

ES1 INTRODUCTION

LNG Canada Development Inc. (LNG Canada), on behalf of Shell Canada Energy, Diamond LNG Canada Ltd. (an affiliate of Mitsubishi Corporation), Kogas Canada LNG Ltd. (an affiliate of Korea Gas Corporation), and Phoenix Energy Holdings Ltd. (an affiliate of Petro-China Investment (Hong Kong) Ltd.), is proposing to construct and operate a natural gas liquefaction facility and marine terminal for the export of liquefied natural gas (LNG), the LNG Canada Export Terminal (the Project). The Project will be located on privately owned lands within the District of Kitimat, BC, Canada.

LNG Canada is uniquely positioned to realize the potential benefits of the proposed Project for BC because of the world-class technical expertise the four partners bring to producing, storing, shipping, and selling gas, along with the access to markets that comes from LNG Canada's group of partners.

At full build-out, the LNG facility will receive approximately 119 million m³/day of natural gas (4.2 billion standard cubic feet per day [Bcf/day] or 3.9 petajoules per day [PJ/day]) and will produce approximately 26 million tonnes per annum (mtpa) of LNG for export. Approximately 8 million m³/day of natural gas (0.3 Bcf/day or 0.32 PJ/day) will be consumed for fuel at the LNG facility. The natural gas will be delivered by a new third-party-owned and operated pipeline.

The Project will include a marine terminal able to accommodate two LNG carriers and a marine offloading area. Supporting infrastructure and facilities include power supply, water supply, waste collection and treatment, and temporary infrastructure and facilities.

It is anticipated that the Project will be constructed in phases, with the first phase having a design capacity of approximately 13 mtpa of LNG and a further 13 mtpa of design capacity to be added in subsequent phase(s). Construction of the first phase is expected to be completed approximately five to six years following issuance of permits, with the subsequent phase(s) being developed as required by market demand.

LNG Canada is committed to a high standard of environmental management for the planned activities to ensure all regulatory and corporate requirements are fulfilled. LNG Canada is working with Aboriginal Groups, the local community and other stakeholders to ensure the proposed Project integrates local knowledge and experience throughout Project design and operation. Through active community engagement, LNG Canada is also seeking input to ensure local opportunities and concerns have been considered as part of the planning process.

ES2 PROJECT OVERVIEW

ES2.1 Proponent Description

The Project Owners are leaders in the global LNG industry:

- Shell has been a global leader in natural gas liquefaction since 1964, with ten LNG projects in operation and two under construction. Shell was a partner in the first-ever purpose built LNG carrier and has been delivering LNG safely for nearly half a century. Today, Shell is one of the largest LNG vessel operators in the world, with interests in approximately a quarter of the LNG vessels in operation.
- PetroChina is China's largest oil and gas producer and supplier, as well as one of the world's major oilfield service providers and a contractor in engineering construction. PetroChina officially launched three LNG projects in June 2004, two of which started operations in the first half of 2011.
- KOGAS has been South Korea's principal LNG provider since 1983; it is the world's largest LNG importer, and currently operates three LNG import terminals and a nationwide pipeline network, supplying natural gas from around the world to power generation plants, gas-utility companies, and city gas companies throughout the country. KOGAS has also diversified into LNG swapping and trading, and LNG terminal construction, operations and management.
- Mitsubishi is a global integrated business enterprise that develops and operates business across virtually every industry including industrial finance, energy, metals, machinery chemicals, foods, and environmental business. Mitsubishi pioneered the first LNG import to Japan from Alaska in 1969, and now handles 40% of Japan's LNG imports and has successfully built a portfolio of LNG export investments across Australia, Indonesia, Malaysia, Brunei, Oman, Russia, and North America.

LNG Canada is coordinating preparation of approval applications for the Project. If approved, the Environmental Assessment Certificate (EAC) and operational permits for the Project will be held by LNG Canada, a Canadian corporation based in Vancouver, BC.

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All communications regarding the EA for the Project should be sent to the following:

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LNG Canada has retained Stantec Consulting Ltd. (Stantec) to manage and prepare the Application for an EAC for the Project. The contact information for Stantec is:

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ES2.2 Description of the Project

ES2.2.1 Provincial and Federal Scope

The provincial and federal scope of the Project to be assessed in the EAC Application is set out by the BC Environmental Assessment Office (EAO) in the section 11 Order issued on June 6, 2013 and as amended in the section 13 Order issued on August 7, 2013. The scope of the Project comprises:

- the LNG facility and associated activities:
 - a natural gas receiving and LNG production facility that, at full build-out, will produce approximately 26 mtpa of LNG
 - a marine terminal, with a material offloading facility (MOF), able to simultaneously berth two LNG carriers up to 345 m long

- supporting infrastructure and facilities consisting of upgrades to the existing haul road, modifications to existing water intake and discharge structures, and upgrades to the existing wastewater pipeline
- temporary infrastructure and facilities consisting of workforce accommodation centre(s) and laydown areas.
- related shipping activities:
 - the operation of LNG carriers and other supporting marine traffic along the marine access route between the marine terminal in Kitimat Harbour and the pilot boarding location at or near Triple Island.

Assessment of the above Project scope will meet the requirements of the BC *Environmental Assessment Act* (BCEAA) and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) as per the federal-provincial *Memorandum of Understanding (MOU) on Substitution of Environmental Assessments* (2013).

