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7.0 EFFECTS ASSESSMENT METHODOLOGY

The environmental assessment methodology for the Project has been developed to satisfy regulatory requirements of a screening level assessment under *CEAA*. It is anticipated that this approach will also satisfy the requirements of a Class I Registration under the Nova Scotia *Environment Act* and Environmental Assessment Regulations. In particular, this document is intended to comply with the Scoping Document for the Proposed Bear Head LNG Terminal (DFO 2004) that was approved by the Responsible Authority (RA) under *CEAA* (DFO) and reviewed (with comments provided) by NSDEL.

The methodology used in this report has evolved from methods proposed by Beanlands and Duinker (1983), who stressed the importance of focusing the assessment on environmental components of greatest concern. In general, the methodology is designed to produce an environmental assessment document that:

- is focused on issues of greatest concern;
- addresses regulatory requirements;
- addresses issues raised by the public and other stakeholders;
- integrates engineering design and mitigative and monitoring programs into a comprehensive environmental management planning process; and
- integrates cumulative effects assessment into the overall assessment of residual environmental effects.

The environmental assessment screening methodology for this Project includes an evaluation of the potential effects, including cumulative effects, of each Project phase – construction, operation and decommissioning – as well as malfunctions and accidents, with regard to Valued Environmental Components (VECs) and Valued Socio-economic Components (VSCs). Project related effects are assessed within the context of temporal and spatial boundaries established for the assessment. The evaluation of potential cumulative effects with regard to other projects and activities will generally include past, present and future activities that will be carried out and will interact temporally or spatially with the proposed Bear Head LNG Terminal Project.

7.1 Issues Scoping and Selection of Valued Environmental and Socio-economic Components

An important part of the assessment process is the early identification of VECs and VSCs upon which the assessment can be focused for a meaningful and effective evaluation. Issues scoping is an important part of the VEC and VSC identification process. The issues scoping process for this assessment included:

- a regulatory review of the draft Project Description and other informal discussions regarding potential environmental interactions with DFO, Environment Canada, Transport Canada, the CEA Agency, NSDEL, Nova Scotia Museum, and Nova Scotia Department of Agriculture and Fisheries;
- a review of relevant provincial and federal websites (*e.g.* Department of Natural Resources, Environment Canada);
- review of listed species and/or species at risk found within the Project area using existing regional information and/or site surveys;
- discussions with government scientific authorities (*e.g.*, NSDNR species at risk experts);
- preliminary environmental investigations conducted by ANEI environmental and engineering consultants;
- open house public meeting held by ANEI in Port Hawkesbury on September 25, 2003 and subsequent comments received as part of the ongoing public consultation process;
- consultation with stakeholders;
- a review of environmental assessment documentation for a similar project previously proposed for the Strait area (*i.e.*, the Arctic Pilot Project) (Province of Nova Scotia and Federal Environmental Assessment Review Office 1981, Socio Economic Systems Inc. 1977); and
- the professional judgement of the proponent's study team.

Chapter 5 of this report provides an overview of the public consultation program undertaken by ANEI in relation to this environmental assessment, and for general public information. Information from this process assisted the identification and scoping of VECs and VSCs for the environmental assessment. ANEI's ongoing consultation program involves continued communication with stakeholders and regulators during the application review and post application follow-up process.

Regulatory issues and guidelines, as well as consultations with regulators and other government officials also formed an integral part of the issues scoping process. A Federal-Provincial Environmental Assessment Agreement has been negotiated between DFO, presently acting on behalf of Transport Canada (the RA under *CEAA*), the CEA Agency, and the Province of Nova Scotia (as represented by NSDEL) to ensure the interests of federal and provincial government departments and agencies are included in the environmental assessment, and to coordinate their respective environmental assessment processes and responsibilities. A copy of the Federal-Provincial Environmental Assessment Agreement included in Appendix A.

