plants..... | 124 |
| 5.4 | Biological Environment – Wildlife and Wildlife Habitat | 130 |
| 5.4.1 | Birds | 131 |
| 5.4.2 | Mammals | 143 |
| 5.4.3 | Reptiles and Amphibians | 149 |
| 5.4.4 | Invertebrates..... | 151 |

| | | |
|------------------|---|------------|
| 5.5 | Biological Environment – Wetlands..... | 152 |
| | 5.5.1 Desktop Review | 152 |
| | 5.5.2 Field Studies..... | 152 |
| | 5.5.3 Wetlands of Special Significance | 161 |
| 5.6 | Biological Environment – Fish and Fish Habitat..... | 167 |
| | 5.6.1 Desktop Review | 168 |
| | 5.6.2 Commercial, Recreational, and Aboriginal (CRA) Fisheries Assessment | 170 |
| | 5.6.3 Fish Habitat Assessments..... | 171 |
| | 5.6.4 Fish Sampling Program | 179 |
| | 5.6.5 Fish Species of Conservation Concern | 180 |
| 5.7 | Biological Environment – Species at Risk..... | 186 |
| | 5.7.1 Mammal Species at Risk | 189 |
| | 5.7.2 Bird Species at Risk | 194 |
| | 5.7.3 Fish Species at Risk..... | 197 |
| | 5.7.4 Herpetofauna Species at Risk | 197 |
| | 5.7.5 Invertebrate Species at Risk..... | 200 |
| | 5.7.6 Vascular Plant Species at Risk..... | 200 |
| | 5.7.7 Lichen Species at Risk | 201 |
| | 5.7.8 Other Non-vascular Plant Species at Risk | 202 |
| 5.8 | Socio-Economic Environment..... | 203 |
| | 5.8.1 Socio-Economics | 203 |
| | 5.8.2 Land Use Environment..... | 207 |
| | 5.8.3 Human Health and Safety | 220 |
| 5.9 | Heritage and Archaeological Resources | 221 |
| | 5.9.1 Desktop Review | 221 |
| | 5.9.2 Field Reconnaissance Surveys..... | 224 |
| CHAPTER 6 | Alternatives to the Project | 230 |
| 6.1 | Alternatives to the Project..... | 230 |
| 6.2 | Project Alternatives Assessment | 232 |
| CHAPTER 7 | Accidents and Malfunctions | 234 |
| 7.1 | Spills | 234 |
| 7.2 | Erosion and Sediment Control Failure..... | 236 |
| 7.3 | Fires..... | 237 |
| 7.4 | Vehicular Collisions | 237 |

| | | |
|------------------|--|------------|
| 7.5 | Vehicle – Wildlife Collisions | 239 |
| 7.6 | Summary | 240 |
| CHAPTER 8 | Environmental Effects Assessment | 241 |
| 8.1 | Potential Environmental Effects and Project-Related Interactions | 259 |
| | 8.1.1 Atmospheric Environment | 261 |
| | 8.1.2 Physical Environment..... | 275 |
| | 8.1.3 Biological Environment - Flora | 292 |
| | 8.1.4 Biological Environment - Wildlife and Wildlife Habitat | 299 |
| | 8.1.5 Biological Environment - Wetlands..... | 319 |
| | 8.1.6 Biological Environment - Fish and Fish Habitat | 326 |
| | 8.1.7 Biological Environment - Species at Risk | 335 |
| | 8.1.8 Socio-Economic Environment | 362 |
| | 8.1.9 Cultural Resources | 378 |
| 8.2 | Mitigation Measures..... | 382 |
| | 8.2.1 Atmospheric Environment..... | 383 |
| | 8.2.2 Physical Environment..... | 384 |
| | 8.2.3 Biological Environment | 386 |
| | 8.2.4 Socio-Economic Environment | 392 |
| | 8.2.5 Cultural..... | 394 |
| 8.3 | Residual Environmental Effects and Significance Determination..... | 395 |
| | 8.3.1 Atmospheric Environment | 396 |
| | 8.3.2 Physical Environment..... | 399 |
| | 8.3.3 Biological Environment | 403 |
| | 8.3.4 Socio-Economic Environment | 411 |
| | 8.3.5 Cultural Environment..... | 415 |
| 8.4 | Monitoring and Follow-up | 416 |
| | 8.4.1 Atmospheric Environment..... | 416 |
| | 8.4.2 Physical Environment..... | 416 |
| | 8.4.3 Biological Environment | 417 |
| | 8.4.4 Socio-Economic Environment | 419 |
| | 8.4.5 Cultural Environment..... | 419 |
| CHAPTER 9 | Monitoring and Environmental Management | 421 |
| 9.1 | Overview | 421 |
| 9.2 | Environmental Management and Commitments | 432 |

| | |
|--|------------|
| 9.2.1 Environmental Protection Plans | 432 |
| 9.2.2 Monitoring and Follow-up Requirements | 434 |
| 9.3 Summary of Residual Effects and Significance | 439 |
| CHAPTER 10 References..... | 441 |

Appendices

| |
|--|
| Appendix A – NSTIR Collision Data |
| Appendix B – Consultations |
| Appendix C – Effects Assessment Criteria Rankings |
| Appendix D – Noise Assessment - Technical Report |
| Appendix E – Aquatic Environment - Technical Report |
| Appendix F – Vegetation Assessment - Technical Report |
| Appendix G – Breeding Bird Surveys - Technical Report |
| Appendix H – Ungulates Pellet Group Inventory (PGI) - Technical Report |
| Appendix I – Wetlands Assessment - Technical Report |

Tables

| | | |
|-----------|--|----|
| Table 1.1 | Number of Collisions for NS Highway 104 from 2007 to 2015 (Sections: 245, 250, 252, 255, 260, 270, 275) | 5 |
| Table 1.2 | Number of Collisions for NS Trunk 4, Sections 20, 23, 30 | 5 |
| Table 1.3 | Animal Collisions on Highway 104 from 2007 to 2015 within Sections 245-275 | 6 |
| Table 1.4 | Provincial and Federal Legislation Relevant to the Project | 9 |
| Table 1.5 | Coordinates of Project Sections (Latitude/Longitude, Decimal Degrees – Datum NAD83)..... | 16 |
| Table 1.6 | Concordance with the Registration Requirements of the Nova Scotia <i>Environment Act</i> and <i>Environmental Assessment Regulations</i> | 17 |
| Table 2.1 | Project Schedule | 50 |
| Table 3.1 | Summary of Questions and Concerns..... | 57 |
| Table 4.1 | Description of Project Phases and Project Activities | 62 |
| Table 4.2 | Potential Valued Environmental Components (VEC) Identification | 64 |
| Table 4.3 | Spatial Boundary Assessment by Valued Environmental Component | 67 |
| Table 4.4 | Ambient Air Quality Regulations in Nova Scotia and Canada applicable to the Project | 68 |
| Table 4.5 | Provincial Noise Guidelines (NSDEL, 1990)..... | 70 |
| Table 4.6 | Municipal Noise Guidelines for the County of Antigonish..... | 70 |
| Table 5.1 | Air Contaminant Emissions in Nova Scotia (2016)..... | 84 |
| Table 5.2 | The Effects of Sound Sources and Intensities on Human Perception and Health | 86 |
| Table 5.3 | Construction Equipment Noise Emissions | 87 |
| Table 5.4 | 2018 Baseline Noise Monitoring Results – Hourly Leq Averages | 90 |
| Table 5.5 | Historic Climate data from Environment Canada Weather Station Nearest the Highway 104 Project Area (1981-2010)..... | 92 |
| Table 5.6 | Provincial and National GHG Emissions..... | 93 |
| Table 5.7 | National GHG Emissions for Select Components within the Energy IPCC Sector | 93 |

| | | |
|------------|--|-----|
| Table 5.8 | Summary of Watercourses within the Highway 104 Twinning Local Assessment Area, By Watershed..... | 100 |
| Table 5.9 | Summary of Surface Water Quality Parameters Measured in Watercourses in 2016 and 2018. (Freshwater Aquatic Life (FWAL) Guideline Exceedances in Bold) | 101 |
| Table 5.10 | Vascular Plant SOCC Reported by ACCDC (2018) from Within 5 km of the Project Area..... | 113 |
| Table 5.11 | Summary of Vegetation Groups and Vegetation Types Identified in the Project Area during the CBCL Vegetation Field Program in 2016 and 2018..... | 117 |
| Table 5.12 | Vascular Plant Species of Conservation Concern Detected During Field Surveys ... | 120 |
| Table 5.13 | Lichen Species of Conservation Concern Detected in the Local Assessment Area . | 127 |
| Table 5.14 | Other Non-Vascular Plant Species of Conservation Concern Detected in the LAA . | 129 |
| Table 5.15 | Birds Species of Conservation Concern reported by ACCDC from on or within 5 km of the Project Area (ACCDC, 2018c) | 132 |
| Table 5.16 | Major Habitat Types and Descriptions | 134 |
| Table 5.17 | Summary of Species Richness and Abundance within the LAA in 2016 and 2018 .. | 134 |
| Table 5.18 | Bird Species of Conservation Concern detected within the Local Assessment Area by CBCL | 135 |
| Table 5.19 | Mammal Species of Conservation Concern recorded within the Local Assessment Area..... | 147 |
| Table 5.20 | Reptile and Amphibian Species Identified in the Project Area..... | 150 |
| Table 5.21 | Invertebrate Species of Conservation Concern reported by ACCDC from within the Project Area or 5 km buffer (ACCDC, 2018c) | 151 |
| Table 5.22 | Delineated Wetland Area within the Project Area and Right-of-Way..... | 153 |
| Table 5.23 | Wetland Functions and Benefits..... | 159 |
| Table 5.24 | WSS Identified in the Project Area in 2016 and 2018 as Supporting SAR | 167 |
| Table 5.25 | Fish Species Known to Occur in the Local Assessment Area | 169 |
| Table 5.26 | Description of Watercourse Types | 172 |
| Table 5.27 | Water Quality Limits for Sustaining Salmonids in the Aquatic Environment | 173 |
| Table 5.28 | Watercourses with Dissolved Oxygen Levels Below the Tolerance Limit for Brook Trout | 174 |
| Table 5.29 | Fish Species Identified During the 2018 Electrofishing Program..... | 180 |
| Table 5.30 | Watercourse Summary by Fish Habitat Potential within the LAA and PA..... | 180 |
| Table 5.31 | SAR Occurring within the Project Area | 189 |
| Table 5.32 | Population Change and Dwellings in Pictou, Subd. C., Antigonish, Subd. A, Town of Antigonish, and the LAA as a whole (StatsCan, 2016 Census, Statistics Canada, 2017b, c, d, e)..... | 203 |
| Table 5.33 | Population Demographics of Pictou, Subd. C., Antigonish, Subd. A, Town of Antigonish, and the LAA as a whole (StatsCan data, 2016 Census, Statistics Canada, 2017b, c, d, e)..... | 205 |
| Table 5.34 | Employment by category in Pictou, Subd. C., Antigonish, Subd. A, Town of Antigonish, and the LAA as a whole (StatsCan data, 2016 Census)..... | 206 |
| Table 5.35 | Commuting destinations and durations of the workforce in Pictou, Subd. C., Antigonish, Subd. A, Town of Antigonish, and the LAA as a whole (StatsCan data, 2016 Census, Statistics Canada, 2017b, c, d, e) | 206 |
| Table 5.36 | Existing Cemeteries within the Regional Assessment Area | 217 |
| Table 5.37 | Mi'kmaw and Archaeological Cultural Periods | 223 |
| Table 8.1 | Valued Environmental Components (VEC) Identification | 241 |
| Table 8.2 | Environmental Effects Analysis..... | 243 |
| Table 8.3 | Interactions between VECs and Project Components | 260 |

| | | |
|------------|---|-----|
| Table 8.4 | Annual air contaminant emissions (2016) within proximity to the Project area compared against federal and provincial regulatory thresholds..... | 262 |
| Table 8.5 | Summary of Potential Effects of Highway 104 Twinning Project on Air Quality | 263 |
| Table 8.6 | Summary of Potential Effects of Highway 104 Twinning Project on Noise Environment | 269 |
| Table 8.7 | Summary of Potential Effects of Highway 104 Twinning Project on GHG Emission Levels | 273 |
| Table 8.8 | Summary of Potential Effects of Highway 104 Twinning Project on Geology and Soil Quality..... | 276 |
| Table 8.9 | Summary of Potential Effects of Highway 104 Twinning Project on Surface Water Quality..... | 282 |
| Table 8.10 | Summary of Potential Effects on Hydrogeology and Groundwater Quality..... | 287 |
| Table 8.11 | Summary of Potential Effects of Highway 104 Twinning Project on Flora | 293 |
| Table 8.12 | Summary of Areas of Main Habitat Types Present within the Project Area | 295 |
| Table 8.13 | Summary of Potential Effects of the Project on Mammals and Mammal Habitat .. | 301 |
| Table 8.14 | Summary of Potential Effects of Highway 104 Twinning Project on Birds and Bird Habitat | 306 |
| Table 8.15 | Summary of Potential Effects of the Project on Reptile and Amphibian Species and Habitats..... | 312 |
| Table 8.16 | Summary of Potential Effects of Highway 104 Twinning Project on Wetlands..... | 320 |
| Table 8.17 | Watercourse Summary by Fish Habitat Potential within the LAA and Project Area | 327 |
| Table 8.18 | Summary of Potential Effects of Highway 104 Twinning Project on Fish and Fish Habitat | 328 |
| Table 8.19 | Summary of Potential Effects of Highway 104 Twinning Project on Flora Species at Risk..... | 336 |
| Table 8.20 | Summary of Potential Effects of Highway 104 Twinning Project on Mainland Moose | 341 |
| Table 8.21 | Summary of Potential Effects on Bats and Bat Habitat | 347 |
| Table 8.22 | Summary of Potential Effects of Highway 104 Twinning Project on Turtle SAR | 356 |
| Table 8.23 | Summary of Potential Effects of Highway 104 Twinning Project on Land Use | 364 |
| Table 8.24 | Summary of Potential Effects of Highway 104 Twinning Project on Human Health and Safety | 374 |
| Table 8.25 | Summary of Potential Effects of Highway 104 Twinning Project on Heritage and Archaeological Resources | 380 |
| Table 9.1 | Summary of Potential Effects, Mitigation, and Follow-up Measures for the Highway 104 Twinning Project | 423 |

Figures

| | | |
|------------|--|----|
| Figure 1.1 | Project Area: Highway 104 between Sutherlands River (Pictou County) and Addington Forks (Antigonish County)..... | 2 |
| Figure 2.1 | Highway 104 Project Right of Way | 21 |
| Figure 2.2 | Standard Cross Section Open Freeway Median..... | 24 |
| Figure 2.3 | Standard Cross Section - Service Road | 26 |
| Figure 5.1 | Air Quality and Climate Data Stations in Nova Scotia..... | 85 |
| Figure 5.2 | Noise Monitoring Station Locations Within the Project Area | 89 |
| Figure 5.3 | Bedrock Geology Within the Regional Assessment Area | 95 |
| Figure 5.4 | Surficial Geology Within the Regional Assessment Area | 96 |
| Figure 5.5 | Evaporite Deposits Within the Regional Assessment Area | 97 |

| | | |
|-------------|---|-----|
| Figure 5.6 | Primary and Secondary Watersheds and Named Watercourses Overlapping the Local Assessment Area..... | 99 |
| Figure 5.7 | Ecoregions and Ecodistricts Encompassing the Local Assessment Area | 110 |
| Figure 5.8 | Project Ecological Land Classification (P-ELC)..... | 114 |
| Figure 5.9 | Approximate Locations of Vascular and Non-Vascular Flora Species of Conservation Concern Occurring within the Local Assessment Area | 122 |
| Figure 5.10 | Fauna Species of Conservation Concern Occurring Within the Local Assessment Area | 139 |
| Figure 5.11 | NSDNR Significant Wildlife Habitats Within the Regional Assessment Area..... | 146 |
| Figure 5.12 | Locations of Delineated Wetlands within the Local Assessment Area..... | 163 |
| Figure 5.13 | Locations of Surveyed Watercourses within the Local Assessment Area | 175 |
| Figure 5.14 | Fish Bearing Watercourses Identified within the Local Assessment Area..... | 181 |
| Figure 5.15 | Approximate Locations of SAR Occurring within the Local Assessment Area..... | 187 |
| Figure 5.16 | Census Subdivisions within the Regional Assessment Area | 204 |
| Figure 5.17 | Industrial Land Use within the Regional Assessment Area..... | 209 |
| Figure 5.18 | Agriculture and Forestry within the Regional Assessment Area | 213 |
| Figure 5.19 | Urban and Recreational Land Use within the Regional Assessment Area..... | 215 |
| Figure 5.20 | Archaeological Findings within the Local Assessment Area | 226 |

CHAPTER 1 Introduction

Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) proposes the twinning of Highway 104 between Sutherlands River (Pictou County) and Addington Forks (Antigonish County), herein referred to as the ‘Project’ (Figure 1.1). This Project will link the existing twinned Highway 104 east of Sutherlands River to the existing twinned Highway 104 west of Antigonish. This Project meets the threshold of an ‘undertaking’ as defined by the Nova Scotia *Environment Act* and the *Environmental Assessment Regulations*. This document has been prepared following the requirements for the registration of a Class I Undertaking under the *Environmental Assessment Regulations* and applicable guidance documents such as Nova Scotia Environment (NSE)’s *A Proponent’s Guide to Environmental Assessment* (NSE, 2017).

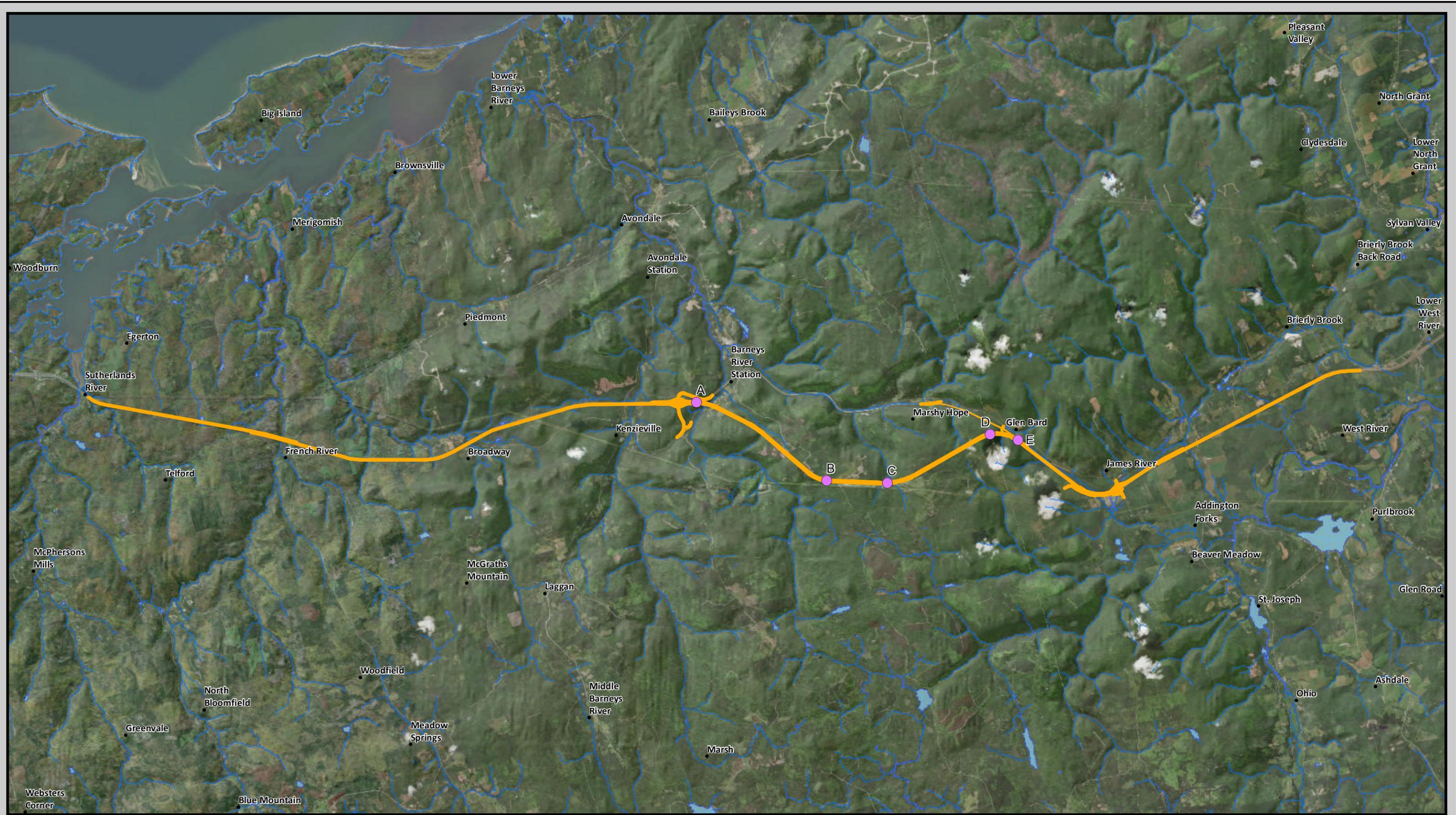
A summary of the Project, including project background, purpose and need, identification of the Proponent, regulatory context and land ownership, is further highlighted within this Chapter. The regulatory context for the proposed Project includes key provincial and federal legislation relevant to the Environmental Assessment and future authorizations, and associated permits and approvals for the Project, as outlined in Section 1.5. A table of concordance which outlines requirements under the *Environmental Assessment Regulations*, and the corresponding sections under which they are discussed within the document, are presented in Section 1.7.

1.1 Project Background

Highway 104 extends from the New Brunswick Border at Fort Lawrence to St. Peter’s, Nova Scotia. Highway 104 is part of the Trans-Canada Highway, with the exception of the portion between Port Hawkesbury and St. Peter’s. Highway 104 is part of the National Highway System (NHS) Core Routes and the Nova Scotia Primary Arterial Highway System.

This Project is the next phase in the linking of the existing twinned Highway 104 east of Sutherlands River to the twinned Highway 104 west of Antigonish. The Project consists of the financing, design, construction, operation, and maintenance of an approximately 38 km highway that consists of three segments:

- Sutherlands River to Barneys River Station;

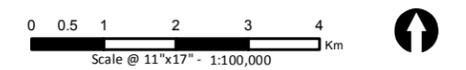


- The 'Project'
- New Four-Lane Alignment – Major Transition Points (Approx.)
- NSGC - 1: 10 000 Waterbodies
- NSGC - 1: 10 000 Rivers/ Streams



Environmental Assessment
HIGHWAY 104 - Sutherlands River to Antigonish

FIGURE 1.1
General Setting
 Sheet 1 of 1



- Barneys River Station to James River (new four-lane alignment south of the existing highway); and
- James River to Antigonish.

Two segments, Sutherlands River to Barneys River Station and James River to Antigonish, will include twinning of the existing alignment (approximately 28 km total). The Barneys River Station to James River segment will include the construction of a new four-lane highway (approximately 10 km) south of the existing highway. The new four-lane alignment is proposed to diverge from the existing Highway 104 alignment just east of the Barneys River, near Barneys River Station, and reconnect west of Exit 30.

The overall Project will include the following main components:

- Approximately 28 km of new twinned lanes;
- Approximately 10 km of new four-lane highway;
- Approximately 25 structure additions, replacements, or modifications dependent on the final configuration of overpasses and underpasses. Including the following key structures:
 - Modifications to the James River interchange (Exit 30);
 - Construction of a new interchange at Barneys River Station;
 - Construction, replacement or modification of nine watercourse crossings over seven watercourses:
 - French River,
 - East French River,
 - Middle Brook,
 - Barneys River,
 - Middle Brook,
 - Hartshorn Brook, and
 - James River.
- Over 60 minor watercourse crossings (pipe culverts or box culvert less than 3 metres in span); and
- Wildlife passage.

Further details of all project components are outlined in Chapter 2.

1.2 Purpose and Need for the Undertaking

The proposed Project will connect the twinned Highway 104 east of Sutherland’s River to the twinned Highway 104 west of Antigonish, forming an approximately 200 km long continuous twinned highway from New Brunswick to east of Antigonish. The current Highway 104 is part of the designated Trans-Canada Highway. The project will provide continuity of the enhancement and rehabilitation of the 100 series highway network throughout this region.