The scoping exercise considered relevant federal, provincial and municipal regulations and guidelines. Issues considered in this assessment, as well as the methodological approaches used, were derived from the *CEAA*, with reference to the various CEA Agency guidance documents. Regulatory issues and concerns have also been identified through various communications and meetings held by ANEI and the Study Team with representatives of relevant regulatory authorities.

Preliminary research included a review of relevant scientific research publications and regulatory documents. Also included in issues scoping were preliminary field investigations (to assist with facility siting) and preliminary stakeholder consultations. The informed professional judgement of the environmental assessment Study Team and ANEI staff was also an important component of the issues scoping exercise.

The environmental issues to be addressed are shown in Table 7.1, along with the rationale for inclusion/exclusion as a VEC or VSC, based on professional judgement. The consolidated list of VECs and VSCs to be evaluated, including their definitions, is included in Table 7.2.

Table 7.1 Selection of Valued Environmental and Socio-economic Components		
Environmental Component¹	Scoping Considerations	Selected VEC/VSC
Air Quality	Concerns with human health and safety, and ecological health and aesthetics. Concerns with greenhouse gas emissions. Provisions under the <i>Canadian Environmental Assessment Act</i> and Nova Scotia Air Quality Regulations	<ul style="list-style-type: none"> • Air Quality
Acoustic Environment	Concern regarding potential increases in ambient noise levels. Administered under noise guidelines of the Nova Scotia Department of Environment and Labour.	<ul style="list-style-type: none"> • Acoustic Environment
Water Quality	Both freshwater and marine water quality are inherently linked to habitat quality for aquatic species. Public and professional concern regarding species of special status protected under the <i>Species at Risk Act</i> and associated habitat that may occur in the area. Concern regarding status of marine commercial fish species. Provisions under the <i>Fisheries Act</i> .	<ul style="list-style-type: none"> • Marine Fish and Fish Habitat • Freshwater Habitat
Sediment Quality	Marine sediment is a pathway for potential ecosystem effects on benthic communities. Fish habitat is protected under the <i>Fisheries Act</i> .	<ul style="list-style-type: none"> • Marine Benthic Habitat and Communities

Table 7.1 Selection of Valued Environmental and Socio-economic Components		
Environmental Component¹	Scoping Considerations	Selected VEC/VSC
Soil Capability and Quality	Due to the limited capability of these soils for agriculture and forestry, the Project site being currently zoned as Port Industrial and lack of interaction with the Project during operations, this component has not been selected as a VEC.	N/A
Fish and Fish Habitat	Focus on marine commercial species offshore and nearshore. Public and professional concern for freshwater fish and fish habitat regarding species of special status and their habitat that may occur in the area. Habitat support for commercial, recreational and aboriginal fisheries. Fish habitat is protected under the <i>Fisheries Act</i> . Species of special concern are protected under the <i>Species at Risk Act</i> .	<ul style="list-style-type: none"> • Marine Fish and Fish Habitat • Freshwater Habitat
Mammals	Protection of species biodiversity and critical habitat. Scientific and public concern. Link to resource use (e.g., subsistence and recreational hunting). Regulatory protection under the <i>Species at Risk Act</i> , <i>Nova Scotia Endangered Species Act</i> , <i>Nova Scotia Wildlife Act</i> and <i>Canada Fisheries Act</i> . Offshore, the focus is on cetaceans and pinnipeds that may migrate through the area. Onshore, the focus is on rare species as well as habitat that is important to mammal species, such as deer wintering areas (DWA).	<ul style="list-style-type: none"> • Marine Mammals • Rare Mammals
Benthos	Focus on direct physical effects on marine benthos. Species of special concern are protected under the <i>Species at Risk Act</i> . Fish and fish habitat, are protected under the <i>Fisheries Act</i> . Marine algae is addressed under this VEC.	<ul style="list-style-type: none"> • Marine Benthic Habitat and Communities
Vegetation	Concerns with protection of species biodiversity and unique or uncommon habitats. Species of special concern are protected under the <i>Species at Risk Act</i> and <i>Nova Scotia Endangered Species Act</i> . Focus on potential interaction of onshore facilities with rare vegetation. Marine algae is addressed under the Marine Benthic Habitat and Communities VEC.	<ul style="list-style-type: none"> • Rare Vegetation
Plankton	Zooplankton and phytoplankton are important to the marine ecosystem, and are discussed in the Marine Fish and Fish Habitat VEC.	<ul style="list-style-type: none"> • Marine Fish and Fish Habitat
Amphibians and Reptiles	Focus on rare species. Scientific concern that rare amphibian and reptile species are at risk from development since large proportions of their populations can be affected by even relatively small perturbations if the population is very small and concentrated in a small area. Protection of species biodiversity is administered through the <i>Species at Risk Act</i> , <i>Nova Scotia Endangered Species Act</i> and <i>Nova Scotia Wildlife Act</i> .	<ul style="list-style-type: none"> • Rare Herpetiles
Birds and Bird Habitat	Concern with protection of species diversity. Migratory and non-migratory birds with focus on rare or sensitive species potentially feeding, breeding, moving and/or migrating through the Project area and their habitat. Protection of migratory species and species of concern are mandated by the <i>Migratory Birds Convention Act</i> , <i>Species at Risk Act</i> , <i>Nova Scotia Endangered Species Act</i> and <i>Nova Scotia Wildlife Act</i> .	<ul style="list-style-type: none"> • Birds