As part of the detailed feasibility assessment of the Project, the traffic growth calculations were defined using a weighted approach, where the Regional Population and Gross Domestic Product forecasts were translated into vehicle kilometres travelled (VKT) forecasts using an elasticity relationship (CBCL, 2017). The Compound Annual Growth rates (CAGRs) were calculated for the lowest volume section and highest volume section, which were reported as -0.11% and 0.35% respectively. These values were used to calculate the Project specific VKT for auto and truck traffic. The Corridor Growth Auto VKT was reported at 0.05% and Corridor Growth Truck VKT was reported at 1.13% (CBCL, 2017). The Corridor VKT forecasts found that there was a 5% increase through to 2050 (CBCL, 2017). Traffic growth is often linked with population and employment growth, the declining provincial population would suggest that traffic growth could also decline, despite the positive GDP growth trend (CBCL, 2017). Therefore, the Project itself was not interpreted to create an increase in traffic, due to the forecasted increase of 5% over a 30 year period.

NSTIR collects collision data for the Highway 104 and Trunk 4 (Appendix A). The number of documented collisions per year between 2007 and 2015 for Highway 104 and NS Trunk 4 are included in Table 1.1 and Table 1.2, respectively. A total of 444 collisions were recorded for the Highway 104 sections assessed during the 9 year period (Table 1.1). These included 299 property damage only (PDO) collisions, 11 fatal collisions, 133 injury collisions, and 1 other. Twenty-three collisions were recorded for the Trunk 4 sections assessed during the 9 year period, including 18 PDO collisions and 5 injury collisions (Table 1.2). The annual average of collisions between 2007 and 2015 is 49.3 collisions per year for Highway 104 and 2.6 collisions per year for Trunk 4.

Collision rates are used to assess the relative safety of a section of highway, which are expressed as the number of collisions per hundred million vehicle kilometres (HMKV). The collision rate for 100 series highways in Nova Scotia with controlled access was 52.4 collisions per HMKV (five year average from 2010 to 2014; NSTIR, 2016). Collision rates for Highway 104 were calculated using the Annual Average Daily Traffic (AADT) and the HMKV which was based on the length of the portion of road assessed. Highway 104 from Exit 27 A (Trunk 4) (Sutherlands River) to Exit 31 (James Street) (Sections: 245, 250, 252, 255, 260, 270, 275) has an AADT of approximately 8,000 vehicles per day (CBCL, 2017). The collision rates ranged from 20.4 to 50.9 annually, with the average of the period calculated to be 38.6; all collision rates are expressed as number of collisions per HMKV. (Table 1.1). These rate are less than the 5 year average of 100 series highways collision rates from 2010 to 2014, and likely contribute to the increase of the average during that period.

During the period of 2007 to 2015, a total of 444 collisions were documented on Highway 104 from Exit 27 A (Trunk 4) (Sutherlands River) to Exit 31 (James Street) (Sections: 245, 250, 252, 255, 260, 270, 275) which included 625 vehicles. Of the 444 collisions recorded, 97 collisions were noted as having an animal in the roadway. Of the 625 vehicles, 81 vehicles hit a deer and 9 vehicles hit another animal (Table 1.3; Appendix A). The species of deer or animals were not included in the summary of information; however, NSDNR has provide additional information on animal strikes, this information is highlighted in Chapter 7.

Table 1.1 Number of Collisions for NS Highway 104 from 2007 to 2015 (Sections: 245, 250, 252, 255, 260, 270, 275)

| Year | ADT ¹ | HMKV ² | Number for Collisions | | | | | Collisions Rates ^{3 4} | | | | |
|--------------|------------------|-------------------|-----------------------|------------|-----------|----------|------------|---------------------------------|-------------|------------|------------|-------------|
| | | | Types of Collisions | | | | Total | Types of Collisions | | | | Total |
| | | | PDO ⁵ | Injury | Fatal | Other | | PDO | Injury | Fatal | Other | |
| 2007 | 8,000 | 0.078 | 39 | 26 | 0 | 0 | 65 | 30.5 | 20.4 | 0.0 | 0.0 | 50.9 |
| 2008 | 8,000 | 0.078 | 22 | 16 | 1 | 0 | 39 | 17.2 | 12.5 | 0.8 | 0.0 | 30.5 |
| 2009 | 8,000 | 0.078 | 39 | 20 | 0 | 0 | 59 | 30.5 | 15.7 | 0.0 | 0.0 | 46.2 |
| 2010 | 8,000 | 0.078 | 34 | 21 | 2 | 0 | 57 | 26.6 | 16.4 | 1.6 | 0.0 | 44.6 |
| 2011 | 8,000 | 0.078 | 49 | 11 | 1 | 0 | 61 | 38.4 | 8.6 | 0.8 | 0.0 | 47.8 |
| 2012 | 8,000 | 0.078 | 40 | 10 | 1 | 0 | 51 | 31.3 | 7.8 | 0.8 | 0.0 | 39.9 |
| 2013 | 8,000 | 0.078 | 23 | 11 | 3 | 0 | 37 | 18.0 | 8.6 | 2.3 | 0.0 | 29.0 |
| 2014 | 8,000 | 0.078 | 36 | 9 | 3 | 1 | 49 | 28.2 | 7.0 | 2.3 | 0.8 | 38.4 |
| 2015 | 8,000 | 0.078 | 17 | 9 | 0 | 0 | 26 | 13.3 | 7.0 | 0.0 | 0.0 | 20.4 |
| Total | 8,000 | 0.078 | 299 | 133 | 11 | 1 | 444 | 26.0 | 11.6 | 1.0 | 0.1 | 38.6 |

1 - Annual Daily Traffic Provided

2 - Hundred Million Vehicle Kilometers (HMKV)

3 - Collision rates are 'number of collisions per HMKV'

4 - Collision Rates are based on a total kilometer length of 43.74.

Highway 104: Section 245: Length: 1.62 km, Exit 27 A (Trunk 4) (Sutherlands River) to Exit 27 (Route 245 Intersection)

Highway 104 Section 250: Length: 10.67 km, Exit 27 (Route 245 Intersection) to Broadway Overpass Structure

Highway 104 Section 252: Length: 8.12 km, Broadway Overpass Structure to Exit 29 (Trunk 4) Barneys River Station

Highway 104 Section 255: Length: 7.71 km, Exit 29 (Trunk 4) Barneys River Station to Pictou-Antigonish County Line

Highway 104 Section 260: Length: 4.27 km, Pictou-Antigonish County Line to Exit 30 (James River Interchange)

Highway 104 Section 270: Length: 9.13 km, Exit 30 (James River Interchange) to Exit 31 A (West River Road)

Highway 104 Section 275: Length: 2.22 km, Exit 31 A (West River Road) to Exit 31 (James Street) Antigonish

5 - PDO - property damage only

Table 1.2 Number of Collisions for NS Trunk 4, Sections 20, 23, 30

| Year | Types of Collisions | | | | Total |
|--------------|---------------------|----------|----------|----------|-----------|
| | PDO | Injury | Fatal | Other | |
| 2007 | 2 | 1 | 0 | 0 | 3 |
| 2008 | 2 | 0 | 0 | 0 | 2 |
| 2009 | 3 | 0 | 0 | 0 | 3 |
| 2010 | 4 | 0 | 0 | 0 | 4 |
| 2011 | 1 | 0 | 0 | 0 | 1 |
| 2012 | 6 | 2 | 0 | 0 | 8 |
| 2013 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 0 | 2 | 0 | 0 | 2 |
| 2015 | 0 | 0 | 0 | 0 | 0 |
| Total | 18 | 5 | 0 | 0 | 23 |

PDO - property damage only

Trunk 4 Section 20: Length: 13 km, Highway 104 Exit 27 to Germaine Road (Broadway)

Trunk 4 Section 23: Length: 9.48 km, Germaine Road (Broadway) to Highway 104 (Exit 29)

Trunk 4 Section 30: Length: 9.67 km, Highway 104 Connector (James River) to Highway 104 (Exit 31 A)

Table 1.3 Animal Collisions on Highway 104 from 2007 to 2015 within Sections 245-275

| Highway 104 Section | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total |
|---------------------|------|------|------|------|------|------|------|------|------|-------|
| 245 | 2 | 1 | 4 | | 3 | 1 | 3 | 3 | 1 | 18 |
| 250 | 4 | 3 | 7 | 2 | 6 | 1 | 1 | 3 | 2 | 29 |
| 252 | - | - | - | 2 | 2 | - | 1 | 1 | - | 6 |
| 255 | 1 | 2 | 1 | 1 | - | 5 | - | 1 | - | 11 |
| 260 | 3 | 3 | - | 2 | 3 | 2 | 1 | 1 | 1 | 16 |
| 270 | 3 | 1 | 2 | - | 4 | 1 | - | 3 | 1 | 15 |
| 275 | - | | - | - | - | - | - | 1 | 1 | 2 |
| Total | 13 | 10 | 14 | 7 | 18 | 10 | 6 | 13 | 6 | 97 |

The sections of Highway 104 considered in the analysis have been identified by the public as needing improvement, due to concerns over collisions and fatalities. As a result, NSTIR determined the need to assess this section of highway for rehabilitation, enhancement, or replacement potential. In 2014, NSTIR initiated the completion of an operations and safety review of Highway 104. Opus International Consultants (Canada) Limited (OPUS) identified and prioritized a series of mitigation measures which were to have a positive impact on safety, which included low cost measures with minimal engineering which are easy to implement (i.e., sign replacements), followed by more comprehensive measures which may require more developed design and planning, at higher cost (Section 6.1). The proposed improvements were identified as interim improvements until the Highway 104 could be twinned, which was found to ultimately address many of the existing safety concerns for operations and safety (OPUS, 2015).

In addition to linking the existing infrastructure, the proposed Project is expected to improve both the level of safety performance and service within this corridor. Divided medians and twinning highways for passing will provide safety improvements. Both are anticipated to result in fewer vehicular collisions. The Highway Twinning Feasibility Study determined that twinning should reduce the number of overall collisions by approximately 30-35%, based on elimination of intersection-related, angle, and head-on collisions. Some reduction in single vehicle, rear-end, and sideswipe collisions is also predicted (CBCL, 2016; CBCL, 2017).

For the same period, 30 vehicles were involved in 23 collisions along sections 20, 23, and 30 of Trunk 4. Five of the 23 collisions were noted as having an animal in the roadway. Of those events, 4 vehicles hit a deer and 1 vehicle hit another animal (Appendix A). Further information of animal strike locations is highlighted in Chapter 7.

1.3 Identification of the Proponent

The name, address, identification of the Proponent, and additional contact persons for the Environmental Assessment of the proposed undertaking are as follows:

| | |
|--|--|
| Name of Project | Highway 104 Twinning, Sutherlands River to Antigonish |
| Name of the Proponent | Nova Scotia Transportation and Infrastructure Renewal (NSTIR) |
| Address of the Proponent | P.O. Box 186 Johnston Building, 1672 Granville Street Halifax, NS, B3J 2N2 |
| Proponent Environment Assessment Contact | Ms. Sylvie Colomb Environmental Analyst NSTIR P.O. Box 186 Johnston Building, 1672 Granville Street Halifax, NS, B3J 2N2 (902) 424-8143 Sylvie.Colomb@novascotia.ca |
| Proponent Executive Contact | Ms. Bonnie Miles-Dunn Director, Highway Engineering and Capital Programs NSTIR P.O. Box 186 Johnston Building, 1672 Granville Street Halifax, NS, B3J 2N2 (902) 424-0565 Bonnie.Miles-Dunn@novascotia.ca |
| Consultant Contact for the Environmental Assessment | Mr. Ian Bryson, M.Sc., EP Principal, Senior Environmental Scientist EA Technical Lead CBCL Limited PO Box 606 1489 Hollis Street Halifax, NS, B3J 2R7 (902) 492-7979 ext. 2513 ianb@cbcl.ca |

Signatures authorizing the submission of the Class 1 Environmental Assessment Registration Document by the Proponent and other Environmental Assessment Contact authorized to do so on behalf of the Proponent are as follows:



Nov 28, 2018

Ms. Bonnie Miles-Dunn
Director, Highway Engineering and Capital Programs -
NSTIR

Date



NOV 28, 2018

Mr. Ian Bryson M.Sc., EP
Principal, Senior Environmental Scientist – CBCL Limited

Date

1.4 Funding

Development of the Project is proposed to occur using the Design-Build-Finance-Operate-Maintain (DBFOM) Model. Funding for the Project will be jointly supplied by the provincial and federal government, along with the Private Partner. The construction of the Project is expected to be completed within 3 to 7 years. Construction may commence in 2019, pending Environmental Assessment Approval and receipt of all required authorizations and permits. The Operation and Maintenance phase of the Project is anticipated to occur indefinitely.

1.5 Regulatory Context

Pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*, the construction of a new paved highway longer than 2 km that is designed for four or more lanes of traffic is subject to a Class 1 Provincial Environmental Assessment. This is the primary undertaking applicable to the Project, since current alignment design includes a 10 km section of new four-lane highway. If wetland alterations within the Project footprint and alignment include disruption of 2.0 ha or more of a wetland, the Project may also qualify as a Class 1 undertaking due to the disruption of greater than 2.0 ha of a wetland.

Provincial, federal, and municipal legislation relevant to the Project have been identified (Table 1.4) The context or requirements of how the legislation may influence the Environmental Assessment or future requirements for authorization, approvals, and permits have been outlined in this Section. Other acts, regulations, guidelines, and codes used for the determining the significance of effects associated with the Project are further defined in Chapter 4 and 8.

Table 1.4 Provincial and Federal Legislation Relevant to the Project

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|---|-------------------------------|--|---|
| Provincial | | | |
| Nova Scotia <i>Environment Act</i> | Nova Scotia Environment (NSE) | The <i>Environment Act</i> was developed to support and promote the protection of the environment by establishing goals, such as maintaining environmental protection, implementing sustainable development, remediating adversely affected areas, and developing policies, standards, objectives, and guidelines to facilitate environmental protection. | |
| Nova Scotia <i>Environment Act - Environmental Assessment Regulations</i> | NSE | Environmental Assessment Approval is required for all undertakings as designated in Schedule A of the <i>Environmental Assessment Regulations</i> . The Project is anticipated to result in greater than 2 km of four-lane highway and potential disruption of a total of 2 ha or more of any single wetland; therefore, an Environmental Assessment Approval is required. | Environmental Assessment Approval |
| Nova Scotia <i>Environment Act - Activities Designation Regulations</i> | NSE | Pursuant to the <i>Activities Designation Regulations</i> under Section 66 of the <i>Environment Act</i> , any Project activities resulting in alteration to a watercourse, water resource, wetland or the flow of water in any three of the aforementioned will require an Approval by the Minister of Environment. Any project activities occurring in wetlands greater than 0.01 (100 m ²) hectares will require an approval under the Nova Scotia <i>Environment Act</i> and <i>Activities Designation Regulations</i> . The Nova Scotia Wetland Conservation Policy was developed in 2011 to help conserve wetlands. | Watercourse Alteration Notification / Approval Wetland Alteration Approval |
| Nova Scotia <i>Environment Act</i> | NSE | Standards for maximum permissible ground level concentrations of air | |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|--|--|---|-------------------------------------|
| - <i>Air Quality Regulations</i> | | contaminants are governed under <i>the Air Quality Regulations</i> . Compliance with the Act and the <i>Air Quality Regulations</i> is required. | |
| <i>Environmental Goals and Sustainable Prosperity Act</i> | NSE | The <i>Environmental Goals and Sustainable Prosperity Act</i> was developed in 2007 and outlines 21 goals associated with ecosystem protection, air emissions, water quality, contaminated sites, solid waste reduction, and sustainable purchasing. Compliance with the Act is required. | |
| <i>Nova Scotia Endangered Species Act (NSES)</i> | Nova Scotia Department of Lands and Forestry (NSDNR) – Wildlife Division | Species that are provincially listed as ‘Extirpated’, ‘Endangered’, ‘Threatened’ or of ‘Special Concern’, and habitat which supports these species, are formally protected under the <i>Nova Scotia Endangered Species Act (NSES)</i> . Under Section 13(1) of the NSES, the following acts are prohibited: <ul style="list-style-type: none"> • Killing, injuring, or disturbing species at risk; • Destroying, disturbing or interfering with its residence (e.g. nest, den, hibernaculum); and • Destroying, disturbing or interfering with its core habitat. | |
| <i>Wildlife Act</i> | NSDNR | The <i>Wildlife Act</i> provides protection measures for wildlife including birds, turtles, and fur-bearing mammals. Except with permission of the Department or unless stated in the Act, its regulations or the <i>Fur Industry Act</i> , no person shall hunt, take, kill; pursue to hunt, take or kill; or possess any fur-bearing animal (Section 44 (2)) nor damage, disturb, or destroy its residence (den/dam) (Section 48(3)). Under Section 50(1), no person shall take, hunt, kill or attempt to take, hunt or kill | |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|--|-------------------------|--|---|
| | | any of the following wildlife: eagle, osprey, falcon, hawk, owl, or any declared by regulation to be protected pursuant to the Act. Section 51 states that, with the exception of a permit issued by the Minister, no person shall “destroy, take, possess, buy or sell any egg of a bird or turtle or disturb the nest of a bird or turtle”. | |
| <i>Crown Lands Act</i> | NSDNR | <p>The <i>Crown Lands Act</i> prohibits the following activities as listed under Section 40(1) of the Act unless authorized by the Minister:</p> <ul style="list-style-type: none"> • Cutting, damaging or removing timber or other resources on crown lands; and • Damaging or removing property on crown lands. <p>Activities on crown lands requiring a permit include, but are not limited to, the construction of access roads and right of ways, and cutting or removal of timber.</p> | Crown Lands Approval / Authorization |
| <i>Public Highways Act</i> | NSTIR | The <i>Public Highways Act</i> is administered by NSTIR and governs activities including the use, construction, and maintenance of highways in the province. Any Project activities on or within a highway right-of-way, such as installing a structure within 100 m of a highway, will require a Work Within Highway Right-of-Way Permit. | Work Within Highway Right-of-Way Permit |
| <i>Provincial Parks Act – Beaver Mountain Provincial Park Designation</i> | NSDNR | The <i>Provincial Parks Act</i> is administered by NSDNR and governs activities including the management and designation of provincial parks. Section 13A prohibits the removal of forest products from a provincial park for any purpose other than the development or management of the park. Road development within the boundaries of a | |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|--|--|--|---|
| | | provincial park are not permitted without consent of the Minister (Section 21). Beaver Mountain Provincial Park is designated as a protected area under Section 8 of the Act and is located within the study areas. | |
| <i>Special Places Protection Act</i> | Nova Scotia Department of Communities, Culture and Heritage (NSCCH) | <p>All palaeontology and archaeology sites are protected under the <i>Special Places Protection Act</i>. The Act enables the government to designate heritage sites as protected sites under the Act and enables that quality research is carried out through the Heritage Research Permit system.</p> <p>This Act applies to anyone exploring or excavating land, including land covered by water, for the purpose of seeking archaeological, historical or paleontological sites and remains. Under the Act, no person shall:</p> <ul style="list-style-type: none"> • knowingly destroy, desecrate, deface, or alter archaeological resources; or • excavate or alter an archaeological site or remove any objects from an archaeological site without approval of a Heritage Research Permit | Heritage Research Permit (Reconnaissance, Research and Resource Impact Assessment) |
| <i>Occupational Health and Safety Act - Blasting Safety Regulations - General Blasting Regulations</i> | Department of Labour and Advanced Education | Regulations pursuant to Section 82 of the Nova Scotia <i>Occupational Health and Safety Act</i> outline guidelines and regulations for blasting safety. Proponent personnel performing blasting during construction must do so in accordance with these regulations and be in compliance with the Act. | |
| <i>Municipal Government Act</i> | Nova Scotia Department of Municipal Affairs (NSDMA) | The <i>Municipal Government Act</i> provides authority to municipal governments to develop municipal planning strategies and land-use by-laws. | |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|---|---|--|--|
| Federal | | | |
| <i>Canadian Environmental Assessment Act, 2012 (CEAA) - Regulations Designating Physical Activities</i> | Canadian Environmental Assessment Agency (the Agency) | CEAA 2012 and its regulations establish the legislative basis for the federal environmental assessment process. Projects that may require an environmental assessment are set out in the <i>Regulations Designating Physical Activities</i> . CEAA 2012 distinguishes between ‘designated projects’ and ‘projects’. Only ‘designated projects’ require an environmental assessment. The components of the project do not include <i>Physical Activities</i> as set out in the <i>Regulations Designating Physical Activities</i> . | Not required, as the project is not a ‘ <i>Designated Project</i> ’ per CEAA 2012. |
| <i>Canadian Environmental Protection Act, 1999 (CEPA)</i> | Environment and Climate Change Canada (ECCC) | CEPA is the primary federal legislative framework for protecting the Canadian environment and human health. The key aspects of CEPA include prevention and management of risks posed by toxic and other harmful substances. CEPA includes provisions pertaining to environmental and human health impacts associated with biotechnology, marine pollution, disposal at sea, vehicles, engines and equipment emissions, fuels, hazardous wastes, environmental emergencies, and other sources of pollution. | |
| <i>Fisheries Act, 1985</i> | Fisheries and Oceans Canada (DFO) | The <i>Fisheries Act</i> requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery. Activities occurring in fish habitat are anticipated to require an Authorization under the <i>Fisheries Act</i> . | Request for Review / Authorization and associated Offsetting/Compensation Plan. |
| <i>Species at Risk Act, 2002 (SARA)</i> | ECCC /DFO | SARA provides protection to species at the national level to prevent extinction and promote recovery of ‘Endangered’, | SARA permit |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|--|-------------------------|---|---|
| | | <p>'Threatened' or 'Extirpated' species, and facilitates the management of species listed as 'Special Concern'. Species listed under Schedule 1 of the SARA are federally protected within Canada through general prohibitions. The general prohibitions in SARA state that no person shall:</p> <ul style="list-style-type: none"> • Kill, harm, harass, capture or take an individual of a wildlife species listed under Schedule 1 as 'Extirpated', 'Endangered' or 'Threatened' [Section 32]; • Possess, collect, buy, sell or trade species listed under Schedule 1 as 'Extirpated', 'Endangered' or 'Threatened' [Section 32]; and • Damage or destroy the residence (e.g., nest, den) of one or more individuals of a wildlife species listed under Schedule 1 as 'Endangered', 'Threatened' or 'Extirpated', if a recovery strategy has recommended the reintroduction of that extirpated species [Section 33]. <p>If project activities interfere with a species at risk and its habitat, SARA approvals may be required.</p> | |
| <i>Migratory Birds Convention Act, 1994 (MBCA)</i> | ECCC | The MBCA and its regulations protect migratory birds and prohibits the disturbance or destruction of migratory bird nests and eggs in Canada, regardless of land ownership. The MBCA also prohibits the dumping of substances harmful to birds in areas and water frequented by them. Compliance with the Act is required. | |
| <i>Navigation Protection Act, 2012 (NPA)</i> | Transport Canada (TC) | The NPA regulates works that potentially interfere with navigation on navigable waters, as defined within the Act. The Act | NPA Opt-out form NPA Notice of Works |

| Acts / Regulations / Guidelines / Codes Authorizations /Permits | Regulatory Authority | Context / Requirements | Possible Approval / Permit Required |
|--|----------------------|---|-------------------------------------|
| | | <p>also prohibits the deposition of materials that risk impacting navigation or the dewatering of navigable waters.</p> <p>Historical works which were legally constructed under previous legislation, were transitioned into the NPA as “legacy works”. Legacy works on navigable waters, not identified in the NPA, may opt out prior to April 1, 2019.</p> | NPA Approval |
| <i>Transportation of Dangerous Goods Act, 1992. (TDGA)</i> | TC | The Transportation of Dangerous Goods Program, pursuant to TDGA, promotes public safety during the transportation of dangerous goods. | |

1.6 Property Ownership

Land Ownership within the proposed right-of-way (ROW) includes the Province of Nova Scotia (crown lands), and private ownership (including resource land properties). NSTIR is in the process of obtaining additional ROW to allow for the execution of the Project. Engagement with property owners and property acquisition efforts is ongoing and will be contingent on the final selected alignment. Any future acquisition requirements will be determined in the DBFOM phase.

Land Acquisition will follow the all relevant provincial legislation, as well as NSTIR’s land acquisition and compensation policy. NSTIR is in the process of negotiations with land owners. Settlements will be based on local market value using real estate appraisal practices, for properties that are either directly impacted or indirectly affected as appropriate.

Given that property acquisition is in progress at the time of this submission, and that PIDs will inevitably be dynamic during this process, NSE has advised that coordinates of key Project components may be provided in lieu of PIDs. The coordinates of the various project sections are provided in Table 1.5. This table indicates:

- Coordinates of the extents of the two twinning sections (i.e., in parallel to existing highway), denoted as the ‘western’ and ‘eastern’ twinning sections;
- Coordinates for the maximum rectangular extent of the new alignment, including a central point; and

- Coordinates for major directional transition areas along the approximate centreline of the new alignment.

Table 1.5 Coordinates of Project Sections (Latitude/Longitude, Decimal Degrees – Datum NAD83)

| Description | Latitude (NAD83) | Longitude (NAD83) |
|---|------------------|-------------------|
| Western Twinning Alignment (Parallel to Existing Highway) | | |
| Western extent of western twinning | 45.587100 | -62.496933 |
| Eastern extent of western twinning | 45.587658 | -62.280155 |
| New Four-Lane Alignment (Rectangular Extent of Entire Alignment) | | |
| NW Corner | 45.587658 | -62.280155 |
| SW Corner | 45.565566 | -62.278744 |
| NE Corner | 45.591173 | -62.166218 |
| SE Corner | 45.569079 | -62.164858 |
| Central Point | 45.578327 | -62.221666 |
| New Four-Lane Alignment (Approximate Centerline Routing – Major Transition Points) | | |
| A - Alignment departs from current Highway 104 | 45.587658 | -62.280155 |
| B - Point near Weavers Mtn. Rd and powerlines | 45.568330 | -62.233598 |
| C - Point near Baxters Brook | 45.567910 | -62.211994 |
| D - Point near Pushie Rd | 45.580242 | -62.175518 |
| E - Alignment rejoins current Highway 104 | 45.578893 | -62.165467 |
| Eastern Twinning Alignment (Parallel to Existing Highway) | | |
| Western Extent | 45.579335 | -62.166371 |
| Eastern Extent | 45.596846 | -62.043725 |

1.7 Environmental Assessment Concordance

This document is prepared in accordance with the *Environment Act, Environmental Assessment Regulations* and associated guidance documents. A summary of concordance of this document with the required components under the *Environmental Assessment Regulations* in order to register a Class 1 undertaking in Nova Scotia is included in Table 1.6.

Table 1.6 Concordance with the Registration Requirements of the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*

| Description | Section in Registration Class 1 EA |
|---|--|
| (i) the name of the proposed undertaking | Chapter 1 – Introduction, Section 1.3 – Identification of the Proponent |
| (ii) the location of the proposed undertaking | Chapter 1 – Introduction, and Chapter 2 – Project Description. |
| (iii) the name, address and identification of the proponent | Section 1.3 – Identification of the Proponent |
| (iv) the name and signature of the Chief Executive Officer or a person with signing authority, if the proponent is a corporation | Section 1.3 – Identification of the Proponent |
| (v) a list of contact persons for the proposed undertaking and their contact information | Section 1.3 – Identification of the Proponent |
| (vi) details of the nature and sensitivity of the area surrounding the proposed undertaking | Chapter 5 – Existing Environment and Appendices Appendix A – NSTIR Collision Data Appendix D – Noise Technical Report Appendix E – Aquatic Technical Report Appendix F – Vegetation Technical Report Appendix G – Breeding Bird Technical Report Appendix H – Ungulates Technical Report Appendix I – Wetlands Technical Report |
| (vii) the purpose and need for the proposed undertaking | Section 1.2 – Purpose and Need for the Undertaking |
| (viii) the proposed construction and operation schedules for the undertaking | Section 2.6 – Project Schedule |
| (ix) a description of the proposed undertaking | Chapter 2.0 – Project Description |
| (x) environmental baseline information including details of the nature and sensitivity of the area surrounding the proposed undertaking | Chapter 5 and Appendices Appendix A – NSTIR Collision Data Appendix D – Noise Technical Report Appendix E – Aquatic Technical Report Appendix F – Vegetation Technical Report |

| Description | Section in Registration Class 1 EA |
|---|--|
| | Appendix G – Breeding Bird Technical Report Appendix H – Ungulates Technical Report Appendix I – Wetlands Technical Report |
| (xi) a list of the licences, certificates, permits, approvals and other forms of authorizations that will be required for the proposed undertaking | Section 1.5 – Regulatory Context |
| (xii) all sources of public funding for the proposed undertaking | Section 1.4 – Funding |
| (xiii) all steps taken by the proponent to identify the concerns of the public and Aboriginal people regarding adverse effects or the environmental effects of the proposed undertaking | Chapter 3 – Consultation and Aboriginal Engagement |
| (xiv) a list of all concerns expressed by the public and Aboriginal people about the adverse effects or the environmental effects of the proposed undertaking | Chapter 3 – Consultation and Aboriginal Engagement |
| (xv) all steps taken or proposed to be taken by the proponent to address concerns of the public and Aboriginal people identified under sub clause (xiv) | Chapter 8 – Environmental Effects Assessment / Environmental Impact Assessment |

CHAPTER 2 Project Description

2.1 Overview of the Project

Highway 104 extends from the New Brunswick Border at Fort Lawrence to the Canso Causeway, and is part of the Trans-Canada Highway. The proposed section from Sutherlands River to west of Antigonish would complete twinning from the New Brunswick border to east of Antigonish, a distance of approximately 200 kilometres.

The Project will be procured via a DBFOM contract which will engage a proponent to carry out all of these activities. NSTIR has thus only conducted preliminary design to this point, in order to have a general understanding of all of the Project Components. This preliminary design has led to an understanding of the general footprint of the Project, and in turn the land requirements in order to acquire the Right of Way (ROW) for the Project; otherwise known as the 'Project Area'.

The identified Project Components will be occurring within the Project Area (Figure 2.1).

The overall Project will include the following main components:

- Approximately 28 km of new twinned lanes;
- Approximately 10 km of new four-lane highway;
- Approximately 25 structure additions, replacements, or modifications, dependent on the final configuration of overpasses and underpasses. This will include the following key structures:
 - Modifications to the James River interchange (Exit 30);
 - Construction of a new interchange at Barneys River Station;
 - Construction, replacement, or modification of nine watercourse crossings over seven watercourses, namely:
 - French River,
 - East French River,
 - Middle Brook,
 - Barneys River,
 - Middle Brook,
 - Hartshorn Brook, and

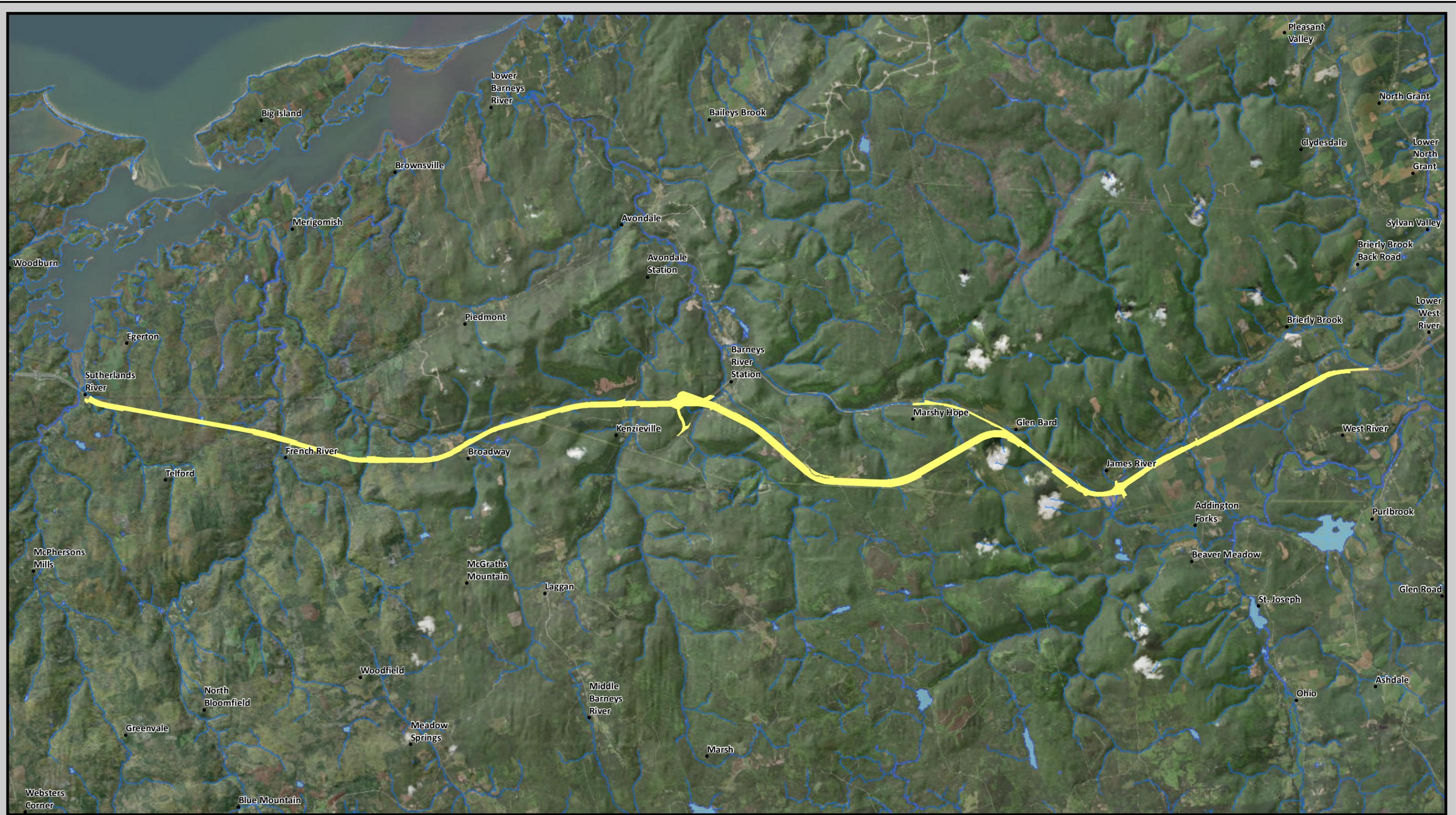
- James River.
- Over 60 minor watercourse crossings (pipe culverts or box culvert less than 3 metres in span); and
- Wildlife passage.

The proposed alignment will include two major components: twinning and a new four-lane alignment. The twinning will include installation of new lanes that will be oriented parallel to the existing highway from Sutherlands River to Barneys River and from west of James River to just west of Antigonish. It is important to note that until the DBFOM proponent executes their design, all details are subject to change. At present, it is anticipated that the twinning will be on the north side of the highway from Sutherlands River to just west of the French River crossing; at this point, it will cross to the south side of the existing highway and continue on the south side until just east of West Barneys River. From this point, the highway will diverge to the south from the existing Highway 104 alignment. The approximately 10 km long new four-lane section will climb gradually to the top of Weavers Mountain, before descending again to rejoin the existing highway alignment east of Pushies Road. From this point, to just west of James River crossing, twinning is anticipated to occur north of the existing highway; beyond this point, twinning will cross to the south and remain on the south for the remainder of the alignment.

The new alignment through the Barneys River Station to James River section will include a new divided highway (two lanes in each direction) with improved highway geometry and as a result, increased safety. A divided highway was selected because it decreases the risk of deadly head-on collisions. The final orientation of all sections (both twinning and new alignment) will be determined during the final design as part of the DBFOM contract. All Project Components will be designed following NSTIR design standards detailed in the latest revision of the *Standard Specification Highway Construction and Maintenance* (NSTIR's *Standard Specifications*; NSTIR, 1997 & subsequent revisions). Further details are provided in Section 2.2.2.

Approximately 25 underpasses and overpasses will be replaced, modified or twinned within the new ROW, depending on the final configuration as determined by the Proponent. Further details are provided in Section 2.2.3 and 2.2.4.

Culverts will be installed to accommodate the new infrastructure, and existing culverts that are found to be in poor condition or having either inadequate hydraulic capacity, or capacity for fish passage, will be replaced during construction. Culvert sizing will be completed during detailed design, and the final number of culvert replacements or additions will be reviewed and determined during the final design as part of the DBFOM contract. All culverts will be installed in accordance with *Watercourse Alterations Standard* (NSE, 2015a), *Guide to Altering Watercourses* (NSE, 2015b) and other guidelines and approvals established by NSE and DFO. Further details are provided in Section 2.2.4.

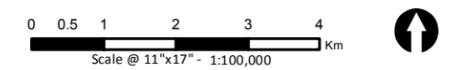


- █ Project Area
- █ NSGC - 1: 10 000 Waterbodies
- █ NSGC - 1: 10 000 Rivers/ Streams



Environmental Assessment
HIGHWAY 104 - Sutherlands River to Antigonish

FIGURE 2.1
Project Area
Sheet 1 of 1



All Project works will be completed in accordance with Nova Scotia's *Construction of 100-Series Highways Environmental Protection Plan (Generic EPP) Manual* (NSTIR, 2007), and any site-specific plans, and regulatory approvals, authorizations and permits.

Parallel to the Environmental Assessment, NSTIR will proceed with completion of the Mi'kmaq Ecological Knowledge Study, and Public and First Nation Engagement activities. Once final design of the Project is underway following the Class 1 EA approval, and selection of a Proponent, the Proponent will commence regulatory requirements for the provincial and federal environmental approvals, such as watercourse and wetland alterations. Following release from the Environmental Assessment process, vegetation clearing activities could be initiated in the winter of 2019 (Section 2.3.1.1). Construction is anticipated to take approximately three to seven years. Highway operations are expected to occur indefinitely with no plans for decommissioning. Further detail pertaining to the Project Schedule is located in Section 2.6.

2.2 Project Components

The proposed Project includes several components. The main Project Components include the following:

- Roadway / Existing Infrastructure;
- Interchanges and Grade Separation Structures;
- Watercourse Crossings / Fish Passage;
- Service Roads;
- Secondary / Existing Road Modifications;
- Temporary Ancillary Project Elements; and
- Wildlife Passage.

2.2.1 Roadway / Existing Infrastructure

Highway 104 from Sutherlands River to Antigonish is constructed to NSTIR's *Major Arterial Standard*. The posted speed limit varies from 90 to 100 km/hr. The new highway will be upgraded and constructed to a NSTIR's *Freeway Open Median Standard*, with a posted speed limit of 110 km/hr (Figure 2.2). The separation distance from centre line to centre line of each set of lanes will be set at 35 metres and will be reduced to a minimum of 30 metres where necessary to reduce impacts on adjacent features such as secondary roads or watercourses. The new alignment will also be Controlled Access; as a result, access is only permitted by grade-separated interchanges (as described in Section 2.2.2).

Some sections of the existing alignment may be reconstructed to improve geometric design, and to meet provincial standards for horizontal geometry. These activities may include redesign of road alignment or change in road elevation to meet provincial standards. The locations of these areas and final grades will be determined during the final design.

2.2.2 Interchanges and Grade Separation Structures

Interchanges and grade separation structures will be included as part of the Controlled Access Highway. These structures are considered to be any structures greater than 3 m in span and include culverts, overpasses, underpasses, interchanges and bridges. There could be approximately 25 structures within the ROW. These include new additional structures, replacements, or modifications to existing structures, and the final number will be dependent on the final configuration of overpasses and underpasses, which will be determined in final design. All structures will be designed to improve safety and operational efficiency. Existing at-grade crossings will be removed or replaced with the construction of grade separation structures, as needed. This final locations of the interchanges and grade separation structures will be determined in the final design. The following key structures have been identified:

- Modifications to the James River interchange (Exit 30);
- Construction of a new interchange at Barneys River Station;
- Construction, replacement or modification of nine watercourse crossings over seven watercourses:

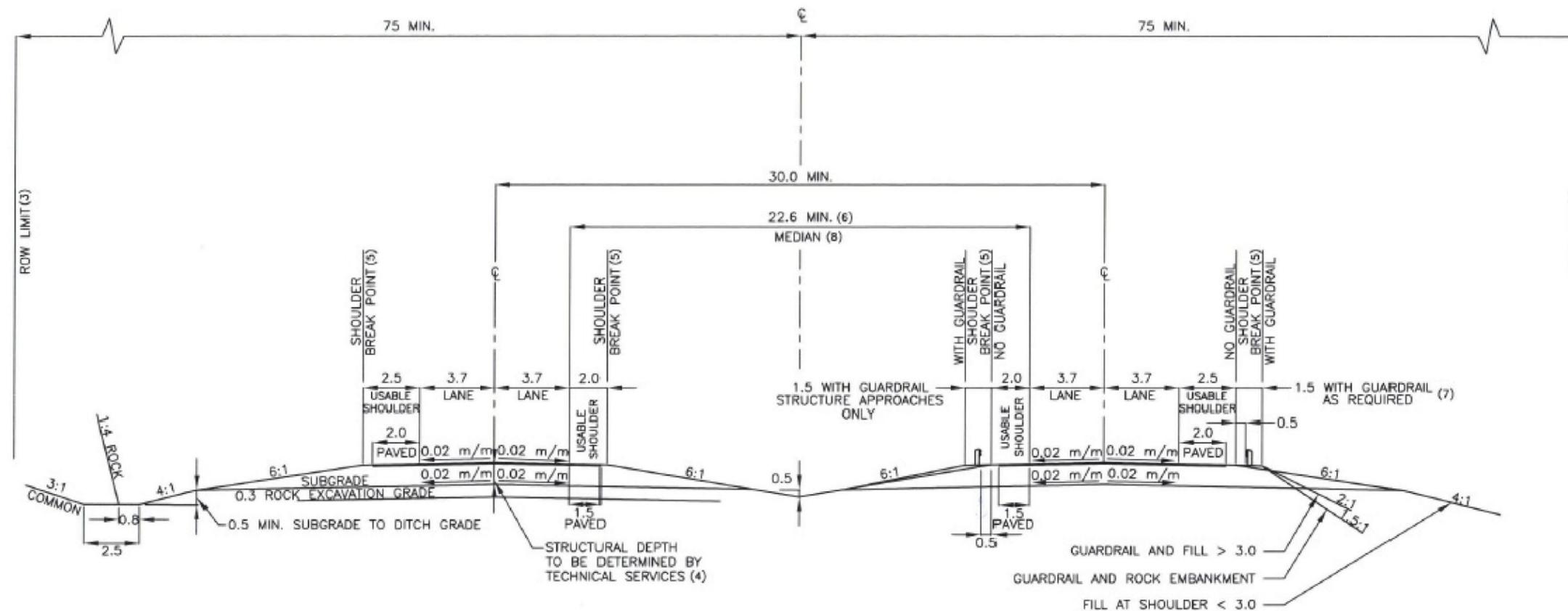
The existing interchange at James River (Exit 30) will be modified and upgraded with the proposed twinning. The final design will be determined at a later stage of the Project; however, it is assumed to include a diamond interchange with roundabouts and a grade-separated underpass.

A new interchange is proposed at Barneys River Station. The interchange will link Trunk 4 to the existing 104 to Barneys River Station and Marshy Hope. The configuration and location will be dependent on the final design; however, it is assumed to include a diamond interchange with roundabouts and grade-separated underpass.

Construction, replacement, or modification of nine watercourse crossings will be required over seven watercourses: French River, East French River, Middle Brook, Barneys River, Middle Brook, Hartshorn Brook, and James River. Watercourse crossing are further discussed in Section 2.2.3.

2.2.3 Watercourse Crossings

The proposed Project crosses over several watercourses including seven large named watercourses: French River, East French River, Middle Brook, Barneys River, Middle Brook, Hartshorn Brook, and James River. The seven identified watercourses will require structures which are larger than three metres; the remaining minor watercourses, tributaries or drainages will require culverts or to be realigned depending on the final configuration of the Project. Culverts will be designed to allow fish passage, where applicable. Culverts along the existing Highway 104 alignment and within the Twinning sections, may be extended to account for the new twinned lanes. NSE and DFO will be consulted during the design process. All culverts will be installed in accordance with *Watercourse Alterations Standard* (NSE, 2015a), *Guide to Altering Watercourses* (NSE, 2015b) and other guidelines and approvals established by NSE and DFO.



- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS ARE MEASURED PERPENDICULAR TO CENTERLINE.
 3. TO BE ADJUSTED TO ALLOW FOR MINIMUM OF 5.0m BEYOND DAYLIGHT LOCATION OR EXCEPTIONALLY 3.0m MAY BE ACCEPTABLE.
 4. THE SUBGRADE WIDTH IS DEPENDENT UPON THE DEPTH OF STRUCTURAL MATERIAL.
 5. 0.8m ROUNDING CENTERED ON SHOULDER BREAK POINT IF GUARDRAIL NOT INSTALLED.
 6. APPLICABLE TO SOME TWINNING PROJECTS. WIDER MEDIANS SHOULD BE CONSIDERED FOR GREENFIELD ALIGNMENTS, THROUGH SIDE HILL AREAS, ON CURVES, ETC.
 7. IF GUARDRAIL IS INSTALLED THE SIDE SLOPE OF THE STRUCTURAL MATERIAL WILL VARY.
 8. INSTALL ROUNDED DEPRESSION OR SWALE WITH DRAINAGE TREATMENT AS REQUIRED IN MEDIAN.

B. Williams
 Manager Highway Planning and Design

P. Smith
 Director Highway Engineering Services

P. Smith
 Executive Director Highway Engineering and Construction



| No. | REVISION |
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| | |
| | |
| | |

Scale : N.T.S.
 Drawn by : G.WRIGHT
 Checked by : K.BODDY
 Date of Plan : NOV-2015
 File No. : S-2015-003

**STANDARD CROSS SECTION
 FREEWAY OPEN MEDIAN (A)**



Environmental Assessment
 HIGHWAY 104 - Sutherlands River to Antigonish

FIGURE 2.2
 Standard Cross Section
 Open Freeway Median

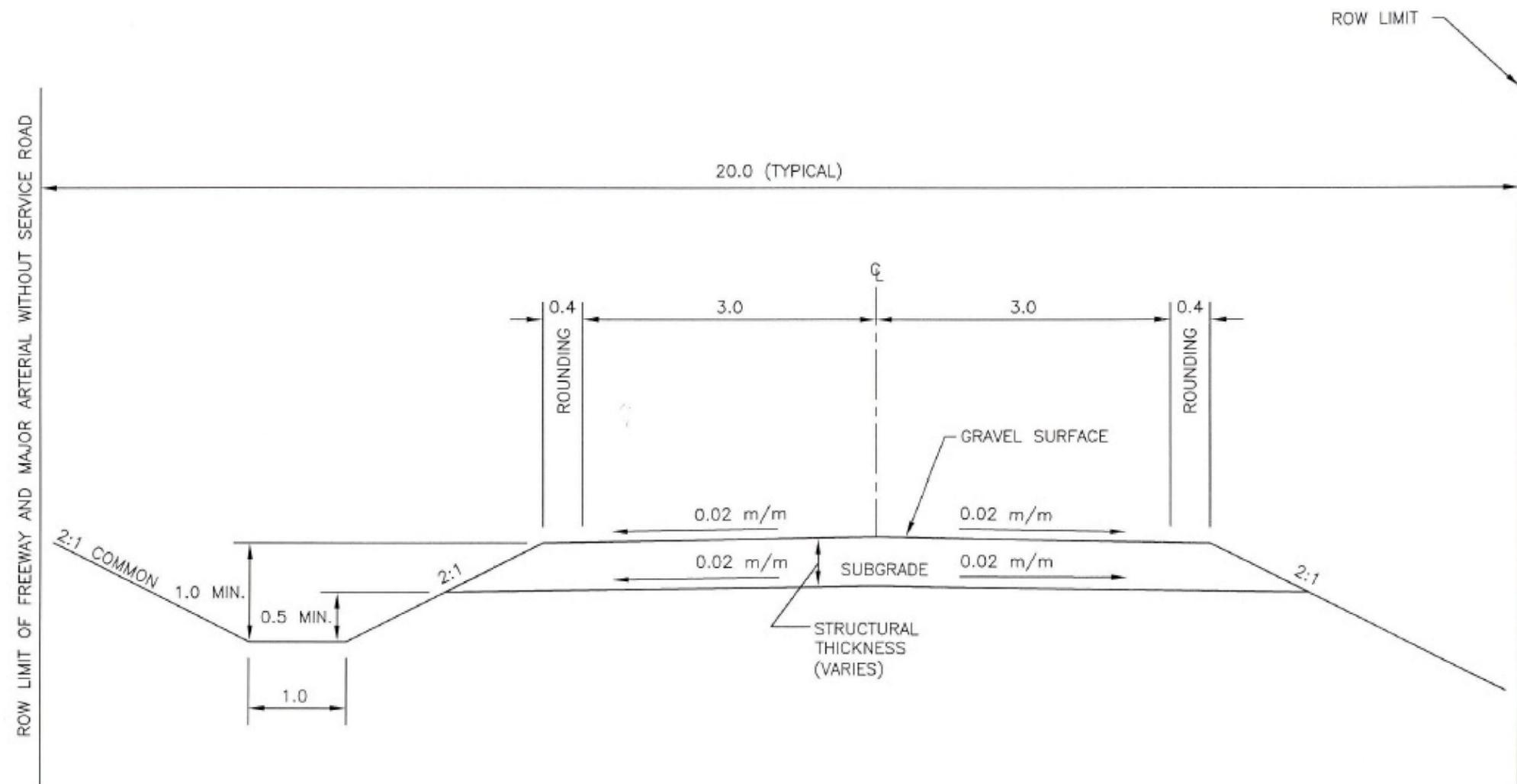
The final watercourse crossing requirements will be determined based on the final design. All new structures will be designed considering accommodation of Climate Change, such as a 1:100 year Annual Exceedance Probability and a factor of sensitivity as required. Watercourse alteration activities may be required for all affected watercourses in the ROW. These activities will include:

- Culvert or bridge crossings; and
- Watercourse re-alignment; or removal.