Table 7.1 Selection of Valued Environmental and Socio-economic Components		
Environmental Component¹	Scoping Considerations	Selected VEC/VSC
Species at Risk	Species at risk are discussed within their relevant environmental component. The Project interactions potentially affecting a rare terrestrial plant species are very different from those affecting rare bird species or a rare fish species, and are thus more meaningfully discussed within their respective VEC sections. Protection of species biodiversity is administered through the <i>Species at Risk Act</i> , Nova Scotia <i>Endangered Species Act</i> , Nova Scotia <i>Wildlife Act</i> and <i>Migratory Birds Convention Act</i> .	<ul style="list-style-type: none"> • Marine Benthic Habitat and Communities • Marine Fish and Fish Habitat • Marine Mammals • Freshwater Habitat • Rare Mammals • Rare Herpetiles • Birds • Rare Vegetation
Groundwater Resources	Groundwater resources are important in the hydrologic cycle and ecological function (<i>e.g.</i> , surface water discharge), as well as important as a water supply, particularly to rural users. Due to specific comments and requests from regulators Groundwater is included as a VEC in the assessment.	<ul style="list-style-type: none"> • Groundwater
Surface Water Resources	Surface water resources in terms of water quality are inherently linked to habitat quality for aquatic species. Protection of species biodiversity is administered through the <i>Fisheries Act</i> , <i>Species at Risk Act</i> , Nova Scotia <i>Endangered Species Act</i> . Consideration of the potential effects on the Landrie Lake protected water supply watershed are included in the discussion of Community Services and Infrastructure and Groundwater.	<ul style="list-style-type: none"> • Freshwater Habitat • Community Services and Infrastructure • Groundwater
Wetlands and Wetland Functions	Important habitat type often associated with high species diversity including species at risk. Important regulator of surface water and groundwater. Included as a VEC due to regulatory considerations and ecological sensitivity. Activities in wetlands are regulated by the Federal Policy on Wetland Conservation and Activities Designation Regulation under the Nova Scotia <i>Environment Act</i> with specific guidance provided by the Wetlands Directive (NSDOE 1995).	<ul style="list-style-type: none"> • Wetlands
Marine and Land Based Archaeological and Heritage Resources	Concerns with the effective management of archaeological and heritage resources. Administered under the Nova Scotia <i>Special Places Protection Act</i> .	<ul style="list-style-type: none"> • Archaeological and Heritage Resources
Land and Resource Use for First Nations and Aboriginal Peoples	First Nations current use of Lands and Resources is included as a VSC in this assessment in recognition of the potential interest of First Nations use of land and resources. <i>CEAA</i> requires consideration of current use of land for traditional purposes. <i>CEAA</i> also requires directed consultation with First Nations.	<ul style="list-style-type: none"> • First Nations Land and Resource Use
Transportation	Marine transportation is a VSC in consideration of potential effects of Project related marine traffic and marine infrastructure on existing patterns of commercial activity (<i>e.g.</i> , fishing, shipping) and associated navigation safety concerns. Administered under <i>Navigable Waters Protection Act</i> , TERMPOL Assessment Process, International Ship & Port Facility Security (ISPS) Code. Potential impacts associated with land based transportation are discussed under the VSC Community Services and Infrastructure.	<ul style="list-style-type: none"> • Marine Transportation • Community Services and Infrastructure
Fisheries and Aquaculture	Fisheries and aquaculture are considered a VSC due to their importance to the regional economy and importance as a socio-cultural activity among maritime communities. Administered under the Nova Scotia <i>Environment Act</i> .	<ul style="list-style-type: none"> • Fisheries and Aquaculture
Land Use	It is important to consider the compatibility of the Project with existing land uses, municipal land use plans and zoning designations.	<ul style="list-style-type: none"> • Land Use