Local drainage will be considered in the final design, and additional culverts may be required to maintain adequate drainage throughout the Project, or to maintain hydrologic connectivity of wetlands bisected by highway construction.

2.2.4 Service Roads

Service roads, both permanent and temporary, may be required as a result of the design to meet the new *Freeway Open Median Standard*. These roads will provide landowners of properties adjacent to the ROW access to their lands during and following the construction of the highway. Temporary access roads may be required as necessary to provide access during construction; however, efforts will be made to continue access through existing roads as much as possible. Service roads will be designed to NSTIR's *Standard Cross Section - Service Road* (Figure 2.3). The final configuration of the service roads will be determined in the final design; and are anticipated to occur within the defined ROW, with the ROW widened as necessary for the service roads.



- NOTES:
1. THE SUBGRADE WIDTH IS DEPENDENT UPON THE DESIGN DEPTH OF THE STRUCTURAL MATERIAL.
 2. DESIGN LOADING: 38500kg
 3. DIMENSIONS ARE MEASURED PERPENDICULAR TO CENTERLINE.
 4. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

Philip Cohen
 Manager Highway Planning and Design

[Signature]
 Director Highway Engineering Services

[Signature]
 Executive Director Highway Engineering and Construction



| No. | REVISION |
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Scale : N.T.S.
 Drawn by : M.ANDERSON
 Checked by : K.BODDY
 Date of Plan : AUG2009
 File No. : S-2009-017

**STANDARD CROSS SECTION
 SERVICE ROAD**



Environmental Assessment
 HIGHWAY 104 - Sutherlands River to Antigonish

FIGURE 2.3
 Standard Cross Section
 Service Road

2.2.5 Secondary / Existing Road Modifications

The Project includes the modification of existing and secondary roads as a result of the new alignment of the Highway 104, in order to achieve controlled access. The modification to these roads will be dependent on the final design. All road modification will conform to NSTIR's relevant standards. The identified roads may vary from the roads to be modified in the final design. The roads that may be affected as a result of modification, replacement, construction or removal of underpasses or overpasses include:

- Lamont Road;
- Trunk 4 (at French River);
- Trunk 4 (at Broadway);
- Barneys River West Side Road;
- Pushie Road;
- Beaver Meadow Road; and
- Mill Road.

Other secondary roads that may require realignment to accommodate the new lanes within the alignment include the following:

- Trunk 4 (at Rossfield Road);
- Trunk 4 (at Middle Brook);
- Highway 104 at proposed interchange at Barneys River;
- Weaver's Mountain Road; and
- Beaver Mountain Road.

2.2.6 Temporary Ancillary Project Elements

To support the main components of the Project, Temporary Ancillary Project Elements will be required. The location and need for these will be determined during the DBFOM phase of the Project by the selected Proponent. All elements will operate in compliance with applicable legislation and regulatory permit, approval or authorizations. The anticipated Temporary Ancillary Project Elements may include:

- Equipment;
- Laydown areas / material storage areas;
- Petroleum storage and Fuelling areas;
- Mobile asphalt, concrete or aggregate production plants;
- Borrow areas; and
- Disposal facilities / sites.

The elements will be in place during Construction or Operation and Maintenance, and removed as necessary. The length of time they will be installed will be dependent on the successful Proponent. Elements installed during construction could be in place for 3 to 7 years; however during Operation and Maintenance, they will likely be in-situ for shorter periods of time.

The location and operation of the Temporary Ancillary Project Elements may be subject to the approval of NSTIR and other regulatory authorities. During construction, the location of these

elements may move depending on the demands for the Project. Generally, the location of these elements, particularly petroleum storage and fuelling areas, will be located greater than 30 m from wetlands and watercourses, and should avoid other sensitive features, such as archaeological resources and Species of Conservation Concern (SOCC), when possible. Additional investigations may be required to assess the suitability of these locations.

When and where these Temporary Ancillary Project Elements are required are further described in Section 2.3. The environmental effects and mitigation measures are discussed within the construction and operation activities (Chapter 8) and Accident and Malfunctions (Chapter 7). Borrow areas and disposal sites will likely be located outside of the Project Area; therefore, the assessment of effects as a result of borrow areas, and disposal sites, is considered outside of the scope of this EA. However, only material from provincially approved borrowing source will be used, and all disposal from the Project will follow applicable legislation at an approved disposal facility.

Equipment

Equipment and vehicles will be necessary for Site Preparation, Construction, and Operations and Maintenance phases of the Project, and will be used throughout the many activities as identified in Section 2.3. The majority of the equipment will be mobile, and used throughout the Project or used to transport wastes and salvageable materials from the Project Site. However, some equipment may be stationary, such as asphalt / concrete plants. Temporary facilities may be located off-site, but will require the transport of material to site. The requirements for the transportation of material to site are not known at this time, and will be highly dependent on the location of Temporary Ancillary Project Elements. For example, if Temporary Ancillary Project Elements are located offsite, traffic will increase accordingly. The transport of goods will follow applicable legislation and provincial vehicle weight restrictions, including seasonal specific restrictions.

Equipment and vehicles are anticipated to be primarily diesel-fuelled. The operation of equipment will be required to be in compliance with applicable legislation and the NSTIR's *Generic EPP*. Periodic maintenance will be required to maintain equipment and vehicles in good working order. Equipment will be required to be frequently inspected and repairs and leaks will be addressed immediately. When possible, maintenance of equipment will occur off-site, however, emergency repairs may be required on site. Activities should occur greater than 30 metres from wetland and watercourses and will be conducted in compliance with spill containment requirements, such as the use of spill and drip trays and spill response protocols. All equipment will be required to be washed at locations greater than 30 metres from any watercourse or wetland. The operation and storage of equipment is further described in the 'Petroleum Storage and Fuelling Areas' section.

Specific equipment requirements are further identified in Section 2.3.

Laydown Areas / Material Storage Areas

Laydown areas and material storage area may be required as part of the Project. These may include areas for the storage of equipment, vehicles, safety material (e.g., pylons and barricades) and materials. The location of these areas will be determined during the DBFOM phase of the Project by

the selected Proponent. Any material storage will be required to be in compliance with applicable legislation, such as the *Hazardous Products Act*, and NSTIR's *Generic EPP*. For example: All material stored in stockpiles will be done so as to prevent erosion and release to wetlands and watercourses, and ESC measures will be in place.

Petroleum Storage and Fuelling Areas

Petroleum storage and fuelling areas will be required onsite as the majority of the equipment to be used for the Project will require fuel. Some equipment will be stationary, and so mobile fuel delivery by fuel trucks will be required. All petroleum storage will be in accordance with the *Environment Act*, *Petroleum Management Regulations*, *Hazardous Products Act*, NSTIR's *Generic EPP*, and appropriate permits, as established in the *Petroleum Management Regulations*. Fuelling and storage activities will follow mitigation measures as identified in NSTIR's *Generic EPP*, which include, but is not limited to, the following:

- All fuelling, storage and maintenance of equipment and vehicles will occur greater than 30 m from a wetland, watercourse or a drainage leading to a wetland or watercourse; areas with a high water table; or area with exposed and shallow bedrock;
- All lubricant, hydraulic fluid, grease, gasoline, diesel or other fuel storage will occur greater than 30 m from a wetland, watercourse or a drainage leading to a wetland or watercourse, or other sensitive areas;
- All wastes, such as waste oils and lubricants, will be stored in approved, closed, labelled containers, and disposed of in accordance with the *Environment Act*;
- All spills will be promptly contained and cleaned up, with disposal of material done in accordance with the *Environment Act* or NSE direction. All stained soil resulting from the use of chemicals or fuels will be handled in compliance with the *Environment Act* or NSE direction;
- Spill containment materials are to be clearly identified, maintained and located in areas of fuel and chemical storage;
- All storage areas will be clearly marked; and tanks shall be protected from vehicle damage by the use of barriers or markings such as snow fencing;
- All users will be trained in proper handling and fuelling practices in order to prevent contamination of soil, surface water, and groundwater; and
- Drums will be stored following the identified guidance in the *Generic EPP*; "If drums are stored on their sides, the drums shall be stored so that the bungs are in the '9 and 3' position, on level ground and prevented from rolling" (NSTIR, 2007).

Asphalt, Concrete and Aggregate Production Plants

Asphalt, concrete and aggregate production plants will be required for the Project. These may be either mobile or set at established facilities. The location of these plants and the type of plant required will be determined during the DBFOM phase of the Project by the selected Proponent. Typical mobile locations for these facilities include quarries, which may be used to decrease overall haul distances.

Mobile plants will be required to be operated in compliance with the applicable legislation: including the *Environment Act - Activities Designation Regulations*, and *Petroleum Management Regulations*; associated approvals, such as an NSE Industrial Approval; and NSTIR's *Generic EPP*. All petroleum storage will be in accordance with the *Environment Act - Petroleum Management Regulations* and NSTIR's *Generic EPP*. Further description of petroleum storage is outlined in the 'Petroleum Storage and Fuelling Areas' section.

Mobile plants will be operated using best management practices and in compliance with NSTIR's *Standard Specifications* and industry standards such as those of the Canadian Construction Association (CCA), and as specified in the DBFOM contract documents.

Borrow Areas

The location of borrow areas will be determined during the DBFOM phase of the Project by the selected Proponent. All borrow areas will be required to operate in compliance with applicable legislation, such as the *Environment Act* and *Pit and Quarry Guidelines*, and regulatory permit, approval or authorizations. If new areas are required, additional investigations may be required to assess the suitability of these locations. Use of these areas will be required to be in compliance with the NSTIR's *Generic EPP*. The location of aggregate and borrow areas will be located greater than 30 m from wetlands and watercourse, and should avoid other sensitive features, such as archaeological resources and Species of Conservation Concern (SOCC), when possible.

Disposal Facilities / Sites

The location of disposal facilities / sites will be determined during the DBFOM phase of the Project by the selected Proponent. Material that is not suitable for the purposes of construction or fill will be disposed of off-site in compliance with applicable legislation, and NSTIR's *Standard Specifications*. Disposal of construction and demolition debris may occur outside of the ROW at approved and licensed facilities. Any disposal of waste will be done so in compliance with current legislation, issued permits, approvals and authorizations and in accordance with NSTIR's *Standard Specifications*. Further describing of waste recovery and management is located in Section 2.3.

2.2.7 Wildlife Passage

Wildlife passage will be implemented as part of the Project.

Opportunities for wildlife passage exists at a number of major river crossings identified within the Project corridor, particularly along the portions of the Project alignment to be twinned. The design of new or replacement structures at watercourses (culverts or bridges) by the Proponent will include consideration for the passage of wildlife (amphibians and reptiles, or large and small mammals) along the channel, banks, and riparian area wherever possible (Section 2.3.2.8). It is not anticipated at present that wildlife fencing will be erected adjacent to these structures.

In addition to wildlife passage allowances to be made at major river crossings, it is anticipated that a minimum of two combined wildlife/ATV/snowmobile crossings (under the highway) will be placed at key locations along the corridor, with wildlife fencing applied adjacent to these. It is anticipated at

this stage that 4-5 linear kilometres of fencing may be required for each conduit location (i.e., 2 – 2.5 km of fencing on each side of the highway corridor, approximately centred on the crossing location). At present, approximate locations for these combined crossings are identified as:

- at Weavers Mountain, near the southernmost extent of the new four-lane alignment; and
- at a location east of Mill Rd, along the eastern twinning alignment.

The precise locations of these combined crossings, their design details (particularly optimal dimensioning for large mammal usage, and the associated length of fencing) is to be determined by the Proponent during the final design of the Project, with appropriate input and review from NSDNR (Section 2.3.2.7).

Additionally, accommodation of passage for wood turtles will be provided for at least one river crossing site that intersects with Critical Habitat for this species. Precise locations for wood turtle passage and Critical Habitat have been withheld at the request of NSDNR, for the protection of this species.

The final siting and configuration of all passage structures and fencing is to be determined by the Proponent at the detailed design phase. Follow-up measure related to wildlife passage and the necessity for monitoring will be developed by the Proponent, in consultation with NSDNR and NSE.

2.3 Project Activities

This section outlines the Project activities that comprise the identified phases of the Project; these phases will be referred to throughout the course of the Effects Assessment, and are defined as ‘Site Preparation’, ‘Construction’, and ‘Operation and Maintenance’. The following section provides a description of the anticipated activities.

2.3.1 Site Preparation

The Site Preparation phase is the initial step associated with road construction. This step is technically part of construction; however, it has been identified as a separate Project phase as elements of it are anticipated to be completed in advance of other construction activities. This phase is essential for the remaining activities, and scheduling of Site Preparation activities is important to reduce potential environmental impacts. Activities associated with Site Preparation include:

- Vegetation clearing;
- Grubbing and soil management;
- Waste recovery and disposal; and
- Erosion and sediment control measures.

Various equipment will be required for Site Preparation activities. The following equipment has been identified for the Site Preparation phase, when possible, tracked equipment will be used.

- Excavators;

- Bulldozers/Scrapers;
- Loaders;
- Fueling Equipment;
- Dump-trucks;
- Tree clearing equipment;
- Hand-saws; and
- Mulching equipment.

2.3.1.1 Vegetation Clearing

Site Preparation activities for the construction of the highway will require vegetation clearing within the areas of twinning and within the new alignment. NSTIR Policy and the *Migratory Birds Convention Act* limits the periods when tree clearing can take place in order to avoid disturbance of birds during critical nesting periods (mid-April to late August). A width of approximately 150 metres will require clearing within the new alignment and an approximate width of 75 metres will require clearing along the two areas where twinning will occur. Areas surrounding proposed interchanges and grade separation structures (underpasses and overpasses) may require greater widths to accommodate the required cuts and fills. Within these areas, the clearing will depend on the required slopes. These areas will be defined during the final Project design. Tree clearing may be undertaken in advance of completion of the procurement process, in order to avoid schedule issues if award of the contract does not align with allowable tree clearing seasons. Additional clearing may be required for the construction of access roads if determined necessary. All limits of clearing will be surveyed and marked prior to construction.

Trees will be cut within 0.3 m from the ground. Merchantable timber will be harvested, de-limbed and removed from the site following the *Forest Act* and its regulations and policies. Non-salvageable timber will be chipped within the ROW.

Vegetation removal will be completed outside of biologically sensitive time windows, such as the regional bird nesting window (mid-April to late August); ideally this work is completed during winter months on frozen ground, when possible. If it is not possible to avoid vegetation clearing during the bird nesting period, mitigations and survey protocols (to be executed by qualified biologists) will be developed, in close consultation with the regulators of authority on the Project (i.e., Canadian Wildlife Service (CWS)). Application of the developed measures will help achieve compliance with the *Migratory Bird Convention Act*.

To reduce potential impacts to vegetation and to wetlands and watercourse by release of sediment, clearing of vegetation, when possible, should be completed within the winter months on frozen ground. Completing clearing on the frozen ground will protect the underlying vegetation from damage and reduce the potential of sediment release during these works. Best management practices such as hand clearing will be implemented where heavy equipment used is not suitable, such as in proximity to watercourses and wetlands, where machinery rutting may be a sedimentation, erosion or rutting concern. If activities such as vegetation clearing are required

within 30 m of a watercourse or wetland, work will only occur following the placements of required erosion and sediment controls (Section 2.3.1.4).

2.3.1.2 Grubbing and Soil Management

Construction of the highway will require the grubbing of materials of areas of twinning and in within the new alignment similar to the areas requiring vegetation clearing. Grubbing includes the removal, disposal or salvage of all organic materials (stumps, roots, downed timber, embedded logs, humus, roots, and topsoil), and overlaying soil unsuitable for construction within the ROW. This typically occurs in where excavations are required, a layer of soil unsuitable for construction or that may cause future issues with settlement is present, or where surface works are at depths of less than 1.5 m. Grubbing under fills of greater than 1.5 m is not typically required; with exception of scenarios such as installation of a bridge, culvert, or retaining wall.

Removal is likely to be performed by bulldozers; however, excavators are sometimes used when material is to be placed directly into dump-trucks and removed from site. When possible, track mounted bulldozers and excavators will be used.

The end use of the grubbed materials will be determined on-site. Grubbed topsoil will be reused, when feasible, for uses such as embankments along the roadway. Where large organic materials, such as stumps, and roots, are embedded in topsoil, these materials may be removed and disposed of prior to the reuse of soils. Organic material may be removed and chipped prior to reuse or disposal. Grubbed organic material may also be used as a means of revegetation, as this material contains local seedbanks and may expedite re-establishment of native vegetation. This activity may be considered in select areas, where sediment and erosion migration into aquatic receptors is not anticipated to be an issue. If grubbed organic materials are known to contain highly invasive species (e.g., Japanese knotweed) then these materials should not be reused.

Useable top soil will be salvaged and stockpiled for future reuse within the ROW such as side slopes and within the median per NSTIR's *Standard Specifications*. Other soils not suitable for construction will be handled following applicable best management practices and are further outlined in Section 2.3.2.14.

If activities are required within 30 m of a watercourse or wetland, work will only occur following the placements of required erosion and sediment controls (e.g., sediment fence, and settling ponds). Erosion and sediment control will be implemented during the Site Preparation phase to reduce the potential impacts of sediment releases to aquatic receptors such as wetlands and watercourses. The proposed erosion and sediment control (ESC) measures are outlined in Section 2.3.1.4, and will be conducted using best management practices for grubbing, and in accordance with NSTIR's *Standard Specifications* and ESC Course Materials (available on the NSTIR website: <https://novascotia.ca/tran/works/enviroservices/enviroErosion.asp>).

2.3.1.3 Waste Recovery

Waste recovery and disposal has been identified during Site Preparation; however, overall waste management efforts are outlined in Section 2.3.2.14. Generally, material excavated or collected from site preparation activities will first be reused within the highway construction corridor; for example, non-salvageable material, such as limbs and non-merchantable timber, may be chipped and reused within the ROW. With approval, large items that are unable to be chipped, such as tree stumps, are occasionally buried on within the ROW. Salvageable material will be handled following applicable legislation and permitted approvals. Non-salvageable materials will be properly disposed of off-site at approved and licensed facilities.

Disposal sites will be determined by the successful Proponent at an approved disposal facility and approved by NSTIR prior to disposal. Disposal of construction and demolition debris may occur outside of the ROW at approved facilities. Any disposal of waste will be done so in compliance with current legislation, issued permits, approvals and authorizations and in accordance with NSTIR's *Standard Specifications*. Additional waste recovery and disposal efforts are further outlined in Section 2.3.2.14.

2.3.1.4 Erosion and Sediment Control

ESC measures will be implemented prior to ground disturbance, as effects related to ground disturbance can result in the release of soil and sediment to sensitive environmental components such as wetlands and watercourses. Implementation of ESC measures limit or eliminate the potential erodibility of soils and sedimentation. The terrain, slope, soil grain size and drainage all influence the erodibility of the soil. At a minimum, NSTIR requires that all onsite supervisory staff have "certificates of training" (Green Cards) to ensure erosion prevention, onsite water management, and understanding of the limits of ESC measures (NSTIR, 2016).

ESC measures will be developed in accordance with:

- Current legislation and policies, such as Nova Scotia's *Watercourse Alterations Standard* (NSE, 2015a);
- ESC training materials prepared by NSTIR, NSE and DFO to certify the training of onsite supervisory and other staff (NSTIR, 2016);
- Regulatory approvals, including issued terms and conditions and letters of advice;
- Established environmental management plans, such as NSTIR's *Generic EPP*;
- Best managements practices, such as the *National Guide to Erosion and Sediment Control on Roadway Projects* (TAC, 2005) and a *Synthesis of Environmental Management Practices* (TAC, 2014); and
- Industry standards, including *NSTIR Standard Specifications* (NSTIR, 1997).

Project-specific plans will be developed and followed throughout the Project, when possible. Plans will include locations of specific mitigation measures, be reviewed by regulatory bodies for approval and compliance with the *Environment Act*, and updated periodically to remain current. Plans may include, but are not limited to, *ESC Plans*, *Water Control Plans*, and *Contingency Plans*. Plans are further detailed in Section 9.1.

Some generic mitigation measures that will be implemented include the following:

- Proposing terrain-specific mitigation measures, such as scheduling of work to minimize exposed soil;
- Retention of existing vegetation for slope stability for as long as possible;
- Mulching within grubbed areas;
- Diverting surface water from exposed or bare ground areas;
- Reducing length and steepness of slopes;
- Reducing run-off velocities using surface water management measures;
- Implementing adequate drainage pathways;
- Sediment control measures, such as silt fencing;
- Maintenance of a minimum 30 m buffer of undisturbed vegetation between the construction area and watercourses until erosion and sediment controls are in place;
- Maintenance of a minimum 5 m buffer of undisturbed vegetation between the construction area and wetlands until erosion and sediment controls are in place; and
- Regular inspection and maintenance of applied measures.

2.3.2 Construction

Following site preparation, the road construction elements can begin. These activities will be implemented following industry standards, BMPs and mitigations measures to reduce the likelihood for environmental effects. Activities associated with construction include:

- Excavation;
- Blasting;
- Fill placement and compaction;
- Ditch construction;
- Gravel placement and compaction;
- Paving;
- Highway infrastructure installation or construction;
- Watercourse diversion;
- Bridge and grade separation structure construction;
- Removal of existing infrastructure, as required;
- Installation of watercourse crossings;
- Wetland alterations;
- Rehabilitation and site restoration;
- Revegetation (planting, and hydro seeding);
- Water management;
- Installation and maintenance of ESC measures; and
- Waste recovery and disposal.

Various equipment will be required for Construction activities. The following equipment has been identified as potential being required:

- Asphalt or concrete paving equipment;
- Asphalt and concrete plants;
- Bulldozers;

- Cranes and boom lifts;
- Excavators;
- Fueling equipment (fueling trucks and temporary storage);
- Graders;
- Dump trucks;
- Hydroseeding equipment;
- Rollers;
- Rock breakers;
- Road marking equipment (such as paint trucks); and
- Steel drum compactors.

2.3.2.1 Excavation

Excavation of materials will be required in preparation of the subgrade, i.e., the bottom layer of the roadbed which provides strength and stability. One or more methods of excavation may be implemented depending on the type of material to be removed. Such methods include the following:

- Common excavation;
- Swamp excavation; and
- Rock excavation.

Common excavation is the removal of overburden, such as till, topsoil, and small boulders (primarily from upland areas) with the use of equipment such as excavators and bulldozers. Swamp excavation is implemented when the soil or organic material encountered on site are unsuitable for use as a sub-grade (i.e., peat, black muck, humus, or soils which are saturated with water). Such materials are typically encountered in wetland habitats (e.g. swamps, and marshes). These soils or organic materials must subsequently be excavated and replaced with suitable fill. It will be the responsibility of the Proponent to ensure that the full depth of the swamp is removed prior to placement of suitable fill materials, per NSTIR's *Standard Specifications*. As outlined in Table 1.3, a *Wetland Alteration Approval* must be obtained from NSE prior to excavation of or alteration to any wetlands. Excavated soils or organic materials may be salvaged for use in wetland restoration projects or used for fill or dressing of slopes. If deemed unsuitable for such uses, excavated materials should be disposed of at an approved disposal site according to applicable guidelines.