Environmental Component¹	Scoping Considerations	Selected VEC/VSC
Public Health and Safety	Concerns for human health and safety in communities surrounding the LNG facility. Concerns related mainly to potential for major release of LNG (non-ignited or ignited) from the facility or LNG vessel. These concerns are addressed in the Risk Assessment (Appendix C) summarized in Section 3. Potential community health impacts from facility air emissions are described (in relation to guideline levels) in the Air Quality section.	<ul style="list-style-type: none"> • Risk Assessment (Appendix C, Section 3) • Air Quality
Community Services and Infrastructure	Requirement for ensuring local capacities and response capabilities (fire, medical and police) and on-going support services (health and social services). Protection of community water supply (Landrie Lake). Addresses potential effects on land based transportation.	<ul style="list-style-type: none"> • Community Services and Infrastructure
Economic Development	Fundamental socio-economic determinant. Related to increased economic activity related to the Project.	<ul style="list-style-type: none"> • Economic Development
¹ Environmental Component (candidate VEC/VSC to be considered)		

Valued Environmental Component	Definition for EA Purposes
Air Quality	Ambient air quality.
Acoustic Environment	Ambient noise levels.
Marine Benthic Habitat and Communities	Flora and fauna existing on the sea floor as well as in sediments; sediment quality.
Marine Fish and Fish Habitat	Pelagic and demersal marine finfish, shellfish and fish habitat.
Marine Mammals	Marine and coastal mammals.
Wetlands	Wetland types as defined in scientific literature and government regulations.
Freshwater Habitat	Habitat quality of freshwater bodies.
Rare Mammals and Critical Habitat	Rare mammals, potentially feeding, breeding, moving and/or migrating through the Project area, and their habitat. Includes critical habitat such as deer wintering areas.
Rare Herpetiles and Critical Habitat	Rare herpetiles potentially feeding, breeding, moving and/or migrating through the Project area, and their habitat.
Birds	Migratory and non-migratory birds with focus on rare or sensitive species potentially feeding, breeding, moving and/or migrating through the Project area, and their habitat.
Rare Vegetation	Rare vegetation and their habitat. Also includes unique or uncommon vegetation assemblages (e.g., old growth forest).
Groundwater	Water that originates from percolation of rain, snowmelt, or surface water into the ground.
Archaeological and Heritage Resources	Marine and terrestrial archaeological and heritage resources and sites providing evidence of past use and occupation.
First Nations Land and Resource Use	Lands and resources of specific social, cultural or spiritual value to First Nations of Nova Scotia with focus on current use of lands for traditional purposes.
Marine Transportation	Marine traffic, including recreational boating, shipping, commercial and passenger traffic.
Fisheries and Aquaculture	Commercial and recreational fisheries. Commercial aquaculture operations and foreshore lease holdings.
Community Services and Infrastructure	Local emergency response services (fire, medical and police) and on-going support services (health and social services). Includes potential effects on community water supplies (e.g., Landrie Lake Water Supply watershed), local and regional traffic and infrastructure and community hospitality capacity during peak construction periods.
Economic Development	Regional employment and business. Focus on job creation and change to local economy.
Land Use	Existing land development (industrial, commercial, residential), settlement areas, recreation and areas of special community or social value.