Rock excavation is the removal of bedrock or single pieces of rock which are larger than one cubic metre. Methods of rock excavation include blasting, ripping, and breaking. The method employed depends largely on the geologic structure of the rock being removed. Ripping is typically used for the excavation of soft rock (e.g., shale and sandstone) or bedrock that has been weakened by physical characteristics, such as faults, fractures, or weathering. It entails the use of ripper blades to cut and break soft rock into smaller pieces that are more readily loaded onto trucks. The equipment used for rock breaking varies based on the size of the rock. For example, smaller rock breaking may entail the use of a compressed air based jack hammer, whereas larger rock breaking may require the use of a rock breaker, or excavator mounted hydraulic hammer. Excavation of rock via blasting may

be required if ripping or breaking of bedrock is not possible. Blasting is described separately in Section 2.3.2.2.

2.3.2.2 Blasting

Blasting is an alternative to mechanical excavation and entails the use of explosives to break rock for excavation. The use of blasting for rock excavation will depend on several factors, among which include the competency of the rock (i.e., hardness, presence of faults or fractures, stratification). For example, large, hard, and homogenous geologic formations may be difficult to break down using mechanical forms of excavation and require the use of blasting. Blasting is associated with greater environmental impacts than mechanical forms of excavation, due to the production of ground vibration, noise, fly-rock, and dust, for example.

Blasting operations needs will be assessed during final design by the Proponent and completion of geotechnical investigations. The need for blasting will be assessed along the proposed alignment and will be dependent on the overburden thickness and lithology (physical character of the rock) in the area.

Based on geological mapping, coarse-grained sedimentary rock (e.g. sandstone, conglomerate) predominates in the western-most part of the corridor, and occurs over shorter intervals in the centre of the corridor. Finer-grained sedimentary and metamorphic rock predominate through much of the central part of the corridor (siltstone, mudstone, shale, quartzite, metasandstone and slate). The material underlying the eastern part of the corridor is primarily evaporite deposits of the Antigonish Basin. This material comprises limestone, gypsum, and anhydrite, interbedded in places with sandstone, siltstone, and mudstone. Karst formations have been documented in the Antigonish Basin. Relative to other areas in Nova Scotia, bedrock in this region is composed of relatively soft bedrock (i.e., sandstone, mudstone, and limestone) which is suitable for rock excavation via ripping. If blasting is required, mitigation measures will be implemented to reduce environmental impacts (Section 8.2). For example, prior to blasting, NSTIR will be responsible for determining the location, water quality, discharge rates, and physical condition of wells within 300 m on either side of the proposed alignment, if possible. The Proponent will calculate the size and spacing of explosives in accordance with provincial guidelines in order to prevent damage to wells and structures. Monitoring of ground vibration and air concussion during blasting operations at locations near the blast site and at nearby structures will also be required. The personnel performing the blasting will be required to hold a valid Blaster's Licence and to perform a pre-blast survey prior to operations. The Proponent will also abide by provincial regulations governing blasting operations in Nova Scotia and conduct blasting operations in accordance with the *Blasting Safety Regulations* and *General Blasting Regulations* pursuant to Section 82 of the *Nova Scotia Occupational Health and Safety Act*, 1996. If blasting is to occur in or near a watercourse, consultation and approvals (as required) from DFO will be necessary, and operations will be conducted in accordance with the *Guidelines for Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky, 1998).

Other best management practices and mitigation measures to be followed include:

- Development of a detailed blast plan by the Proponent;

- Using blasting mats to cover all blasts and reduce fly-rock;
- Implementation of blast vibration monitoring in area of blasting and locations surrounding blast area;
- Notification of the public prior to blasting;
- Closures of adjacent roads during blasting;
- Implementation of dust collectors on drill rigs; and
- Wetting down of blast muck, and covering trucks transporting blast debris.

2.3.2.3 Fill Placement and Compaction

Following excavation of unsuitable materials, placement of suitable fill is required to construct a structurally sound subgrade that is able to withstand the weight of operation for both the highway and access roads. Mineral soil, free of organic material (e.g., wooden debris or humus), is typically used as fill. Fill is placed and spread in layers of specified thickness to the elevation indicated in the engineering design plans. The thickness of each layer will largely depend on the properties of the material used and on design specifications. Each layer of fill is spread using a grader (grading) and compacted prior to application of the subsequent layer. The volume required for movement of fill is not known at this time.

Nova Scotia Highways are built following NSTIR's *Standard Specifications*; which include a 200 to 300 mm layer of 'Type 2' gravel placed over the subgrade. Prior to paving activities, an additional layer of Gravel Type 2 is applied, additional layers of 'Type 2' gravel can be applied as required, followed by an application of 'Type 1' gravel. Specifications for gravel types 1 and 2 can be found in NSTIR's *Standard Specifications*.

Compaction occurs during the process of fill placement. Controlled compaction of each layer may also be performed through the application of water in conjunction with a vibratory roller. The process of layering fill placement and compaction reduces future maintenance costs by minimizing sedimentation, erosion, settling, and ponding of water.

2.3.2.4 Ditch Construction

Ditches are constructed during road bed preparation in order to collect and divert run-off from construction areas. Ditches shall be excavated and constructed to the depth, width, and grade specified in the design drawings with excavators, bulldozers and other grading equipment. Ditches are designed to provide sufficient flow to avoid settlement of water or debris. Ditch outlets will be directed into vegetated areas away from watercourses. Ditches should be maintained and cleared of debris during construction to avoid erosion and sedimentation. Permanent erosion control measures will be constructed in ditches and drainage channels to prevent degradation of downstream aquatic resources and sensitive habitats, such as wetlands. Examples of such measures include, but are not limited to, lining ditches with impermeable fabric, turf reinforcement mats, rip-rap, check dams, and erosion control blankets, as well as constructing diversion ditches and sediment ponds (Section 2.3.2.13).

2.3.2.5 Paving

Paving of the roadway will be the final surface on the highway. There are two types of pavements used in Nova Scotia for highway and access road construction, and include hot mix asphalt (i.e., black asphalt concrete) and Portland cement concrete. The final surface layer will be determined by the selected Proponent.

Hot mix asphalt is made in an asphalt plant by mixing petroleum based liquid asphalt with sand and crushed stone. It is commonly used in Nova Scotia for roadways in accordance with the NSTIR's *Standard Specifications*, specifically Section S-1 (2012) on Hot Mix Asphalt Concrete, and Section S-2 (2010) on Performance Graded Asphalt Binder (NSTIR, 1997). Advantages of asphalt for paving are that the hot mix is easily transported from the plant to the work site, readily applied, is cost effective, and the road can be used almost immediately following the application of asphalt. A disadvantage of asphalt is that it is not as durable as Portland cement concrete, so wheel rutting, breaks in pavement, and potholes may result from continued use of heavy trucks or frost action. High friction asphalt mixes have greatly reduced these problems in recent years.

The use of Portland cement concrete is also used in Nova Scotia in accordance with NSTIR's *Standard Specifications*. It is made at a concrete plant by mixing Portland cement, coarse aggregate (e.g., crushed stone or gravel), fine aggregate (e.g., sand) and water. The concrete mix is then transported from the plant to the work site where it is dumped, spread, levelled, and consolidated using concrete slip-form paving equipment. An advantage to using Portland cement concrete is it is more rigid and less susceptible to breaking, potholes, or wheel rutting, resulting in a smoother surface and drive for users. Disadvantages are that the concrete must cure or set for several days prior to use by traffic, resulting in delayed road closures when compared with using asphalt. The initial cost to use Portland cement concrete may be higher than asphalt pavement, however maintenance costs are generally lower.

It is anticipated that the crushed stone needed to make either type of pavement will be acquired from existing quarries. It is the responsibility of the Proponent to obtain crushed stone which meets NSTIR specifications and to ensure compliance with applicable pit and quarry regulations. The volume of trucks required to provide paving services is not known at this time. If aggregate sources are located close to the Project, the volume and amount of traffic may decrease.

2.3.2.6 Highway Infrastructure

Following completion of most construction activities, the following infrastructure will require installation prior to commissioning of the highway:

- Guard rail;
- Installation of wildlife fencing;
- Signage and lighting; and
- Highway finishing activities (i.e., marking and painting).

Construction of guard rails may require drilling of holes along the highway shoulder for post installation of structural posts. Following the installation, steel guide rails will be attached to the installed posts.

Wildlife fencing will require installation on a stable ground free of minor ground undulations. Existing debris, and vegetation should be removed to the extent necessary, so as not to interfere with or prevent proper installation. Excavations may be required in small, localized areas prior to the installation of fence posts. When possible, fence posts will be drilled or driven in to the ground and reinforced with concrete. Fence posts will be installed at set distances for the length of the fencing. The distance between the posts and the number of posts will be determined based on the final plan. Fence fabric and fence wire will be applied to the fence posts according to the specific design. One-way gates may be installed to allow passage of animals (primarily ungulates – i.e., moose and deer) from within the ROW to pass to the forest side. The location and the number of any one-way ungulate gates will be dependent on further discussion with NSDNR and the final approved design developed by the Proponent.

Excavation in small, localized areas will be required prior to the installation of concrete footings to support signs and lighting. Installation of lighting will occur at sites specified in engineered design drawings, typically at and near interchanges and roundabouts.

Highway markings are among the final activities completed prior to operation. Road surface markings provide guidance and information to drivers. These markings may include, but are not limited to, painted white and yellow longitudinal lines, preformed thermoplastic pavement markers often used at intersections, and polymer tape commonly used to mark crosswalks or turn lanes. The painting will be applied with road marking equipment, such as paint trucks, or manually as necessary.

2.3.2.7 Bridge and Grade Separation Construction

Bridge and grade separation structures are required to allow the safe passage of traffic over watercourses and over the proposed highway infrastructure. Bridge and grade separation structures may also be used as a component of wildlife passage requirements for the Project, as these may provide conduits for the movement of animals.

Bridge structures will be constructed in accordance with the *Watercourse Alterations Standard* (NSE, 2015a), *Guide to Altering Watercourses* (NSE, 2015b), and designed meeting DFO fish passage requirements. Grade separation structures will include overpass and underpasses. Following the Site Preparation activities of vegetation clearing, grubbing and implementation of ESC measures, bridge foundations will be dewatered (as necessary) and excavated. Construction of bridge abutments and piers will generally include pile driving and the erection of forms, installation of reinforcement, and placement of concrete. Bridge abutments will be built in conjunction with earth and rock embankments, or on bedrock foundations. These components will be prepared as part of the roadway subgrade and drainage system development activities. The construction of the bridges will be determined based on the final design by the Proponent.

Girders will be put into place using equipment, such as cranes. The girders may be made of pre-stressed concrete or steel construction; as will be determined during detailed design. Following the placement of the girders, a deck will be constructed, typically of cast-in-place reinforced concrete, and a waterproof membrane will be applied. The structure will then be paved to the indicated road elevation. The dimensions and construction may vary, and will be determined based on the final design.

Box culverts may be used for the passage of All Terrain Vehicles (ATV) and snow machines, or for low volume secondary roads. The dimensions and construction may vary, and will be determined based on the final design.

2.3.2.8 Existing Infrastructure Removal

At this stage of the design, it is unknown if modification or removal of existing infrastructure, such as existing roads or buildings, will be required.

The former Highway 104 Roadway from approximately Brown's Mountain Road to east of Pushie Road may be removed following the construction of the new alignment. This is composed of a series of sub-activities and may include items such as removal and excavation of the existing pavement and culverts. Following the removal of the existing roadway, culverts will be removed and disposed of offsite if the culvert cannot be reused. The removal of culverts will follow similar procedures to the installation of watercourse crossing, as required (Section 2.3.2.9). Required approvals, authorizations and permits will be obtained prior to removal or demolition. It is anticipated that these permits, approvals, notifications and authorizations will be the responsibility of the selected Proponent.

Removal of buildings may be required as part of construction, and includes the termination of water and sewage services, as required. If needed, any wells will be decommissioned following the *Nova Scotia Water Well Decommissioning Guidelines* pursuant to the *Environment Act* (NSE 2007). Required municipal or provincial approvals, authorizations and permits will be obtained prior to removal or demolition. It is anticipated that these permits, approvals, notifications and authorizations will be the responsibility of the selected Proponent.

Any waste from removal of existing infrastructure will be handled in accordance with the *Environment Act* and the *Solid Waste-Resource Management Regulations*. Additional waste recovery and disposal efforts are further outlined in Section 2.3.2.14.

2.3.2.9 Installation of Watercourse Crossings or diversions

The proposed alignment contains over 60 watercourses or drainages that will require either the construction and installation of new watercourse crossings or the extension or upgrading of existing culverts. The size and type of watercourse structure constructed (e.g., bridge or culvert – open or closed bottom) at these crossings will depend on factors including, but not limited to:

- the size of the watercourse and its floodplain;
- calculation of a minimum 1:100 year estimated storm flow;

- considerations for extreme events related to climate change;
- considerations for the presence of fish habitat;
- the necessity for fish passage for specific species; and
- the necessity (in select locations) for terrestrial passage by other species, such as deer, moose or wood turtles.

The dimensions and construction may vary, and will be determined based on the final design. Details on bridge construction is provided in Section 2.3.2.7.

Watercourse crossings, where culvert installations are applicable, will be constructed in accordance with applicable legislation, NSTIR's *Standard Specifications*, and guidelines, such as the *Watercourse Alterations Standard* (NSE, 2015a). These activities generally entail the implementation of sedimentation and erosion control measures, excavation to ensure installation occurs along a uniform slope, installation of the culvert, and backfilling to return the streambed to its natural elevation. Construction and installation typically occurs in the dry (i.e., in the absence of flow) to reduce impacts to aquatic resources. This is accomplished by temporarily diverting stream flow around the construction area. In-stream construction will be conducted during low-flow periods (i.e., between June 1 and September 30) as identified by NSE and DFO to minimize impacts fish and fish habitat including fish spawning, incubation, and hatching. Culverts will be aligned with the existing watercourse channel and installed at a proper slope, within a straight section of the watercourse, in the direction of stream flow, and extend a minimum of 0.3 m beyond the upstream and downstream toe of fill and rip-rap. Typically excavators will be used for the installation of culverts.

For fish bearing watercourses, the design and construction of new culverts and upgrading of existing culverts must meet the fish passage requirements pursuant to the *Fisheries Act*, for watercourses that provide suitable fish habitat or where fish presence is known. The *Guidelines for the Design of Fish Passage for Culverts in Nova Scotia* (DFO, 2015) recommends the use of open bottom in watercourses supporting fish or fish habitat, since the streambed remains intact, resulting in less disturbance to aquatic resources. Open bottom structures (e.g., bottomless pipe arches and open-bottom box culverts) may be constructed of metal, concrete or rot-resistant wood. These structures must be founded on continuous footings supported by footings extending below the thalweg depth (i.e., the deepest part in the channel). Excavation will occur prior to placement of footings. After the structure is installed, rip-rap will be placed at both ends of the culvert to protect the inlet and outlet side slopes from erosion. Approved materials will be placed around the culvert in order to return the streambed to its natural elevation and support the structure and road above it. To prevent dewatering of the streambed, backfilling via compactible lifts not exceeding 0.3 m each are recommended.

Closed bottom structures are an alternative type of watercourse crossing to open bottom culverts. While closed bottom structures are typically the most economical watercourse crossing, they pose greater risks to fish passage if designed or installed incorrectly. Examples of closed bottom structures include concrete box culverts, metal pipe arch culverts, corrugated metal pipe round

culvert, and circular concrete culverts. As indicated in the *Guidelines for the Design of Fish Passage for Culverts in Nova Scotia* (DFO, 2015), installation of these culverts are better suited for watercourses which do not provide suitable fish habitat or where fish presence does not occur.

The construction of permanent and temporary watercourse diversions may be required prior to installation of watercourse crossings which require instream work, in order to reduce impacts to fish and fish habitat. This will be dependent on the Project's final design and alignment.

Temporary watercourse diversion channels should be constructed parallel to the existing channel, to reduce sedimentation impacts to aquatic resources and should be excavated in absence of water flow, beginning at the downstream portion and working upstream. Two earthen plugs will be left at each end of the excavated channel. The diversion channel will then be stabilized with protective rock, plastic, or geotextile. Following stabilization, the downstream earthen plug will first be removed followed by the upstream plug to divert water flow from the natural to temporary channel. A barricade, such as a cofferdam, will be placed in the upstream and downstream portions of the temporary channel to contain the water and inhibit backflow into the construction area. Upon completion of the watercourse crossing, water will be re-directed to the original channel, the diversion channel will be filled in and stabilized. Similar measures should be applied for permanent diversions; however, the need and locations for such diversions are not known at this time. Watercourse diversions will be constructed in accordance with NSTIR's *Standard Specifications*, the NSE *Nova Scotia Watercourse Alterations Standard* (NSE, 2015a) and with guidance from DFO.

It is anticipated that a *Watercourse Alteration Notifications or Approvals* from NSE will be required prior to constructing watercourse crossings or diversions. It is also anticipated that DFO *Fisheries Act Authorization* and an *Offsetting / Compensation Plan* will be required pursuant to Section 35 (2) of the *Fisheries Act* to offset the potential for serious harm to Commercial, Recreational, or Aboriginal (CRA) fisheries.

2.3.2.10 Wetland Alterations

A *Wetland Alteration Approval* from NSE will be required prior to the alteration of any wetland within the ROW. Where alteration to a wetland cannot be avoided, organic material within the ROW will be either partially or completely removed and replaced with suitable fill materials per the 'Swamp Excavation' methods described in NSTIR's *Standard Specifications*. Fill material should be clean, pH neutral and coarse (e.g., gravel or crushed rock). Side-cast or fill material should be placed above the ordinary high water mark of the wetland.

Excavation within a wetland should occur from the road shoulder whenever possible. Work in or directly adjacent to a wetland should utilize low impact techniques, such as wooden construction mats, to stabilize heavy machinery and reduce impacts to wetland habitat beyond the Project footprint. To further mitigate the risks associated with using heavy machinery on soft, wet ground, wetland alteration should be conducted during the winter whenever possible. Excavated soils or organic materials may be salvaged for use in wetland restoration projects or used for fill or dressing of slopes. If deemed unsuitable for such uses, excavated materials should be disposed of at an

approved disposal site according to applicable guidelines. Sedimentation and erosion measures should be implemented during construction to ensure that sediment loading does not occur in wetlands (or watercourses, which are frequently associated with wetlands). Such measures are discussed in detail in Section 8.2.4 and include, but are not limited to, reducing the time, slope, and area of exposed soils. The slope between the edge of the road and wetland or any areas where soil has been disturbed adjacent to the wetland will be stabilized and revegetated (Section 2.3.2.12) which will further reduce erosion and sediment loading into the wetland.

2.3.2.11 Rehabilitation / Site Restoration

During construction, there is a potential for areas to be altered that are not included in the Project footprint, such as access areas adjacent to watercourses for culvert installations. These areas will be restored similar to existing conditions following active construction of these areas. Rehabilitation / site restoration activities may include activities such as contouring, grading and placement of top soil, plus all applicable implementation of ESC measures. The final rehabilitation will be depended on the final design which is to be completed at further stages of the Project. Following the rehabilitation of these areas, the area will be revegetated as further outlined in Section 2.3.2.12.

2.3.2.12 Revegetation

Stabilization of exposed soil areas and slopes within the ROW is accomplished by revegetating these areas of impact. Revegetation predominantly entails hydroseeding, but may also include the application of mulch, temporary or permanent erosion mats, dressing with reclaimed vegetation, wetland soils or other organics excavated from within the Project footprint, and planting of native vegetation. Hydroseeding is a slurry of seed, fertilizer, hydraulic mulch, binder, water, and other components as required, which are prepared on-site in a tank (truck or trailer mounted) and sprayed onto exposed soils and slopes.

The NSTIR's *Standard Specifications* outlines several guidelines for hydroseeding during construction, among which include the following:

- hydroseeding will be conducted as soon as possible upon completion of surface preparation;
- dressing of slopes will occur as areas are completed so that hydroseeding can be implemented as work progresses;
- hydroseeding will not be permitted on hardened or crusted soil;
- hydroseeding is not to occur during high winds, high rainfall, or a severe drought;
- hydroseeding shall not be performed on areas covered by standing water, on frozen surfaces, or under other adverse conditions as determined by an Engineer;
- the hydroseed mix will be prepared on site in an appropriate tank, applied uniformly to soils immediately following preparation, and should not be left in the tank for more than 6 hours prior to use; and
- hydroseeding should be followed by the application of straw or hay mulch (or erosion control blankets) within 24 hours of application.

NSTIR's *Standard Specifications* also outlines requirements for sodding during road construction. According to this standard, areas which require sodding will first be raked and spread with at least

75 mm of approved topsoil, followed by lime, and fertilizer. After sod has been uniformly laid, it should be watered twice a day for at least seven days and watered for an additional fourteen days. Any sods laid on slopes will be secured by wooden pegs and wire mesh. It is expected that application of sod will be minimal, and is only foreseeable in the vicinity of roundabouts to be installed at current and proposed interchange locations.

2.3.2.13 Erosion and Sediment Control

To reduce risks associated with erosion and sedimentation and water management, the Proponent will be responsible for ensuring that construction activities are implemented in accordance with the following standards and guidelines:

- NSTIR's *Standard Specifications* (NSTIR, 1997 and updates);
- NSTIR's *Generic EPP* (NSTIR, 2007);
- *National Guide to Erosion and Sediment Control on Roadway Projects* (TAC, 2005);
- *Synthesis of Environmental Management Practices* (TAC, 2014); and
- *Nova Scotia Watercourse Alterations Standard* (NSE, 2015a).

The Proponent will also be responsible for developing and enforcing an *ESC Plan* to reduce erosion, run-off and sediment loading as a result of construction activities. Examples of mitigation measures to reduce erosion and sedimentation during construction are outlined in Chapter 8 and may include, but are not limited, to the following:

- Minimizing the amount of soil exposed and the duration of exposure;
- Reducing the length and steepness of slopes;
- Planning construction activities so that only active areas are exposed at any given time;
- Stabilize slopes and re-establish vegetation directly following completion of construction activities, such as grading;
- Keeping soil covered with mulch, temporary or permanent vegetation;
- Utilizing diversion techniques or structures to re-direct surface run-off from exposed soils; and
- Construction of sedimentation basins or traps to control sedimentation.

Water management practices that include provisions for proper drainage during construction will be required. It is the responsibility of the Proponent to develop and ensure compliance with ESC practices. Drainage control is essential for reducing erosion and promoting sediment retention during construction activities. Measures to control the drainage surface water within the ROW may include constructing:

- Ditches;
- Diversion ditches;
- Cross drainage culverts;
- Flow checks (ditch blocks); and
- Settlement ponds.

All measures, such as ditches and settlement ponds, are to be completed to design specifications and will depend on the final design configuration.

2.3.2.14 Waste Recovery / Disposal

Materials excavated or as a result of construction activities will be reused within the highway construction corridor whenever possible. NSTIR's *Standard Specifications* and NSTIR's *Generic EPP* will be followed and includes waste storing and storage practices. All waste will be sorted and stored following applicable legislation. Domestic wastes, such as food scraps and other garbage will be stored in covered containers to reduce interactions with wildlife. The Proponent will ensure that no litter (including food waste) is left in ROW or Project areas. Temporary storage areas for such waste, if necessary, shall be stored at least 30 m from waterbodies and 60 m from wells.

Non-salvageable material, such as limbs and non-merchantable timber, may be chipped and reused within the ROW, such as for wetland restoration projects or used for fill or slope stabilization. With approval, large items that are unable to be chipped, such as tree stumps, are occasionally buried on within the ROW.

Material that that is not suitable for the purposes of construction or fill will be disposed of off-site in compliance with applicable legislation, NSTIR's *Standard Specifications*, and conditions as outlined during the design phase. If potentially acid generating bedrock is discovered, management and disposal of these materials will be required to be in compliance with the *Sulphide Bearing Material Disposal Regulations*.

Disposal sites will be determined by the Proponent at an approved disposal facility and approved by NSTIR prior to disposal. These disposal site could likely be outside of the ROW. Any disposal of waste will be done so in compliance with current legislation, issued permits, approvals and authorizations and in accordance with NSTIR's *Standard Specifications* and NSTIR's *Generic EPP*.

2.3.3 Operation and Maintenance

Activities anticipated during Operation and Maintenance include the following:

- Highway operation (i.e., Traffic);
- Highway maintenance (i.e., Snow removal, sanding, and salting);
- Infrastructure maintenance (minor); and
- Vegetation management such as vegetation removal, mowing, and planting.