7.2 Potential Interactions between Project Activities and Valued Environmental and Socio-economic Components

The potential interactions between Project activities and the selected VECs and VSCs are summarized in Tables 7.3 and 7.4 respectively. A potential interaction does not necessarily indicate a predicted impact, but warrants further analysis in the environmental assessment. The specific nature and extent of these interactions with each VEC and VSC are discussed and evaluated in the environmental effects assessment sections (8.1 and 8.2).

7.3 Outline of the Environmental Effects Assessment

This section provides an outline of the steps involved in the assessment of potential Project effects. The analysis presented in Sections 8.1 and 8.2 follows these steps for each VEC and VSC. Other components of the overall impact assessment including, accidental effects and malfunctions, cumulative effects, and effects of the environment on the Project, are described in Sections 8.3, 8.4 and 8.5 respectively and summarized in Chapter 9. The analysis methodology employed for the assessment represents accepted practice as defined in the CEA Agency's Practitioner's Guide to the Canadian Environmental Assessment Act (CEA Agency 1994) and has been successfully used in assessing the effects of other oil and gas projects in Atlantic Canada.

7.3.1 VEC and VSC Identification

The CEA Agency guidance documents (1994) require a description of the ecological and socio-cultural context for each VEC. The consideration of the current state of a VEC, and any Project-related effects, requires an evaluation of the relationship of each VEC with other components of the ecosystem or human systems (*e.g.*, trophic relationships).

7.3.2 Boundaries

An important aspect of the effects assessment process is the determination of the boundaries of the assessment. Temporal and spatial boundaries encompass those periods during, and areas within which, the VECs/VSCs are likely to interact with, or be influenced by, the Project. Administrative and technical boundaries have also been considered for the assessment.

Table 7.3 Summary of Potential Interactions Between Project Activities and VECs

Project Activities	Air Quality	Acoustic Environment	Marine Benthic Habitat & Communities	Groundwater Resources	Marine Fish & Fish Habitat	Marine Mammals	Wetlands	Freshwater Habitat	Rare Mammals	Rare Herpetiles	Birds	Rare Vegetation	Potential Interactions
Construction Phase													
Clearing	X	X					X	X	X	X	X	X	Dust and construction equipment emissions can reduce local ambient air quality and contribute to greenhouse gases. Habitat degradation or alteration (including changes to hydrology), and disturbance of species (including disturbance of feeding, breeding, movement and/or migration); increase in ambient noise levels.
Grubbing and grading	X	X	X	X	X		X	X	X	X	X	X	Dust and construction equipment emissions can reduce local ambient air quality and contribute to greenhouse gases. There is potential for erosion and sedimentation of freshwater and marine habitat. Potential habitat degradation or alteration (including changes to hydrology), and disturbance of species. Potential changes to groundwater flows; increase in ambient noise levels.
Construction of land based infrastructure (tanks, process areas, roads closed loop system (if applicable)); working areas	X	X	X		X		X	X	X	X	X	X	Dust and construction equipment emissions can reduce local ambient air quality and contribute to greenhouse gases. There is potential for erosion and sedimentation of freshwater and marine habitat. Potential habitat degradation or alteration (including changes to hydrology), and disturbance of species. Potential effects of lights on birds. Potential changes to groundwater flows; increase in ambient noise levels.
Construction of marine based infrastructure (jetty, saltwater intake and outfall (if applicable))	X	X	X	X	X	X					X		Construction equipment and vessel emissions, can reduce local ambient air quality and contribute to greenhouse gases. There is potential for turbidity, siltation and release of contaminants from marine sediment disturbances. Marine habitat degradation or alteration could result. Potential effects of noise on marine mammals. Conflicts between marine mammals and vessel traffic. Potential effects of light on birds; increase in ambient noise levels.

Table 7.3 Summary of Potential Interactions Between Project Activities and VECs													
Project Activities	Air Quality	Acoustic Environment	Marine Benthic Habitat & Communities	Groundwater Resources	Marine Fish & Fish Habitat	Marine Mammals	Wetlands	Freshwater Habitat	Rare Mammals	Rare Herpetiles	Birds	Rare Vegetation	Potential Interactions
Operations Phase													
Presence and routine operations of land based facilities	X	X					X	X	X	X	X	X	Emissions of air pollutants could result in a decrease air quality and contribute to greenhouse gases. There is potential for turbidity, siltation and contamination from surface runoff. Habitat degradation or alteration associated with changes to hydrology. Potential disturbance of species from light, noise and presence of the facility (including disturbance of feeding, breeding, movement and/or migration); increase in ambient noise levels.
Presence and routine operations of marine based facilities		X	X		X	X					X		Potential for contamination from surface runoff from jetty. Disturbance of marine species and birds from light, noise and presence of the facility. Reef and refuge effects of pilings. Effects of discharge treated water (if applicable); increase in ambient noise levels.
Project vessel traffic (Pilot, tugs, and stand-by/security vessels, LNG ships)	X	X	X		X	X							Emissions of air pollutants from Project vessels could degrade ambient air quality and contribute to greenhouse gases. Potential for turbidity, siltation and contamination from vessel propwash. Interactions between marine mammals and Project vessels; increase in ambient noise levels.
Malfunctions and Accidental Events													
Failure of sedimentation/erosion control structures			X		X		X	X					Sedimentation of marine benthic habitats, marine fish and fish habitat, wetlands and freshwater habitat leading to habitat degradation and direct mortality of individuals (e.g., smothering of benthic organisms).
Fires and explosions	X		X			X	X	X	X	X	X	X	Fires could result in terrestrial habitat alteration, wetland habitat loss, and direct mortality of rare plants, mammals, birds and herpetiles. Fire fighting chemicals and any spilled materials from the facility could enter the freshwater, wetland and marine environments and adversely affect biota and habitat if allowed to disperse and persist. Fires and explosions have the potential for adverse effects on air quality.

Table 7.3 Summary of Potential Interactions Between Project Activities and VECs

Project Activities	Air Quality	Acoustic Environment	Marine Benthic Habitat & Communities	Groundwater Resources	Marine Fish & Fish Habitat	Marine Mammals	Wetlands	Freshwater Habitat	Rare Mammals	Rare Herpetiles	Birds	Rare Vegetation	Potential Interactions
Vessel accidents and related cargo spills					X	X					X		There is potential for interactions with marine fish and fish habitat, marine mammals, birds and shoreline habitat. Potential interactions include habitat alteration and loss, and injury/direct mortality to individuals. Potential for project related vessel collisions resulting in large releases of oil or other deleterious substances.
LNG release	X						X		X	X	X	X	LNG release at the terminal site or from LNG vessels could result in direct mortality of wetland plants, terrestrial vegetation, mammals, herpetiles and birds in the immediate area of the release. There is also potential for reduced air quality.
Hazardous material spill (other than LNG)				X	X	X	X	X	X	X	X	X	Alteration of marine, freshwater, terrestrial and wetland habitat; impact groundwater quality; cause injury and mortality to birds, mammals, herpetiles, rare plants, marine fish, freshwater fish and marine mammals.
X = potential interaction													