2.3.3.1 Highway Operation

The proposed highway will operate as a new four-lane divided highway. The speed limit will be posted at 110 km/hr. The traffic volumes expected within the Highway 104 corridor are not expected to increase as a result of the twinning Project (CBCL, 2017); however, safety performance and collision reductions are expected as a result of the Project. This would be due to an expected reduction of accidents such as intersection-related, angle, and head-on collisions and some reduction in single vehicle, rear-end, and sideswipe collisions (CBCL, 2017).

2.3.3.2 Highway Maintenance

Highway maintenance generally includes the activities to maintain the safe use of the highways, for example snow removal and ice control. The removal of snow and control of ice helps reduce traffic

disruptions and safety hazards. These services are anticipated to be provided by the Proponent.

Activities may include the following:

- Operation of heavy equipment (sand/salt, and plows);
- Snow plowing;
- Sand application; and
- Salt application (Salt and pre-wetting).

Winter driving hazards, such as snow and ice, are mitigated by the application of salt and sand to the roadway to increase traction. Salt is often used to maintain clear driving lanes following precipitation events such as snowfalls or storms. The placement of salt is expected to occur shortly after the precipitation / storm event. However, the application of a sodium chloride (NaCl) brine solution can also be used ('pre-wetting') prior to the application of granular salt. Pre-wetting is used as a first alternative to granular salt to reduce potential loss of road salts applied to highways as a result of wind and traffic disturbance. Other materials, such as sand, are used to increase traction as a result of driving hazards such as snow-packed or icy roads. Sand may also foreseeably be used during conditions where salt is expected to be less effective (i.e., in temperatures below -10°C), or where susceptibility of salt intrusion into groundwater wells is a consideration.

The locations of equipment and materials to be used during the highway Operations and Maintenance phase are not known at this time, could be located at new or existing facilities. The need for additional storage locations have not been determined at this stage of the Project design.

NSTIR has implemented a *Salt Management Plan (SMP)*, in accordance with Environment Canada's *Code of Practice for the Environmental Management of Road Salt*. This plan includes best management practices to provide safe, and cost effective roadway management systems while reducing the use and potential impacts from salt. Best management practices include timing of salt placement for example pre-wetting and application of salt prior to storm events, which act as an 'anti-icing' exercise rather than a 'de-icing' exercise.

In addition, NSTIR has implemented the following initiatives to manage the use of road salt. Some of the implemented initiatives include:

- Increased covered storage capacity for salt/sand storage locations and structures;
- Installation of road weather information system (RWIS) sites;
- Development of winter maintenance standards which include a measurable level of service for ice and snow removal to all areas of Nova Scotia; and
- Upgrading of equipment, such as a salt spreading truck fleet, which includes computerized salt controls; infrared pavement temperature sensors, and pre-wetting capability for release of a sodium chloride (NaCl) brine solution.

2.3.3.3 Infrastructure Maintenance

Infrastructure maintenance activities are to occur during the operation of the proposed highway. The effect and disruption to the public from these repairs is anticipated to be temporary and

infrequent. The activities typically occur during the summer months and are required to maintain service, and safety such as:

- Asphalt and pavement repair;
- Guardrail maintenance and repair;
- Shoulder grading / shoulder repair;
- Embankment and cutslope stabilization;
- Erosion prevention and water/sediment management;
- Inspections of watercourse crossings and infrastructure such as bridges and culverts;
- Marking and painting; and
- Signage and lighting.

Each of these activities may be composed of a series of sub-activities. Asphalt and pavement repair may include sub-activities such as removal and excavation of the existing pavement and subgrade material; asphalt patching; leveling; grading; placement of fill materials; surface treatment; and milling/overlay of asphalt. Shoulder grading / shoulder repair may include similar activities as Asphalt and pavement repair, but specifically include placement of fill materials and grading. Water management activities may include the periodic maintenance of roadway drainage systems such as culvert replacements and the re-establishment of local drainage ditches. Other minor activities such as line repainting and replacement of signage and lighting is will also occur; however, disruption to the public from these activities will be temporary.

2.3.3.4 Vegetation Management

Vegetation management is an important aspect of the highway operations; as vegetation regrowth can restrict lines of sight and affect safe use of the highway. Clearing of vegetation along the ROW will be completed as part of regular maintenance. Clearing may use both manual and mechanical removal. Vegetation management techniques, such as use of minimal maintenance plant species and control of noxious weeds, will be implemented. Herbicide may only be used only under the guidance of NSTIR's *Integrated Roadside Vegetation Maintenance (IRVM)* program and NSE pesticide application approvals. Herbicide will not be permitted within the following conditions:

- Within 30 m of a bank or ordinary high water mark of any watercourse; and
- Within 60 m of a water well, surface watercourses or protected water supply used for a water supply.

2.3.4 Deactivation of Portions of Current Highway 104

The proposed highway is not expected to require decommissioning, as it will be required for an indefinite amount of time. However, a segment of the former (upon commissioning of the new highway) Highway 104 roadway from approximately Brown's Mountain Road to east of Pushie Road may be removed from service following the Project's commissioning. These activities are included in the Construction phase activities detailed in Section 2.3.2. Any future decommissioning activities related to the four-lane highway to be constructed, if required, will be completed in compliance with the applicable laws, regulation and guidelines that are current at that point in time.

2.4 Environmental Design Considerations

The following environmental design considerations will be incorporated into the final design in addition to NSTIR's *Generic EPP*, applicable design criteria following TAC or CSA standards, and Project-specific mitigation measures:

- NSTIR *Standard Specification* (NSTIR, 1997 and updates);
- Nova Scotia *Temporary Workplace Traffic Control Manual* (Government of Nova Scotia, 2018);
- *Guide to Considering Climate Change in Project Development in Nova Scotia* (NSE, 2011c);
- NSE's *Watercourse Alterations Standard* (NSE, 2015a);
- NSE's *Guide to Altering Watercourses* (NSE, 2015b);
- DFO's *Guidelines for the Design of Fish Passage for Culverts in Nova Scotia* (DFO, 2015); and
- NSE's *Water Well Decommissioning Guidelines* (NSE, 2007).

2.5 Environmental Management

The implementation of an effective environmental management program is a critical component to the success of a Project. NSTIR is committed to designing, constructing, and maintaining projects that reflect environmental protection and management. Some of the initiatives that have been identified include the following:

- Following an environmental protection plan (EPP) of 100 Series Highways (*Generic EPP*);
- Developing Project-specific plans outlining NSTIR's commitments to regulatory agencies, the public, and the Proponent;
- Inspections and monitoring requirements to confirm compliance with environmental legislations, standards, and approvals – including the Class 1 EA approval and wetland / watercourse alteration approvals; and
- Compensation and offsetting requirements for lost or damaged habitat.

The *Generic EPP for the Construction of 100 Series Highways (Generic EPP)* was developed to provide an overview of NSTIR's commitment for the construction of 100 Series Highways, and complements additional Project-specific plans to be developed by the Proponent, such as *Project-Specific EPPs* and *Environmental Control Plans* (NSTIR, 2007). The *Generic EPP* contains the following components to address environmental interactions that may occur during highway construction:

- Best management practices (BMPs);
- ESC measures;
- Spill contingency plans;
- Winter clearing protocols;
- Access Road Specifications; and
- NSTIR's *Salt Management Plan*.

The Project-specific *Environmental Protection Plan* and other associated plans will be developed by the Proponent, and be employed throughout the Project. The plans are to include measure to

address the specific terms and condition as a result of government approvals, authorizations and permits. These plans will be updated periodically and will include emergency response to spills and unplanned events such as chance finds of archaeological and heritage resources, fire, storms and other natural events or emergencies. The Proponent will maintain training and reporting requirements throughout the course of the Project, in order to comply with NSTIR’s *Generic EPP*, and Volume 4 of NSTIR’s *Health, Safety and Environmental Program*.

Depending upon specific circumstances, the Proponent will implement compensation, follow-up monitoring and inspections as required for these plans and programs. Compensation programs may include compensation for the acquisition of land or for the loss of habitat as a result of the Project. Monitoring and follow-up programs are identified in Chapter 8 during the effects assessment and a summary is included in Chapter 9.

The Proponent will be expected to comply with the requirements of these plans, the *Generic EPP*, any specific Project plans, and all terms and conditions of government approvals and authorizations – including the Class 1 EA approval being applied for presently.

2.6 Project Schedule

The proposed Project schedule (Table 2.1) has not been finalized at this stage of the Project and will be subject to change, dependent on procurement timelines in securing a Proponent to undertake the Project.

Table 2.1 Project Schedule

| Project Task | Start | Completion Date |
|---|---------|-----------------|
| Project Design and Development | 2017 Q4 | 2018 Q3 |
| Environmental and Regulatory Consultation | 2018 Q1 | 2018 Q4 |
| Community Consultation | 2018 Q4 | 2019 Q2 |
| Field Reconnaissance and Surveys | 2018 Q2 | 2018 Q3 |
| Environmental Assessment Compilation | 2018 Q1 | 2018 Q4 |
| Environmental Assessment Government Review | 2018 Q4 | 2019 Q1 |
| Regulatory Applications (e.g., Wetlands, Watercourses) | 2020 Q2 | 2021 Q3 |
| Construction Specifications & Tendering | 2018 Q1 | 2020 Q2 |
| Site Preparation (Tree Clearing) | 2019 Q3 | 2020 Q2 |
| Site Preparation (Remaining Activities) and Construction and Environmental Monitoring During Construction | 2020 Q2 | 2024 Q4 |

The detailed design of the project is scheduled to be initiated in 2019. Following the Class 1 EA approval, selection of a Proponent through the tendering process, and initiation of detailed Project design, the Proponent will commence regulatory requirements for the provincial and federal environmental approvals, such as watercourse and wetland alterations.

Site Preparation activities could be initiated in the winter of 2019 (specifically, tree clearing). Construction activities will be scheduled to avoid potential interactions with Valued Ecological Components (VECs) during biologically sensitive periods such as bird breeding periods and fish migration periods. Project-specific mitigation measures will be implemented to minimize potential effects and include conditions and requirements from received permits and authorizations. These may include the following:

- Instream work to be completed from June 1 through September 30 or per approved Nova Scotia *Water Approvals* and DFO *Fisheries Act Authorizations*; and
- All vegetation clearing to occur outside of the regional nesting window mid-April to late August or only following pre-clearing bird nest surveys by a qualified biologist. If an active nest is found, no disturbance zones will be established and remain undisturbed until the nest is non-active.

Construction is anticipated to take approximately three to seven years and will depend on the final delivery method for the Project. Highway operations are expected to occur indefinitely with no plans for decommissioning for the proposed Project.

CHAPTER 3

Aboriginal Consultation and Engagement

3.1 Overview

Successful projects incorporate the key concerns identified during stakeholder consultation and aboriginal engagement throughout the design and environmental assessment processes. Though highway projects are typically undertaken to improve safety and transportation of people and goods, it is important to consider the concerns, needs and benefits of the public and other stakeholders as early as possible.

The following were identified as key groups or stakeholders, with which participation has occurred:

- Regulatory agencies;
- Aboriginal groups and First Nations; and
- the Public.

The following section outlines the activities completed to date, and future proposed activities.

3.2 Regulatory Consultation

Provincial and federal regulatory agencies have been consulted and have participated in activities throughout the planning and environmental assessment development processes. During the feasibility phase of the Project, a regulatory review was completed and it was determined that a Class 1 environmental assessment would be required under the provincial *Environment Act*. Environmental field programs for wood turtles, moose and bats were developed with input from NSDNR Wildlife Division throughout the 2016 to 2018 program.

A Project Brief was developed on January 24, 2018 and provided to provincial and federal regulatory agencies including NSE – Environmental Assessment Branch, NSE – Regional offices (Pictou & Antigonish), NSDNR – Wildlife Division, NSDNR – Eastern Region, DFO – Fisheries Protection, NSCCH – Heritage Resources, and the Canadian Environmental Assessment Agency.

On February 28, 2018, a Regulatory Workshop and presentation was provided which included several EA-related topics for discussion and comment. The attendees included CBCL, NSTIR, Davis - MacIntyre & Associates, NSE – EA Branch, NSE – Regional offices (Pictou & Antigonish), NSDNR – Wildlife Division, NSDNR – Eastern Region, DFO – Fisheries Protection, NSCCH – Heritage Resources, and the Canadian Environmental Assessment Agency. The topics highlighted included the following:

- Description of the Project;
- Description of the Environmental Setting;
- Valued Environmental Component Selection; and
- Regulatory Requirements and Path Forward.

Feedback on the Project was provided during and following the workshop, the regulatory agencies provided technical and regulatory advice on scope of assessment, survey protocols and mitigation/compensation.

The Canadian Environmental Assessment Agency found that based on the information provided, the proposed Project does not appear to be described as a ‘designated project’ in the *Regulations Designating Physical Activities* under CEEA 2012, and therefore, under such circumstances, would not be required to submit a project description to the Canadian Environmental Assessment Agency. However, NSTIR was advised to review the Regulations and contact the Canadian Environmental Assessment Agency if, changes in either the project or the Regulations may apply to the proposed Project. In turn on March 6, 2018, a letter was provided by the Agency, indicating the exempt status of the Project.

A follow-up meeting was completed with NSDNR On September 25, 2018 to provide an update on field work completed in 2018 for the Project, provide an update to the project description and discuss the requirements for wildlife passage and other topics for discussion and comment. Attendees included NSTIR, NSDNR, and CBCL. The topics highlighted included the following:

- Updates related to the description of the Project;
- Updates related to field programs completed and key findings; and
- Conversation related to the topic of wildlife passage.

Feedback on the field programs completed and key findings indicated that the completed field programs would be suitable for the requirements of the Environmental Assessment. Suitable parameters for wildlife passage could not be confirmed during the meeting. NSTIR has committed to working with NSDNR to develop a plan for wildlife passage and associated monitoring protocols and reporting.

Additional follow-up with NSDNR has been conducted in order to establish acceptable protocols for mapping and reporting of identified occurrences of Species of Conservation Concern and Species at Risk, particularly for non-mobile species such as plants and lichens.

Regulatory consultations are on-going and summary of activities will be provided, as necessary, to NSE.

3.3 Aboriginal Engagement

Introduction of the Project to the Kwikw'wakw Maw'klusuaqn Negotiation Office (KMKNO) was initiated in 2016 with an introductory letter at the feasibility study phase. Aboriginal consultation and engagement for the purposes of the environmental assessment was initiated for the Project by a letter dated January 30, 2018 sent to the KMKNO, Acadia First Nation, Annapolis Valley First Nation, Eskasoni First Nation, Glooscap First Nation, Lsitkuk (Bear River) First Nation, Membertou First Nation, Millbrook First Nation, Paq'tnkek (Afton) First Nation, Pictou Landing First Nation, Potlotek (Chapel Island) First Nation, Sipekne'katik First Nation, Wagmatcook First Nation and Waycobah (Whycocomagh) First Nation. A reminder email was sent to KMKNO, Millbrook First Nation and Sipekne'katik First Nation on February 15, 2018. A reminder letter was also sent to KMKNO, Millbrook First Nation and Sipekne'katik First Nation on May 25, 2018.

Davis-MacIntyre & Associates, the firm responsible for completing the Archaeological Resource Impact Assessment for the Highway 104 project, contacted KMKNO on February 13, 2018 to request information regarding past and traditional Mi'kmaq land use in or near the Project Area. As of the date of submission of the ARIA report to NSCCH no response had yet been received.

Since this time, NSTIR has been involved in ongoing correspondence with the KMKNO, and Paq'tnkek and Pictou Landing Mi'kmaq First Nations.

The project was discussed at KMKNO's bi-monthly update meetings with the Nova Scotia Office of Aboriginal Affairs (OAA) on March 20, 2018 and May 22, 2018.

The project was discussed at Sipekne'katik's bi-monthly update meetings with OAA on February 7, 2018 and April 11, 2018.

A written response was provided by KMKNO to NSTIR in September 2018. At that time, KMKNO requested that baseline study reports be provided for review when they are available. These include but are not limited to archaeology reports, biological reports and a completed Mi'kmaq Ecological Knowledge Study. It was also noted that the execution of the Project should not preclude present and future use or reference to Aboriginal and Treaty Rights.

NSTIR commissioned the Confederacy of Mainland Mi'kmaq (CMM), which formerly conducted environmental studies under the name Mi'kmaq Environmental Services, to provide a Mi'kmaq Ecological Knowledge Study (MEKS) for the Highway 104 New Glasgow to Aulds Cove in 2004 (Mi'kmaq Environmental Services, 2004). This report included the Highway 104 Sutherlands River to Antigonish portion, however; it did not include the present location of the proposed new four-lane alignment. A summary of the findings is provided in Section 5.8.2.

NSTIR has commissioned a MEKS in 2018 and the study is on-going, and will be completed in early Summer 2019, prior to construction. The MEKS study documents the historic and current Mi'kmaq land and resource use, evaluates the potential impacts on the identified uses as a result of the

Project, evaluates the significance of these potential impacts, and provides recommendations for appropriate mitigation of impacts upon traditional land use. The MEKS will describe the baseline conditions for current use of lands and resources for traditional purposes within the Project Area and assessment area, and will include the following:

- Mi'kmaw Land and Resources Use Sites (i.e., Kill / Hunting, Burial / Birth, Ceremonial, Gathering Food / Medicinal, and Occupation / Habitation);
- Plants of Significance to Mi'kmaq; and
- Mi'kmaw Communities.

Aboriginal consultations are on-going and summary of activities will be provided, as necessary, to NSE.

3.4 Public Consultation

NSTIR has endeavoured to integrate the needs of Nova Scotians within the scoping of the Project. NSTIR has sought feedback and concerns from local stakeholders at various points in Project development, from the conceptual design of the project through to present. Some of these efforts whether previously undertaken, in progress, or in the planning stages, are further documented in this Section. These include:

- 2017 - Nova Scotia Highway Twinning Consultations;
- 2018 - Public Information Session; and
- 2018 – Other Stakeholder Consultation

3.4.1 Nova Scotia Highway Twinning Consultations

Following an Operational and Safety Review of 3 of the 100 series highways, including Highway 104, NSTIR commissioned CBCL to study eight individual corridors for further consideration in terms of twinning. Following the completion of this study in 2017, NSTIR wanted to provide Nova Scotians an opportunity to hear about the study findings with and gather their feedback (Appendix B).

Based on these consultations, NSTIR received wide support from the towns and municipalities, and the majority of residents in these areas who participated in the consultation process supported the Project and noted that twinning was the best and only solution to improve the highway. The consultation effort in 2017 also include an assessment of tolling as a means to allow the Project to occur more quickly.

3.4.2 Public Information Session

Two public information sessions / open houses were held, one in Antigonish and one in Stellarton, NS. The purpose of the public information session / open house was to provide information on the proposed Project to the general public, and to those people whose environment and property may be affected. A key objective of these sessions is to document and respond to questions and seek feedback from the local community.

The Antigonish public information session / open house was held from 16:00 to 19:00 on November 6, 2018, in the MacKay Room of the Bloomfield Centre at St. Francis Xavier University. This session was well attended with approximately 153 participants attending. Invitations to the public information session / open house were provided to the KMKNO, Chief and Council of the Pictou Landing First Nation, and Chief and Council of the Paq'tnkek (Afton) First Nation.

The Stellarton public information session / open house was held from 16:00 to 19:00 on November 7, 2018, at the Holiday Inn Express at 86 Lawrence Boulevard. The meeting was well attended with approximately 114 participants attending. Invitations to the public information session / open house were provided to the KMKNO, Chief and Council of the Pictou Landing First Nation, and Chief and Council of the Paq'tnkek (Afton) First Nation.

Both the Antigonish and Stellarton public information sessions / open houses included a series of poster boards highlighting the concept of the Project, the need for the Project, how the Project will be delivered, and a summary of the environmental assessment process. At each session, participants were provided with a fact sheet summarizing the Project, and a comment and feedback form. Generally, the participants were in support of the Project, including the increase in safety as a result of the Project. Questions from the participants were identified in the following main themes:

- Project General;
- Project Design;
- Environmental Assessment;
- Environmental Studies;
- Environmental Authorizations, Permits and Approvals; and
- Land Use.

A summary of the feedback received during both sessions is provided in Section 3.5, with additional details provided in Appendix B.

Public consultations are on-going at the time of EA submission. A summary of activities will be provided, as necessary, to NSE.

3.4.3 Consultation during Design, Construction and Operation and Maintenance

If required by NSE as part of the Environmental Assessment Process, NSTIR will delegate the successful Proponent to complete further consultation during the design of the Project. This will be intended to provide a pathways for the public to provide concerns about the Project, such as potential effects of the Project on the community and documentation of concerns which develop as a result of the design, construction, operation and maintenance. The selected Proponent will be responsible for the coordination and collection of the input and concerns of the public.

Consultation will be on-going and summary of activities will be provided, as necessary, to NSE.

3.4.4 Other Stakeholder Consultation

NSTIR has engaged some other stakeholders, which may be effected by the proposed Project, specifically trail users. On August 30, 2018, NSTIR met with ATV Association of Nova Scotia (ATVANS) and Snowmobilers Association of Nova Scotia (SANS). In this meeting, NSTIR presented the current concept plans for the project. As part of the discussion, ATVANS and SANS identified two areas where they would like NSTIR to provide trail crossings.

NSTIR is evaluating the request within the conceptual design, and the current plan is to provide crossings near the two locations identified. These crossings may also be constructed so that they can be used for both these users groups and as wildlife crossings.

3.5 Summary of Engagement Activities

The engagement activities to date suggest that there is general support for the twinning of Highway 104 overall, as the project is proposed to improved safety. Question and concerns that have been identified through regulatory, Aboriginal and public engagement have included the following themes:

- Project General;
- Project Design;
- Environmental Assessment;
- Environmental Studies;
- Environmental Authorizations, Permits and Approvals; and
- Land Use.

A summary of questions and concerns raised as a result of engagement activities and location of where they are addressed in the Environmental Assessment are presented in Table 3.1.

Table 3.1 Summary of Questions and Concerns

| Theme | Summary of Questions and Concerns | Location Addressed in the EA General Responses, and Locations where addressed in the EA |
|-----------------|---|--|
| Project General | Start of Construction | Fall of 2019 with tree clearing. Remainder of Project anticipated to proceed after design in 2020. Addressed in: Section 1.4 and Section 2.6 |
| | Completion of Construction | 3-7 years from the start of construction, estimated to be 2024. Addressed in: Section 1.4 and Section 2.6 |
| Project Design | Highway Crossings for ATV and Snowmobiles | Crossings have been identified as part of the conceptual design. The locations and number of these will be determined in the final design. |

| Theme | Summary of Questions and Concerns | Location Addressed in the EA General Responses, and Locations where addressed in the EA |
|--------------------------|-------------------------------------|---|
| | | Addressed in: Section 2.3.2.7 and Section 8.1.8 |
| | Wildlife Passage | Wildlife passage is identified within the Project; however the amounts and specific locations are to be determined during detailed design. Addressed in: Section 2.2.7 |
| | Watercourse Crossing | There are over 60 watercourse crossings anticipated; however, the final number will be determined during detailed design. Addressed in: Section 2.2.3 |
| | Land acquisition | NSTIR is presently in the process of contacting Landowners. Addressed in: Section 1.6 |
| Environmental Assessment | Why do an Environmental Assessment? | Project qualifies as a Class 1 Undertaking, therefore requiring an Environmental Assessment under the <i>Environment Act</i> . Addressed in: Section 1.5 |
| | Noise | Noise has been assessed as part of the Environmental Assessment. Addressed in: Section 5.1.2 and Section 8.1.1 |
| | Air Quality | Air quality has been assessed as part of the Environmental Assessment. Air contaminants reviewed include fine particulate matter – PM _{2.5} (particles having diameters of 2.5 micrometers or smaller). A specific inquiry was made by one individual about the assessment of rubber particulate, this was not specifically assessed. Addressed in: Section 5.1.1 and Section 8.1.1 |
| | Mitigation Measures | Mitigation measures have been identified as part of the Environmental Assessment. These include a series of broad measures intended to protect the overall environment, as well as specific mitigations for each assessed environmental component (e.g., dust suppression plan and measures, and planting practices). Addressed in: Section 8.2 |

| Theme | Summary of Questions and Concerns | Location Addressed in the EA General Responses, and Locations where addressed in the EA |
|---|--|---|
| Environmental Studies | What studies were completed as part of the Environmental Assessment? | <ul style="list-style-type: none"> • Vegetation and Lichen Surveys • Wetland Assessments • Breeding Bird and Owl Surveys • Ungulate Surveys • Fish and Fish Habitat Surveys • Species at Risk Assessments • Wood Turtle Surveys • Bat Surveys • Mainland Moose Surveys • Archaeological Resource Inventory Assessment • Project Ecological Land Classification • Noise Study <p>Addressed in: Chapter 5</p> |
| | Endangered species | <p>Endangered species were assessed during the Environmental Studies, and taxa such as mainland moose, wood turtles, flora and birds were studied and occurrences of the species were documented.</p> <p>Addressed in: Chapter 5</p> |
| | Geotechnical studies | <p>Geotechnical studies have been completed and will be used for project design; however, these reports were not available for the purposes of the Environmental Assessment.</p> |
| Environmental Authorizations, Permits and Approvals | Required approvals | <p>Approvals will be required prior to construction, and will be dependent on the final design.</p> <p>Addressed in: Section 1.5</p> |
| | Wetland compensation requirements | <p>Wetland compensation will be required as part of any wetland alterations. All wetland alterations will be completed following the requirements of the <i>Environment Act</i>.</p> <p>Addressed in: Section 1.5</p> |
| | Replanting compensation for areas cleared for highway | <p>A broad replanting program has not been considered; however, the relocation of sensitive species, such as black ash may be used a part of the mitigation measures in consultation with NSDNR.</p> <p>Addressed in: Section 8.2, and Section 8.4</p> |

| Theme | Summary of Questions and Concerns | Location Addressed in the EA General Responses, and Locations where addressed in the EA |
|----------|-----------------------------------|--|
| Land Use | Use of Gravel Pits | The proponent to complete the work has not been selected at this time. The locations of aggregate sources, will be determined following project design and the selection of the proponent. |
| | Hunting | All hunting activities will need to be in compliance with appropriate legislation. Section 8.1.8 |

NSTIR (and the Proponent, once chosen) is committed to working with regulatory, Aboriginal and public interests throughout the Project design and implementation phases.