Table 7.4 Summary of Potential Interactions Between Project Activities and VSCs								
Project Activities	Archaeological & Heritage Resources	First Nations Land & Resource Use	Marine Transportation	Fisheries & Aquaculture	Land Use	Community Services & Infrastructure	Economic Development	Potential Interactions
Construction Phase								
Clearing	X	X			X	X	X	Potential loss of archaeological/heritage resources; change in land use; increase in demand on community services and infrastructure; increase in economic activity; change in areas of significance to First Nations.
Grubbing and grading	X	X			X	X	X	Potential loss of archaeological/heritage resources; change in land use; increase in demand on community services and infrastructure; increase in economic activity; change in areas of significance to First Nations.
Construction of land based infrastructure (tanks, process areas, roads closed loop system (if applicable)); working areas		X			X		X	Potential change in land use; increase in demand on community services and infrastructure; increase in economic activity; change in areas of significance to First Nations.
Construction of marine based infrastructure (jetty, saltwater intake and outfall (if applicable))	X	X	X	X		X	X	Potential loss of marine archaeological resources; interactions with fisheries and aquaculture (impacts on habitat/exclusion of fishing vessels/interaction with construction vessels); increase in demand on community services and infrastructure; increase in economic activity; change in areas of significance to First Nations.
Operations Phase								
Presence and routine operations of land based facilities		X			X	X	X	Potential change in land use; potential for impacts on human health (from air emissions); increase demand on community services and infrastructure; increase in economic activity; change in areas of significance to First Nations.
Presence and routine operations of marine based facilities			X	X		X	X	Potential impact on navigation safety; interactions with fisheries and aquaculture (exclusion of fishing vessels/interaction with project vessels); increase demand on community services and infrastructure; increase in economic activity.
Project vessel traffic (Pilot, tugs, and stand-by/security vessels, LNG ships)			X	X				Potential interactions with marine traffic; interactions with fisheries and aquaculture (interaction with project vessels); increase in economic activity.
Malfunctions and Accidental Events								
Vessel accidents and related cargo spills			X	X				Potential impacts on marine transportation; damage to fisheries and aquaculture equipment, as well as loss of market or market value.
LNG release				X			X	Community services and infrastructure can be affected due to demands on local emergency response services. Fishers and aquaculturists may be potentially affected by temporary loss of fishing grounds and loss of market values for commercial fish and aquaculture species.

The temporal boundaries considered for this assessment include the construction and operation life of the Project. Spatial boundaries for the assessment vary according to the VEC/VSC but are generally limited to the immediate Project area unless otherwise noted. For example, effects on migratory birds may include a more regional perspective, while effects on rare flora are limited to populations in the immediate Project area (*i.e.*, “footprint” and adjacent land). The temporal and spatial boundaries for each VEC and VSC are described in Sections 8.1 and 8.2. Administrative boundaries discussed in the assessment define the administrative/political/regulatory considerations for the assessment of the VEC/VSC (*e.g.*, relevant jurisdictions, legislation) while technical boundaries define technical factors which may have imposed constraints on the assessment (*e.g.*, availability of data, time).

7.3.3 Description of Existing Conditions

Existing conditions (*i.e.*, pre-Project) are described for each VEC and VSC. The description is restricted to a discussion of the status and characteristics of the VEC/VSC within the boundaries established for the assessment. In order to improve the focus and readability of the assessment, the description centres on aspects that are relevant to potential Project interactions.

7.3.4 Residual Environmental Effects Evaluation Criteria

Section 16(1)(b) of the *CEAA* requires that the significance of environmental effects be determined. Accepted practice in meeting this requirement involves establishing and applying evaluation criteria for the determination of significance. Residual environmental effects rating criteria have been established based on information obtained in issues scoping, available information on the status and characteristics of the VEC/VSC, and often involves the application of environmental standards, guidelines or objectives, where these are available (*e.g.*, applicable ambient air quality guidelines). As well, the CEA Agency notes that consideration of the carrying capacity, tolerance level, or assimilative capacity of the area may be helpful, even though it may not be possible to quantify these characteristics.