Environmental Assessment Scope and Methods

The proposed Project must be registered for an EA as a Class 1 Undertaking pursuant to Section 3(2) of the *Environmental Assessment Regulations* of the *Nova Scotia Environment Act*. This document fulfills the requirements for Project registration under this legislation and as outlined in *A Proponent's Guide to Environmental Assessment* (NSE, 2017). The assessment process, as outlined in this Chapter, will identify the existing conditions and sensitivities of the surrounding area (0) and how the Project Activities interact with this environment, and use this information to determine:

- Positive and negative environmental effects that the Project may cause; and
- Residual effects on the environment from the Project.

In general, the assessment will be focused on the following:

- Identifying environmental components of concern;
- Identifying regulatory requirements;
- Identifying and addressing concerns raised by the public and stakeholders;
- Integrating engineering design into environmental management planning, such as mitigation and monitoring plans;
- Assessing environmental effects; and
- Identification and assessment of residual effects.

The assessment will include the evaluation of potential environmental effects on environmental components through Site Preparation, Construction, and Operation and Maintenance (Chapter 8), as well as accidents and malfunctions (Chapter 7). Project related effects will be assessed within boundaries (temporal and spatial), which will be established for each selected environmental component for this assessment. The methodology for this assessment is described in the following sections.

There are no known requirements under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) as the proposed Project is not listed as a designated project per the *Regulations Designating Physical Activities* [Section 14]. This was confirmed by a letter from the Canadian Environmental Assessment Agency received on March 6, 2018. The Project is not expected to require an Environmental Assessment pursuant to Sections 67-72 of CEAA 2012; for example, Section 67

requires that a federal authority is responsible to make a determination regarding the significance of environmental effects of the Project, for any project occurring within their managed federal lands. Federal lands are not identified within the Project Area.

4.1 Scope of the Assessment

The scope of the Project includes the Project Phases (i.e., Site Preparation, Construction, and Operation and Maintenance,) as defined in Chapter 2, and other associated Project Activities and Physical Works as described within that section.

4.1.1 Scope

The Project Activities and Physical Works associated with each phase, as defined in Chapter 2, reflect the scope of the Project that is included in this assessment (Table 4.1). Refer to Chapter 2 of this Class 1 Registration for additional details regarding Project Phases.

Table 4.1 Description of Project Phases and Project Activities

| Project Phase | Project Activities / Physical Works |
|------------------|---|
| Site Preparation | <ul style="list-style-type: none"> • Vegetation Clearing; • Grubbing and Soil Management; • Waste Recovery; and • Erosion and Sediment Control Measures. |
| Construction | <ul style="list-style-type: none"> • Excavation; • Blasting; • Fill Placement and Compaction; • Ditch construction; • Bridge and Grade Separation Structure Construction (i.e., concrete placement); • Removal of Existing Infrastructure (i.e., existing buildings, if applicable); • Paving; • Highway Infrastructure: <ul style="list-style-type: none"> ○ Barrier installation; ○ Marking and painting; and ○ Signage, lighting; • Installation of Watercourse Crossings and Diversion; • Wetland Alterations; • Rehabilitation / site restoration of affected areas; • Revegetation (i.e., planting, and hydroseeding). • |

| Project Phase | Project Activities / Physical Works |
|---------------------------|--|
| Operation and Maintenance | <ul style="list-style-type: none"> • Highway Operation (Open and in use by public); • Highway Maintenance: <ul style="list-style-type: none"> ○ Waste Management; ○ Snow Removal; ○ Sanding; and ○ Salting. • Infrastructure Maintenance (minor): <ul style="list-style-type: none"> ○ Asphalt and pavement repair; ○ Guardrail maintenance and repair; ○ Shoulder grading / shoulder repair; ○ Embankment and cutslope stabilization; ○ Erosion prevention and water/sediment management; ○ Inspections of watercourse crossings and infrastructure such as bridges and culverts; ○ Marking and painting; and ○ Signage and lighting. • Vegetation Management: <ul style="list-style-type: none"> ○ Vegetation Removal; ○ Mowing; and ○ Planting. |

4.1.2 Valued Environmental Components (VEC) Identification

Early identification of potential effects is an important part of the Environmental Assessment process. This Project was initiated with potential environmental components of value as the focus for proposed studies and surveys. Valued Environmental Components (VEC) are environmental, biophysical, or human features that are of value or interest and which may be affected by the Project. These VECs have been identified because they may be of interest or concern to regulatory agencies, Indigenous peoples, key stakeholders, the EA study team, and the general public. The VEC assessment included their value within the ecosystem as well as their value to human interest.

Initial VECs were identified early within the Environmental Assessment process and updated throughout the assessment process. The methodology and rationale for selection of VECs included the following:

- Identification of the VECs' importance through the review of federal, provincial, and municipal legislation, policies and guidelines, as well as other bodies (i.e., COSEWIC and ACCDC); for example, Species of Conservation Concern (SOCC) were identified from the *Endangered Species Act*, SARA, COSEWIC, and ACCDC;
- Identification of VECs or lessons learned from other Environmental Assessments and available information or reports completed for nearby projects, or those which included similar Project Components or Project Activities;
- Identification of a potential interaction between the existing environment (i.e., physical, biophysical, land use, and cultural conditions) and Project Components or Project Activities within the Project area;

- Reviewing information obtained during a regulatory workshop (February 2018) and discussions with regulatory agencies, including NSE, NSDNR, NSCCH, DFO, and CEAA;
- Anticipated and raised concerns by Indigenous Peoples; for example, areas of land and resource use, plants of significance, and communities obtained through traditional ecological knowledge;
- Anticipated and raised concerns by the public and stakeholders through consultation efforts completed by NSTIR and the Nova Scotia Government; and
- Professional experience and judgement of the EA study team.

Based on selection criteria, the following potential VECs were selected to facilitate a focused and efficient evaluation (Table 4.2).

Table 4.2 Potential Valued Environmental Components (VEC) Identification

| Environment | Potential VEC | Specific Factors to be Considered | | |
|-------------------------|---|---|--|---|
| Atmospheric Environment | Air quality | <ul style="list-style-type: none"> • Air quality | | |
| | Noise | <ul style="list-style-type: none"> • Noise | | |
| | Climate Change / Greenhouse Gas Emissions | <ul style="list-style-type: none"> • Local climate and meteorology • Global climate change • Greenhouse gas emissions | | |
| Physical Environment | Geology and Soil Quality | <ul style="list-style-type: none"> • Geology, soils, and geochemistry | | |
| | Surface Water Quality and Quantity | <ul style="list-style-type: none"> • Surface water quality • Surface water quantity | | |
| | Groundwater Quality and Quantity | <ul style="list-style-type: none"> • Groundwater quality • Groundwater quantity | | |
| Biological Environment | Flora | <ul style="list-style-type: none"> • Plant communities • Vascular plant diversity and abundance • Lichen diversity and abundance • SOCC and habitat | | |
| | | Wildlife and Wildlife Habitat | <ul style="list-style-type: none"> • Wildlife (including migratory birds and owls) presence/absence • Wildlife habitat • Wildlife movement and landscape connectivity (i.e., corridors) • SOCC and habitat | |
| | | | Wetlands | <ul style="list-style-type: none"> • Wetland boundaries and classification • Wetland functions • Wetlands of Special Significance (WSS) • Use of wetlands by SOCC |
| | | | | Fish and Fish Habitat |
| | Species at Risk | <ul style="list-style-type: none"> • SOCC and habitat (aquatic and terrestrial) | | |
| | Land Use | <ul style="list-style-type: none"> • Current use of the land within and surrounding the Project area | | |

| Environment | Potential VEC | Specific Factors to be Considered |
|----------------------------|-----------------------------------|--|
| Socio-Economic Environment | | <ul style="list-style-type: none"> • Anticipated or foreseeable future land use • Areas, sites, structures, or things identified as having cultural significance (e.g., Areas of Plants of Significance to Indigenous persons) |
| | | <ul style="list-style-type: none"> • Use of lands and resources for traditional purposes by Indigenous persons |
| | Human Health and Safety | <ul style="list-style-type: none"> • Health and safety |
| Cultural Environment | Historical / Archaeological Sites | <ul style="list-style-type: none"> • Areas, sites, structures, or things identified as having historical, paleontological, archaeological, or architectural significance |

4.2 Environmental Assessment Methods

The Environmental Assessment methods have been designed to meet the requirements of the *Environmental Assessment Regulations* and the *A Proponent’s Guide to Environmental Assessment* (NSE, 2017). Each of the identified VECs will be assessed against the proposed project activities to evaluate potential environmental effects during each phase of the Project (i.e., Site Preparation, Construction, and Operation and Maintenance, as defined in Section 4.1.1), as well as potential accidents and malfunctions. The terms of this assessment will be compared to VEC-specific spatial and temporal boundaries, which details the timing and spacing of how the effect takes place. The criteria for determining the significance of an environmental effect and if a residual environmental effect is identified to be significant (i.e., an unacceptable change) is established specifically for each VEC.

The following section identifies the methodology used to evaluate each VEC. The VECs will be assessed using the environmental setting as described in 0. The assessment of each VEC is presented in Chapter 8.

4.2.1 Boundaries

VEC-specific spatial and temporal boundaries were determined for the geographical areas and time periods within which the VECs may interact or are likely to be influenced by the Project. Each identified environmental effect, either direct or indirect, was evaluated within these spatial and temporal boundaries. VEC-specific boundaries were selected, as they may vary among VECs.

The boundaries for spatial and temporal boundaries were developed using the following considerations:

- Timing and schedule of Project phases (i.e., Site Preparation, Construction, and Operations and Maintenance);
- Known ranges and natural variations of each VEC;
- Input from current and traditional land and resource use; and
- Timing required to recover from an environmental effect.

4.2.1.1 Temporal Boundaries

The temporal boundaries identify the duration or timing of environmental effects to the identified VECs during Project activities. The temporal boundaries encompass all Project phases (Site Preparation, Construction, and Operation and Maintenance). Similar to spatial boundaries, temporal boundaries may vary among the VECs.

The Project schedule is still not fully determined at this stage of the assessment; therefore, the following parameters have been adopted for the purpose of the assessment. Site Preparation activities, specifically vegetation clearing, could be initiated in the winter of 2019. The remaining Site Preparation, and Construction phases are anticipated to take approximately three to seven years. Highway Operation and Maintenance activities are expected to occur indefinitely with no plans for decommissioning. Should future decommissioning of the infrastructure planned as part of Project (as identified herein) be required, it will be completed in compliance with future requirements and regulations in place at that time. Therefore, the decommissioning of the proposed Project has not been carried forward into the assessment.

When possible, activities will be scheduled to avoid potential interactions with VECs during biologically sensitive periods such as bird breeding periods and fish migration periods.

Spatial boundaries of each VEC are described in their corresponding subsection within Chapter 8.

4.2.1.2 Spatial Boundaries

The Project Area includes the footprint of the ROW for the new highway alignment, as well as the ROW containing the current Highway 104, and represents the maximum limits of physical disturbance associated with the proposed Project. This includes all the activities as defined in Table 4.1 (i.e., Site Preparation, Construction, and Operation and Maintenance), such as any areas of vegetation clearing, grubbing, cut and fill. The extent of the Project Area will remain the same for all VECs.

The Local Assessment Area (LAA) typically extends outside of the Project Area and includes areas where a likelihood of probable effects to VECs exists. The LAA includes all areas surveyed for VECs. The LAA for each VEC is outlined in Chapter 8 and may vary among the VECs; for example, the LAA for the SOCC Mainland Moose (*Alces alces americana*) is larger than that of vegetation, due to the habitat range of the species. Within the VEC analysis, a separate Field Survey Area (FSA) may also be defined. The FSA typically falls within the LAA but may vary from the selected LAA.

The Regional Assessment Area (RAA) extends outside of the LAA and Project Area and is used to assess the longer range effects of the Project Activities and VEC interactions. This may include effects to atmospheric, socio-economic, and cultural environments. The RAA for each VEC is outlined in Chapter 8 and may vary among the VECs.

Spatial boundaries are described in Table 4.3, as well as their corresponding subsection within Chapter 8.

Table 4.3 Spatial Boundary Assessment by Valued Environmental Component

| Environment | Potential VEC | Project Area | Local Assessment Area | Regional Assessment Area |
|----------------------------|---|--------------|-----------------------|--------------------------|
| Atmospheric Environment | Air quality | X | X | X |
| | Noise | X | X | X |
| | Climate Change / Greenhouse Gas Emissions | X | X | X |
| Physical Environment | Geology and Soil Quality | X | X | |
| | Surface Water Quality / Quantity | X | X | |
| | Hydrogeology and Groundwater Quality / Quantity | X | X | |
| Biological Environment | Flora | X | X | |
| | Wildlife and Wildlife Habitat | X | X | X |
| | Wetlands | X | X | |
| | Fish and Fish Habitat | X | X | X |
| | Species at Risk | X | X | X |
| Socio-Economic Environment | Land Use | X | X | X |
| | Human Health and Safety | X | X | X |
| Cultural Environment | Historical and Archaeological Resources | X | X | X |

4.2.2 Significance Determination

The determination of significance is defined for each specific VEC based on concerns identified within scoping of the Project; existing information regarding the characteristics and state of the VEC, such as its persistence within the Project area; established legislations, guidelines, and policies, as well as professional judgement. Regulatory standards, legislations, guidelines, and policies will be used when appropriate to determine thresholds. Where absent, significance criteria will reflect a variety of considerations based on criteria defined in guidance documents or research (i.e., magnitude, geographic extent, duration, frequency, permanence, and ecological / land use / cultural context).

Some of the Regulatory standards, legislations, guidelines, policies, and criteria considered as part of the significance determination are described in the following subsections. The final significance criteria used are identified in Chapter 8 for each VEC.

4.2.2.1 Atmospheric Environment

The following regulatory standards, legislations, guidelines and policies will be used when appropriate to determine thresholds for the Atmospheric Environment. VEC-specific criteria is also described in Chapter 8.

Environment Act: To support and promote the protection of the environment through the establishment of goals, the *Environment Act* and its regulations establish policies, standards, objectives and guidelines to facilitate environmental protection.

Canadian Council of Ministers of the Environment (CCME): The CCME is a minister-led forum which establishes nationwide guidelines that take into account environmental, economic, and social considerations for environmental issues of national and international concern. With regards to the atmospheric environment, the CCME establishes guidance on air quality and climate change, such as the *Canadian Ambient Air Quality Standards (CAAQS)*; Government of Canada, 2013).

Air Quality

The following regulatory standards, legislations, guidelines and policies were used to determine if there will be a significant residual adverse effect on air quality.

There are established ambient air quality standards set out in the *Air Quality Regulations* under Sections 25 and 112 of the *Environment Act* (Government of Nova Scotia, 2018). Federally, the CCME also provides guidance for ambient air quality standards for fine particulate matter (Government of Canada, 2013). These standards and guidelines will be used in the assessment of environmental effects associated with the Project (Table 4.4).

Table 4.4 Ambient Air Quality Regulations in Nova Scotia and Canada applicable to the Project

| Contaminant | Averaging Period | Nova Scotia | | Federal | |
|--------------------------------------|------------------|---|----------------------------------|---|--|
| | | Maximum Permissible Ground Level Concentration ¹ | | Proposed Air Management Thresholds Values ² | |
| | | micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) | parts per hundred million (pphm) | micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) | Parts per billion (ppb) |
| Carbon Monoxide (CO) | 1 hour | 34,600 | 3,000 | - | - |
| | 8 hours | 12,700 | 1,100 | - | - |
| Hydrogen Sulphide (H ₂ S) | 1 hour | 42 | 3 | - | - |
| | 24 hours | 8 | 0.6 | - | - |
| Nitrogen Dioxide (NO ₂) | 1 hour | 400 | 21 | - | - |
| | Annual | 10 | 5 | - | - |
| Ozone (O ₃) | 1 hour | 160 | 8 | - | - |
| | 8 hours | - | - | - | 63 (2015) ⁵ 62 (2020) ⁵ |

| Contaminant | Averaging Period | Nova Scotia | | Federal | |
|------------------------------------|------------------|---|----------------------------------|--|-------------------------|
| | | Maximum Permissible Ground Level Concentration ¹ | | Proposed Air Management Thresholds Values ² | |
| | | micrograms per cubic metre (µg/m ³) | parts per hundred million (pphm) | micrograms per cubic metre (µg/m ³) | Parts per billion (ppb) |
| Sulphur Dioxide (SO ₂) | 1 hour | 900 | 34 | - | - |
| | 24 hours | 300 | 11 | - | - |
| | Annual | 60 | 2 | - | - |
| Total Suspended Particulate (TSP) | 24 hours | 120 | - | - | - |
| | annual | 70* | - | - | - |
| Total Suspended Particulate (TSP) | 24 hours | - | - | 28 (2015) ³ 27 (2020) ³ | - |
| | annual | - | - | 10.0 (2015) ⁴ 8.8 (2020) ⁴ | - |

Legend

* Geometric Mean

(year) - Year the thresholds take effect

1 - Government of Nova Scotia. 2018. Air Quality Regulations (N.S. Reg. 150/2017)

<https://novascotia.ca/just/regulations/regs/envairqt.htm>

2 - Government of Canada. 2013. Canadian Ambient Air Quality Standards (CAAQS) for PM2.5 and Ozone. Government Notices Vol.147 No. 21. May 25, 2013 <http://gazette.gc.ca/rp-pr/p1/2013/2013-05-25/html/notice-avis-eng.html>

3 - The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations

4 - The 3-year average of the annual average concentrations

5 - The 3-year average of the annual 4th highest daily maximum 8-hour average concentrations

For air quality, a residual environmental effect was determined to be significant if, after implementing mitigation measures, the maximum Project-related emissions of the air contaminants of interest exceeded the *Air Quality Regulations* or the CAAQS (Table 4.4). Further description of the significance criteria is located in Chapter 8.

Noise

Intensity or loudness is recorded in the decibel (dB). The most common measurement of ambient noise is the A-weighted decibel scale (dBA), which includes compensation for the varying ability of humans to detect very high and low pitched sounds by reducing the weighting of these sounds as compared to the standard dB scale.

Guidelines for Environmental Noise Measurement and Assessment, created in 1990 under the *Environment Act* and updated in 2005 under the former Nova Scotia Department of Environment and Labour (NSDEL), outlines criteria for evaluating noise pollution in the environment (NSE, 2005). Within these guidelines, Equivalent Sound Level measured in Leq is established. Leq can be defined as the sound level recorded in decibels equivalent to the total sound energy measured over a stated period of time. The guideline includes criteria for three periods of the day (Table 4.5). Leq should be collected at a minimum of two continuous representative hours in one period, with exception that

the sound being generated is reasonably steady and the Leq is not expected to change drastically. Noise associated with 'Transportation' is excluded from the guideline; however, for the purpose of this assessment, these guidelines will be used in lieu of regulatory limits.

Table 4.5 Provincial Noise Guidelines (NSDEL, 1990)

| Time | Equivalent Sound Level measured in Leq (dBA) |
|------------------------------|--|
| 7:00 am – 7:00 pm (Day) | 65 |
| 7:00 pm – 11:00 pm (Evening) | 60 |
| 11:00 pm – 7:00 am (Night) | 55 |

Municipal Government Act: This Act provides authority to municipal governments to develop municipal planning strategies and land-use by-laws. These may include by-laws to manage the generation of noise within municipal planning areas. The Municipality of the County of Antigonish has established a 'Noise By-Law'. This by-law applies in the Antigonish County Planning Area and defines acceptable levels (Table 4.6). This By-law does not apply to noise caused by the Province of Nova Scotia, their contractors and employees between the hours of 7:00 am and 10:00 pm while acting within reasonable execution of their duties. No noise by-laws exist for the Municipality of Pictou County.

Table 4.6 Municipal Noise Guidelines for the County of Antigonish

| Time | Equivalent Sound Level measured in Leq (dBA) |
|------------------------------|--|
| 7:00 am – 7:00 pm (Day) | 90 |
| 7:00 pm – 10:00 pm (Evening) | 90 |
| 10:00 pm – 7:00 am (Night) | 70 |

For noise, a residual environmental effect, following the implementation of mitigation measures, was determined as significant if the maximum Project-related emissions of noise meet one of the following criteria:

- Sound levels (dBA) exceed criteria established under the provincial guideline and municipal by-law (Table 4.5 and Table 4.6);
- A change of dBA where an exceedance of the *Guidelines for Environmental Noise Measurement and Assessment* and by-law already exists; or
- An increase in 10 dbA where the guideline and by-law are not in exceedance.

Further description of the significance criteria is located on Chapter 8.

Climate Change and Greenhouse Gases

Canada is among the countries which have ratified the *United Nations Framework Convention on Climate Change* (UNFCCC), an international treaty established in 1992 and entered into force in 1994 with the goal of stabilizing greenhouse gas (GHG) emissions to a level that would prevent dangerous

interference with the climate system (ECCC, 2018a). The UNFCCC does not implement any enforcement mechanisms. Instead, the UNFCCC outlines guiding principles to achieve these goals, including that all parties must annually update and submit their national inventories of GHG emissions and removals to UNFCCC.

In 2015, Canada established the goal to reduce GHG emissions by 30% below 2005 levels by the year 2030 (ECCC, 2018a) as its contribution to the UNFCCC.

The Pan-Canadian Framework on Clean Growth and Climate Change was developed to further Canada's commitment to addressing climate change and to meeting its UNFCCC 2010 target. This framework outlines specific actions to reduce GHG emissions. One requirement is that every province and territory in Canada will establish a mechanism for pricing carbon. Among actions suggested to reduce transportation emissions is to make all modes of transportation more efficient, which will include, but is not limited to, improving the efficiency of transportation systems and infrastructure (Government of Canada, 2016).

In 2007, Nova Scotia enacted the *Environmental Goals and Sustainable Prosperity Act*, which outlines commitments to reduce greenhouse gas emissions by 10 percent in 2020 from the level emitted in 1990 and to work with other levels of government on national emission standards for greenhouse gases and air pollutants from motorized vehicles.

In 2009, Nova Scotia released the *Greenhouse Gas Emissions Regulations* under subsection 28(6) and Section 112 of the *Environment Act*, becoming the first province to enforce a hard cap on GHG emissions from the electricity sector (Government of Canada, 2016). In an effort to further reduce GHG emissions in Nova Scotia, the province released *Quantifications, Reporting and Verification of Greenhouse Gas Regulations* under Section 112Q of the *Environment Act* and guidance document *Standards for Quantification, Reporting, and Verification of Greenhouse Gas Emissions* by the Government of Nova Scotia and NSE in 2018; these regulations and standards support the cap and trade program by identifying which companies must report GHG emissions, which emissions must be reported, as well as how to calculate and report these emissions. These emissions are for stationary sources of fuel combustion at facilities in Nova Scotia and, as such, are not applicable to GHG emissions from mobile equipment used during Site Preparation, Construction and Operation and Maintenance of transportation corridors.