Guidance documents prepared by the CEA Agency (1994) list a number of criteria that should be taken into account in deciding whether adverse environmental effects are significant, including: magnitude; geographic extent; duration; frequency; reversibility; and ecological and/or socio-cultural context. These criteria have been considered in this assessment with regard to determining the significance for each VEC/VSC. Additionally, it is necessary to articulate clearly what makes an effect significant. For each VEC and VSC, in Sections 8.1 and 8.2, a definition is provided for “significant adverse effect”, “not significant” and “positive effect”.

7.3.5 Potential Interactions, Issues and Concerns

Potential Project interactions with VECs and VSCs are described in the assessment through a description of the degree to which VECs and VSCs are exposed to each Project activity. Where appropriate, the assessment includes a summary of major concerns or hypotheses of relevance regarding the effect of

each Project activity on the VECs/VSCs being considered. Where existing knowledge indicates that an interaction is not likely to result in an effect, certain issues may not warrant further analysis.

7.3.6 Analysis, Mitigation and Residual Environmental Effects Prediction

The assessment focuses on the evaluation of potential interactions between the VECs/VSCs and the various Project activities outlined in the Project description. A standard evaluation system has been developed to ensure that potential effects are clearly and completely evaluated. Residual environmental effects are those that remain after mitigation and control measures are applied. The prediction of residual environmental effects follows three general steps, as suggested by the CEA Agency (1994).

Determining Whether Environmental Effects are Adverse

The effects evaluation for each VEC/VSC is conducted by Project phase (construction, operation, decommissioning) and for malfunctions and accidents. For each phase, the Study Team selects those Project activities that may result in a positive or adverse effect. To determine if there are adverse effects, the Study Team considers a number of factors, including those recommended in the CEA Agency guidance documents (1994) as noted below.

Determining Whether the Adverse Environmental Effects are Significant

The analysis evaluates the interactions between Project activities and the VEC/VSC and determines the significance of any residual adverse environmental effects (*i.e.*, effects that may persist after all mitigation strategies have been implemented), according to the evaluation criteria established for the VEC/VSC. These effects are assigned a rating of significant adverse, non-significant adverse, or positive. The evaluation includes consideration of specific mitigation strategies and the residual environmental effects evaluation criteria mentioned above.

Determining Whether the Significant Residual Adverse Environmental Effects are Likely to Occur

For significant adverse environmental effects, the assessment also considers their probability of occurrence, and scientific uncertainty.

The effects assessment analysis conducted for each VEC/VSC is summarized in a template matrix. The Residual Environmental Effects Assessment Matrix summarizes the effects by Project activity for each Project phase and describes the mitigation and analysis for each activity. The modifiers used to characterize the various criteria considered in the determination of effect significance may vary for different VECs and VSCs. The Residual Effects Summary Matrix (Section 9) provides the overall residual environmental effects rating by Project phase.

7.3.7 Follow-up and Monitoring

CEAA requires consideration of the need for, and requirements of, any follow-up studies. Monitoring and follow-up requirements are evaluated for each VEC/VSC and are linked to the sensitivity of a VEC/VSC to Project related environmental effects. The likelihood and importance of such effects, as well as the level of confidence associated with the adverse residual effects rating, are also taken into consideration.

7.3.8 Summary of Residual Environmental Effects Assessment

Finally, the adverse environmental effects on each VEC by Project phase (construction and operation), are summarized. Consideration of adverse effects that might result from malfunctions or accidents (Section 8.3) and cumulative effects (Section 8.4) are integrated with construction and operational phase effects in an overall summary in Section 9.