NSE has published two guidance documents on climate change and how it should be considered during Project development and through the Environmental Assessment process. However, these guidance documents do not include methodology for determining significance. The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment established a guidance document *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (the Guidelines); this document also does not provide significance criteria but rather states that “unlike most project related environmental effects, the contribution of an individual project to climate change cannot be measured” (p.4). Instead, the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment

indicates that scoping should focus on identifying whether low, medium, or high volumes of GHG emissions are likely to be associated with the Project (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). Based on GHG reporting thresholds utilized by federal and provincial programs for other industry sectors, 'low', 'medium' and 'high' GHG emissions (based on equivalent tonnes of Carbon Dioxide (expressed as CO₂e) emitted per year) will be assessed and are defined as follows:

- Low magnitude: less than 10,000 tonnes CO₂e per year;
- Medium magnitude: between 10,000-50,000 tonnes CO₂e per year; and
- High magnitude: greater than 500,000 tonnes CO₂e per year.

Greenhouse gas emissions reported in the *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada – Executive Summary 2018* (ECCC, 2018a) will be compared against these criteria as part of the assessment process.

In the absence of federal or provincial standards or guidelines for climate change and greenhouse gas concentrations in ambient air associated with Project activities, the following documents were considered in the assessment of climate change and greenhouse gases:

- *Guide to Considering Climate Change in Environmental Assessments in Nova Scotia* (NSE, 2011b);
- *Guide to Considering Climate Change in Project Development in Nova Scotia* (NSE, 2011c);
- *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003); and
- *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada – Executive Summary 2018* (ECCC, 2018a).

4.2.2.2 Physical Environment

The following regulatory standards, legislations, guidelines and policies will be used when appropriate to determine thresholds for the Physical Environment. VEC-specific criteria is also described in Chapter 8.

Environment Act: The Act helps facilitate protection of the environment and remediation of adversely affected areas. Under the *Environment Act*, the following may apply to the project:

- water and soil-quality guidelines, objectives, and standards;
- source water protection planning;
- disposal of sulphide bearing material;
- approval requirements of watercourse alterations, and
- requirements for well construction.

Contaminated water, soil, and sediment are regulated through the *Contaminated Sites Regulations* (CSR) of the *Environment Act*. The CSR and its guidance documents outline the NSE *Tier 1 Environmental Quality Standards* and the NSE *Tier 2 Pathway-Specific Standards* tables and how they apply to properties and projects throughout Nova Scotia.

Section 106 of the *Environment Act*, designates the protection of areas which are formally designated as 'Protected Water Areas'. These designations allow the establishment of regulations that outline activities allowed or prohibited within the designated watersheds to protect source water quality. The closest protected watershed is the James River Watershed located West of Antigonish, and outside the Project Area.

The *Sulphide Bearing Material Disposal Regulations* outline the requirements for handling and disposal of all sulphide bearing material. Sulphide bearing materials have a potential for acid rock drainage when the material is exposed to oxygen. Surface water runoff from these areas have a potential to contaminate water, soil, or sediment as result. Pursuant to the *Sulphide Bearing Material Disposal Regulations*, all sulphide bearing material will be disposed of at an approved disposal site.

The *Activities Designation Regulations* identifies activities which require approvals or notifications for water activities, such as water withdrawal, and alteration of waterbodies, watercourses and/or wetlands. Monitoring requirements are likely required as a condition to these approvals.

Under the *Well Construction Regulations*, requirements for the construction, testing and abandonment are established.

Water Resources Protection Act: In 2000, the Nova Scotia Government enacted the *Water Resources Protection Act* with the intent to conserve and allocate water resources using sustainable practices and precautionary principles to protect future supplies.

Canadian Environmental Protection Act: CEPA is the primary federal legislative framework for protecting the Canadian environment and human health. The key aspects of CEPA include prevention and management of risks posed by toxic and other harmful substances. CEPA includes provisions pertaining to environmental and human health impacts associated with products of biotechnology, marine pollution, disposal at sea, vehicle, engine and equipment emissions, fuels, hazardous wastes, environmental emergencies and other sources of pollution.

Protocol for Determining Groundwater under the Direct Influence of Surface Water: Nova Scotia has developed a protocol for Groundwater under the Direct Influence of Surface Water (GUDI) under the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems* (Treatment Standards; NSE, 2012a). The Treatment Standards and the GUDI protocol apply to municipal drinking water systems in Nova Scotia and include methodology to assess and remediate wells which interact with surface water.

Canadian Council of Ministers of the Environment (CCME): With regards to the physical environment, the CCME establishes guidance on Environmental Assessments, sustainable groundwater, waste, climate change, water quality, and sediment quality. Project Components and Project Activities will interact with the freshwater environment; therefore, the *Canadian*

Environmental Quality Guidelines (CEQG) for freshwater will apply. The following CEGQ will apply to the Project:

- *Water Quality Guidelines for the Protection of Aquatic Life*; and
- *Sediment Quality Guidelines for the Protection of Aquatic Life - Freshwater Interim Sediment Quality Guidelines (ISQG)/ and Probable Effect Level (PEL)* (CCME, 2018).

Guidelines for Canadian Drinking Water Quality: Health Canada published the Federal-Provincial-Territorial Committee on Drinking Water (CDW)'s *Guidelines for Canadian Drinking Water Quality* (Health Canada, 2017). The guidelines were developed for contaminants that meet the following criteria which may lead to adverse health effects in humans:

- Exposure with the contaminant has the potential to lead to an adverse health effect;
- The contaminant is detected or could be expected to be present within a number of drinking water supplies across Canada; and
- The contaminant is detected or has the potential to be detected in drinking water at a concentration / level which may lead to an adverse health effect.

Fisheries Act: The *Fisheries Act* applies to all fishing zones, territorial seas, and inland waters of Canada and is binding to federal, provincial, and territorial governments. Section 36 of the Act, prohibits the release of deleterious substances into a waterbody. A deleterious substance is defined as “any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water” [Section 34(1)(a)]. Physical activities occurring in watercourses may require approval or authorizations pursuant to the *Fisheries Act*.

Geology and Soil Quality

A residual environmental effect was determined as significant if, after following the implementation of mitigation measures, the following criteria was met for effects to Geology and Soils:

- An exceedance to soil chemical concentrations that is more than the CSR for the land use criteria as a result of project activities.

Further description of the significance criteria is located on Chapter 8.

Surface Water Quality / Quantity

The following regulatory standards, legislations, guidelines and policies were used to determine if there was a significant residual adverse effect on surface water quality and quantity:

- Surface water quality will be compared to the CCME *Water Quality Guidelines for the Protection of Aquatic Life*. A significant adverse effect to surface water quality will include repeated or sustained exceedance of the CCME criteria for Total Suspended Solids (TSS) or Nephelometric Turbidity Unit (NTU) in surface water samples collected in-situ; and
- In case of a spill, accident, or malfunction which results in contamination or release to surface water, the Nova Scotia *Contaminated Sites Regulations* will also apply.

Further description of the significance criteria is located on Chapter 8.

Groundwater Quality and Quantity

Significant changes to the groundwater regime are those which impair the function of a drinking water well or a Groundwater Dependent Ecosystem (GDE). A residual environmental effect was determined significant if the following conditions were met following the implementation of mitigation and off-setting:

- The yield of a well is reduced such that the quantity available is no longer adequate for the intended use;
- A well that provided potable water meeting the Health Canada *Guidelines for Canadian Drinking Water Quality* (GCDWQ) can no longer do so; and
- The quantity or quality of groundwater discharged to a stream or wetland is altered such that the pre-existing biota are adversely affected.

4.2.2.3 Biological Environment

The following regulatory standards, legislations, guidelines, policies and definitions will be used when appropriate to determine thresholds for the Biological Environment. VEC-specific criteria is also described in Chapter 8.

Nova Scotia Endangered Species Act (NSESA): Under NSESA, all species at risk on private and Crown land in Nova Scotia, and habitat which supports these species, are protected. The following acts are prohibited:

- Killing, injuring, or disturbing species a risk;
- Destroying, disturbing, or interfering with its residence (e.g., nest, den, hibernaculum); and
- Destroying, disturbing, or interfering with its core habitat.

Compliance with the Act is required. Assessments were completed to determine if Project activities will interfere with endangered species and their habitats (Chapter 5). NSESA will be used when determining the significance of residual environmental effects.

Species at Risk Act (SARA): Nationally, SARA provides protection to listed species and their habitat under the Act to both prevent extinction and promote recovery of 'Endangered', 'Threatened' and 'Extirpated' species as well as facilitate the management of species listed as 'Special Concern'. The following actions concerning 'Endangered', 'Threatened' and 'Extirpated' species are prohibited:

- to kill, harm, harass, capture or take [Section 32(1)];
- to possess, collect, buy, sell or trade [Section 32(2)];
- damage or destruction of the residence (e.g. nest, den, habitual dwelling [Section 33]); or
- destruction of critical habitat [Section 58(1)].

Critical habitat is defined under SARA as "*habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.*" Pursuant to subsection 58(1) of SARA, no person shall destroy any part of the critical habitat of a listed 'Endangered' or 'Threatened' species if:

- the critical habitat is on federal land, in the economic zone of Canada, or on the continental shelf of Canada;
- the federally listed species is an aquatic organism; or

- the listed species is a migratory bird protected under the *Migratory Birds Convention Act* (MBCA, 1994).

As such, species at risk and critical habitat must be considered prior to construction, alteration or disturbance of land. SARA will be used when determining the significance of residual environmental effects.

COSEWIC: COSEWIC constitutes a committee responsible for reviewing and assessing wildlife species in Canada and assigning a designation of ‘Endangered’, ‘Threatened’, ‘Special Concern’, ‘Data Deficient’, or ‘Not at Risk’. Designations are based on a combination of local, Aboriginal and scientific knowledge. Within the SARA, COSEWIC is identified as an independent party for assessing species at risk. Results of the assessment are presented to the Canadian government, the public, and the Minister of Environment. After review, designated species identified by COSEWIC may qualify for legal protection and recovery under SARA.

NSDNR Significant Habitat: Within Nova Scotia, the NSDNR has compiled a database of significant habitat within the province. Significant habitat may include, but is not limited to, areas which are rare in the province or where the following occur (NSDNR, 2013):

- federally or provincially designated species at risk or other species of conservation concern;
- migratory birds; or
- unusually large concentrations of wildlife (e.g., deer overwintering grounds).

Data on significant habitat is compiled by regional biologists and the Wildlife Division of NSDNR based on sites known to NSDNR or data acquired from additional sources, such as other government departments, universities, museums, and the Atlantic Canada Conservation Data Centre (ACDC) (NSDNR, 2013). The mapping of significant areas by NSDNR provides an initial step in conserving and managing these areas and provides proponents with information necessary to perform impact assessments for proposed projects (NSDNR, 2007). Preliminary information on significant habitat in Nova Scotia can be obtained through the Provincial Landscape Viewer (<https://nsgi.novascotia.ca/plv/>); however, it is important to note that these maps are not based on systematic surveys and are not a comprehensive representation of all significant habitats in the province (NSDNR, 2013).

Atlantic Canada Conservation Data Centre (ACDC): ACDC provides technical tracking lists of provincially rare species and their known locations within provinces in Atlantic Canada. Conservation statuses of species in Atlantic Canada are assessed and assigned a sub-national status rank (S-rank) based on their occurrence records within each province. Species of conservation concern (SOCC) and their associated occurrence data are maintained in a Geographic Information System (GIS) database by ACDC. While these SOCC are not necessarily provincially or federally protected, consultation with this database is required for the completion of a provincial or federal Environmental Impact Assessment in Canada (ACDC, 2018a). For the purposes of this assessment, only species ranked as variants of S1, S2, and S3 (including S3S4) have been considered for the significance determination. Definitions for these S-ranks are as follows (ACDC, 2018b):

- S1 (Critically Imperiled) - “Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province”;
- S2 (Imperiled) - “Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province”; and
- S3 (Vulnerable) - “Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.”

Species of interest will be evaluated and assessed through the Environmental Assessment process. Two definitions will be applied when describing species of interest that may be affected by the Project. Species of conservation concern (SOCC) are species that are:

- Listed under NSESA;
- Listed under SARA as Endangered, Threatened, Vulnerable, or of Special Concern and their critical habitat;
- Identified by COSEWIC as either Endangered, Threatened, or of Special Concern;
- Identified by *Wild Species: The General Status of Species in Canada* as ‘At Risk’, ‘May be at Risk’, or ‘Sensitive’ to human activities or natural events;
- Known to inhabit NSDNR Significant Habitat; or
- Are ranked by ACCDC as variants of S1, S2, or S3 (including S3S4).

Species at risk (SAR) will be defined as only those species which meet the following criteria:

- Listed under NSESA;
- Listed under SARA as ‘Endangered’, ‘Threatened’, ‘Vulnerable’, or of ‘Special Concern’ and their critical habitat.

Wildlife Act: Provides protection measures for wildlife including birds, turtles and fur-bearing mammals. It is prohibited to do the following, except with permission of the Minister or unless stated in the Act:

- Hunt, take, kill or pursue to hunt, take or kill or possess any fur-bearing animal [Section 44 (2)];
- Buy, sell, barter or offer for sale or have in possession any fur-bearing animal [Section 45(b)];
- Damage, disturb or destroy the residence (e.g., den or dam) of a fur-bearing animal [Section 48(3)];
- Take, hunt, kill or attempt to take, hunt or kill any of the following wildlife: eagle, osprey, falcon, hawk, owl, or any declared by regulation to be protected pursuant to the *Wildlife Act* [Section 50(1)];
- Buy, barter or offer for sale any protected wildlife [Section 50 (2)]; or
- Destroy, take, possess, buy or sell any egg of a bird or turtle or disturb the nest of a bird or turtle (Section 51).

Other criteria that may be used for the determination of significance of residual effects following implementation of mitigation measures include the sustainability of biological populations and the rarity of species or critical habitats.

Flora

For vegetation, a residual environmental effect was determined significant if the following conditions were met following the implementation of mitigation and off-setting:

- Interactions were determined to have a permanent effect to any species distribution or abundance; or
- An effect that does not align with recovery strategies and action plans for identified SOCC (such as the identified goals, objectives or activities).

For all SAR, any project component or activity that results in a non-permitted contravention of any of the prohibitions of SARA and NSESA, or which threatens the long-term sustainability of a plant species within the LAA, will be used as significance criteria during the assessment of environmental effects to plant species at risk. Further description of the significance criteria for SAR is located in Chapter 8.

Wildlife and Wildlife Habitat

MBCA: The MBCA and its regulations protects migratory birds and prohibits the disturbance or destruction of migratory bird nests and eggs in Canada, regardless of land ownership and prohibits the dumping of substances harmful to birds in areas and water frequented by them.

For wildlife, a residual environmental effect, following the implementation of mitigation and off-setting, was determined significant if the following conditions were met:

- Non-permitted contravention of any of the prohibitions stated in *Wildlife Act*;
- Non-permitted contravention of any of the prohibitions stated in MBCA;
- Interactions were determined to have a permanent effect to the distribution or abundance of any wildlife species; or
- An effect that does not align with recovery strategies and action plans for identified SOCC (such as the identified goals, objectives or activities).

An effect that does not meet the significance determinations conditions is considered to be not significant. Further description of the significance criteria is located in Chapter 8.

Wetlands

The *Environmental Goals and Sustainable Prosperity Act* (EGSPA) is a piece of provincial legislation proclaimed in 2007 with the aim of establishing a more economically prosperous and environmentally sustainable province through the development of 25 goals, including, but not limited to improving air and water quality, reducing greenhouse gas emissions, increasing renewable energy initiatives, and sustainably managing natural assets.

Developing a policy to prevent the net loss of wetlands in Nova Scotia was identified as a long-term objective of EGSPA. The *Nova Scotia Wetland Conservation Policy*, which was released by NSE in

2011 to meet this objective under the ESPGA, provides a regulatory framework for conserving and managing wetlands in the province. The policy outlines specific management action items, the first being to manage activities in or near wetlands so there incurs no loss in ‘Wetlands of Special Significance’ (WSS) or no net-loss in area and function of other wetlands, i.e., wetlands not considered WSS. To avoid any loss to WSS, the policy states that the Province of Nova Scotia will not “support or approve alterations proposed for a WSS or any alterations that pose a substantial risk to a WSS, except: alterations that are required to maintain, restore or enhance a WSS; and alterations deemed to provide necessary public function” (NSE, 2011a).

Nova Scotia Environment defines WSS as the following:

- Salt marshes;
- Wetlands within, or partially within, a designated:
 - Ramsar site;
 - Provincial wildlife management area;
 - Provincial park;
 - Nature reserve;
 - Wilderness area; or
 - Lands owned or legally protected by non-government charitable conservation land trusts;
- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through Nova Scotia Eastern Habitat Joint Venture (NS-EHJV);
- Wetlands that support SAR that are designated under SARA or the NSESA; and
- Wetlands in designated protected water areas as described in the *Environment Act* [Section 106].

In compliance with the Nova Scotia Wetland Policy, both wetland area and WSS will be used as significance criteria during the assessment of environmental effects from the Project. Further description of the significance criteria is located on Chapter 8.

Fish and Fish Habitat

Fisheries Act: The *Fisheries Act* provides provisions for the protection of Commercial, Recreational and Aboriginal (CRA) Fisheries. Unless otherwise authorized by the Minister of Fisheries and Oceans Canada, the Act prohibits “serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery” [Section 35]. It also states that any watercourse obstruction preventing fish passage or resulting in serious harm to fish may require implementation of measures including, but not limited to, removal of the obstruction or construction of a fishway, per request of the Minister. Final designs of the watercourse crossing structures are to be submitted for review to DFO under Section 20 of the *Fisheries Act*.

If it is determined that the Project will cause serious harm to CRA fisheries after the implementation of mitigation measures, a *Fisheries Act* Authorization from the Minister is required under Section 35 (2)(b) of the Act. The application must also include an appropriate fisheries impact offsetting plan.

In compliance with the *Fisheries Act*, where an effect that is likely to cause serious, permanent harm to fish or fish habitat that are part of a CRA fishery, or to fish that support such a fishery, following the implementation of mitigation measures, an off-setting will be used as significance criteria during the assessment of environmental effects from the Project. An effect that does not meet the significance determination conditions is considered to be not significant. For example, an effect that results in the permanent loss to fish or fish habitat but can be mitigated through the replacement of lost habitat (off-setting) or salvage/rescue of fish prior to initiation of the activity, will not be considered significant. Further description of the significance criteria is located on Chapter 8.

Species at Risk

In compliance with SARA and NSESA, any project component, or activity that results in a non-permitted contravention of any of the prohibitions of those acts or threatens the long-term sustainability of a Species at Risk (SAR) as defined within those acts within the LAA, such as species' distribution or abundance, or alteration of critical habitat will be used as significance criteria during the assessment of environmental effects from the Project. Further description of the significance criteria is located on Chapter 8.

4.2.2.4 Socio-Economic Environment

The following regulatory standards, legislations, guidelines, policies and definitions will be used when appropriate to determine thresholds for the Socio-economic Environment. VEC-specific criteria is also described in Chapter 8.

Provincial Parks Act: The Project has the potential to interact with Beaver Mountain Provincial Park which is designated as a protected park under Section 8 of the *Provincial Parks Act*. Prohibition 13A of the *Provincial Parks Act* states that unless stated otherwise in the Act, the removal of forest products from a provincial park for any purpose other than the development or management of the park is not allowed. Road development within the boundaries of a provincial park are not permitted without consent of the Minister (Section 21).

Municipal Government Act: This Act provides authority to municipal governments to develop municipal planning strategies and land-use by-laws. Municipal planning strategies, such as land use plans, have established zones, identified permitted or prohibited uses for each identified zone, and provided for any other provisions of these zones.

Land Use

For Land Use, a residual environmental effect, following the implementation of mitigation and off-setting, was determined significant if the following conditions were met:

- non-permitted contravention of any of the prohibitions outlined in the *Provincial Parks Act*;
- Project activities were not compatible with the land or resource use activities as designated in municipal plans pursuant to the *Municipal Government Act*; and
- a loss of the availability or access to land and resources that are currently used by the Mi'kmaq for traditional purposes and which is long-term or cannot be accommodated.

For the purposes of this assessment, long-term effects to availability or access will be defined as the current levels for Mi'kmaq at extended periods of time. An effect that does not meet the significance determination conditions is considered to be not significant. Further description of the significance criteria is located in Chapter 8.

Human Health and Safety

Human Health and Safety, such as Accidents and Malfunctions, are further assessed in Chapter 7 Accidents and Malfunctions.

4.2.2.5 Cultural Environment

The following regulatory standards, legislations, guidelines, policies and definitions will be used when appropriate to determine thresholds for the Cultural Environment. VEC-specific criteria is also described in Chapter 8.

Special Places Protection Act: This legislation protects important archaeological, historical, and paleontological sites in Nova Scotia. Protected sites may exist on land under either public or private ownership as well as underwater. Under the *Special Places Protection Act*, the following actions are prohibited without possession of a Heritage Research Permit:

- explorations or excavations on any land, including land covered with water, for the purpose of seeking heritage objects [Section 8(1)];
- excavation or alteration of a protection site or removal of objects from a protected site [Section 12]; and
- knowingly destroying, desecrating, defacing or altering either archaeological/historical remains or a palaeontological site that is designated under the Act or not [Section 12].

Physical and Cultural Heritage / Historical / Archaeological Site

For Historical and Archaeological Sites, a residual environmental effect, following the implementation of mitigation and off-setting, was determined significant if the following conditions were met:

- occurrence of disturbance or destruction to an archaeological, historical, or paleontological site protected under the *Special Places Protection Act* or that has been identified by affected Aboriginal groups, communities, or provincial heritage regulators to be of major importance due to factors such as rarity, condition, spiritual importance, or research importance.

For the purposes of this assessment, archaeological, historical, and paleontological sites as defined under the *Special Places Protection Act* will be used for determination of significance. An effect that does not meet the significance determination conditions is considered to be not significant. Further description of the significance criteria is located on Chapter 8.

4.2.3 Description of Existing Conditions

Existing baseline conditions characteristic of the area are highlighted in Chapter 5. Descriptions of the atmospheric, physical, biological, socio-economic, and cultural environments provide context for the assessment of effects by providing an understanding of the receiving environment in the PA,

LAA and RAA. The descriptions provide a characterization of the conditions within the assessed boundaries and include a summary of desktop evaluations and field programs which have been conducted in the area and the available information collected for each VEC.

4.3 Assessment of Project-Related Environmental Effects

The assessment of Project-related environmental effects will occur in the following sequence. Potential interactions between VEC, and Project Components and Project Activities will be identified first; where potential interactions exist, a more detailed assessment of the effects will be completed. Each effect will be analyzed qualitatively and quantitatively, when feasible. This assessment will be based on existing knowledge, professional judgement, and analytical tools, when possible. Further analysis will not be conducted for noted interactions that are determined not likely to result in an effect, based on existing knowledge.

Following assessment of the effects, mitigation measures will be applied to each effect. For each interaction where a mitigation measure is applied, the effectiveness of each mitigation measure applied will be assessed in order to identify any remaining residual effects. Residual effects are effects to VECs that are anticipated to remain following the implementation of mitigation measures. The residual effects are then characterized to determine the extent and nature of the effect. To determine significance, the residual effect will be assessed in consideration of magnitude, geographical extent, duration, frequency, reversibility, and ecological and social context, as described in Section 4.2.2 and using the matrix as provided in Appendix C. Significance determination will be conducted for each individual VEC, and VEC-specific follow-up and monitoring measures will be applied to assess the effectiveness of the proposed mitigation measures.

The steps will include the following:

- Identification of how the Project and Project Component interactions with VECs could result in an environmental effect on the VEC (i.e., environmental effects pathways);
- Description of proposed mitigation measures to be implemented by NSTIR to reduce or eliminate potential environmental effects, such as environmental protection measures, best management practices, industry standards, and habitat compensation / off-setting projects;
- Identification of remaining (residual) environmental effects following the application of proposed mitigation and environmental measures;
- Determination of the significance of residual effects using VEC-specific significance determinations; and
- Identification of follow-up and monitoring measures to verify residual environmental effects predictions and to assess the effectiveness of proposed mitigation and environmental measures.

Assessment of each of the VECs is included in Chapter 8. *Effects from Accidents and Malfunctions* are addressed in Chapter 7.