ES2.2.2 Technical Project Information

ES2.2.2.1 Purpose

The purpose of the Project is to convert natural gas into LNG and develop the LNG export industry in BC. LNG exported from the Project will connect the abundant natural gas resources in the Western Canadian Sedimentary Basin (WCSB) with the growing worldwide demand for LNG, including the Asia-Pacific region. The North American gas market has experienced a dramatic shift in recent years, where North American gas supply now exceeds forecasted near- and long-term demand. Increased gas production from new gas fields in the United States has substantially reduced the share of the continental gas market served by the WCSB. Unconventional gas plays in Western Canada have also substantially enhanced the resource potential of the WCSB.

ES2.2.2.2 Location

The Project will be located on approximately 430 ha in the District of Kitimat. Approximately 10% of the LNG processing and storage site was previously developed for methanol production, storage, and transshipment (former Methanex Corporation facility), and for condensate transshipment (Cenovus Energy Inc.). LNG Canada reviewed over 500 sites in BC, from the Lower Mainland to the northwest corner of the province, prior to selecting Kitimat as a preferred site. UTM coordinates for the LNG facility and marine terminal are given in Table ES-1.

Table ES–1: Coordinates of LNG Facility and Marine Terminal

Location	UTM (Zone 9U)		WGS-84	
	Easting	Northing	Latitude	Longitude
LNG Facility (Plot Plan Centre)	520537	5986180	54.023482	-128.68652
Marine Terminal Wharf	521029	5982954	53.994471	-128.67923

ES2.2.2.3 Project Components and Activities

The Project will be developed in a phased approach, and consist of the key components listed in Table ES–2. The description of Project components is based upon on-going engineering design; the final design may differ slightly in configuration and equipment sizing. The marine terminal involves the modification of the existing Rio Tinto Alcan (RTA) Wharf “B” to accommodate two LNG carriers (length up to 345 m) and a materials offloading facility (MOF). The LNG loading and circulation system will interconnect the LNG processing and storage site with the marine terminal. The marine access route will start near the Triple Island Pilotage Station, pass through Principe Sound, continue into Douglas Channel, and end at the head of Kitimat Arm, in the port of Kitimat.

Table ES–2: Physical Components of the Project

Project Feature	Components
LNG processing and storage site	<ul style="list-style-type: none"> ▪ Natural gas inlet station (feed gas) ▪ Natural gas treatment equipment to remove impurities from the feed gas (including carbon dioxide [CO₂], sulphur compounds, water, mercury [if present], and natural gas liquids in the form of condensate) ▪ Storage tanks for condensate and infrastructure for staging and loading condensate into rail cars ▪ LNG production capacity of approximately 26 mtpa (at full build-out) ▪ Liquefaction refrigerant storage (ethane, propane) ▪ Minimum of two and up to four natural gas liquefaction trains with natural gas-powered refrigeration compressors ▪ Two 225,000 m³ LNG storage tanks, for a total storage capacity of 450,000 m³ ▪ Freshwater cooling towers (using freshwater from Kitimat River) ▪ Flare systems ▪ Fire water system ▪ Administration and control buildings, maintenance workshops, warehouse and laydown areas ▪ Waste solids collection and disposal ▪ Wastewater (effluent) collection and treatment ▪ Site stormwater management system
LNG loading and circulation system	<ul style="list-style-type: none"> ▪ LNG loading and circulation system between the LNG processing and storage site and the marine terminal

Project Feature	Components
Marine terminal	<ul style="list-style-type: none"> ▪ Marine terminal with MOF, and two berths able to simultaneously accommodate two LNG carriers with lengths up to 345 m ▪ The marine terminal includes modifications to the existing RTA Wharf "B" (former Eurocan wharf) ▪ The marine terminal includes loading and vapour return piping, LNG loading arms, and associated infrastructure. The planned maximum LNG carrier loading rate will be 12,000 m³/h ▪ Dredged berth areas to provide sufficient water depth for safe approach, berthing of LNG carriers, and operation of the MOF
Supporting infrastructure and facilities	<ul style="list-style-type: none"> ▪ Existing access road upgrades to accommodate larger loads ▪ Modifications to existing railway tracks (within footprint) ▪ Replacement of the existing water intake infrastructure on Kitimat River and water pipeline to the LNG facility site ▪ Replacement of the existing wastewater pipeline to Kitimat Arm ▪ Infrastructure for the import of power to the LNG facility site and marine terminal
Temporary infrastructure and facilities	<ul style="list-style-type: none"> ▪ Temporary workforce accommodation centre(s) and access roads ▪ Additional temporary laydown areas and offloading facilities ▪ Construction offices ▪ Temporary construction utilities ▪ Temporary EOF at the marine terminal

ES2.3 Alternative Means of Undertaking the Project

LNG Canada considered a number of alternative means of undertaking the Project as shown in Table ES-3. A number of criteria were used to reach a decision on the preferred option, including technical suitability, economic feasibility, land zoning, acquisition and access, industrial safety, and avoidance of environmental and heritage resources.

Table ES-3: Summary of Alternative Means of Undertaking the Project

Evaluation Criteria	Technical Criteria			Economic Criteria			Existing Use or Zoning Criteria		Environmental and Heritage Resources Criteria	Industrial or other Safety Criteria	Selection
	Feasible	Weather / Oceanographic Conditions	Narrow or Confined Channel Areas?	Proximity to Pilotage Authority	Proximity to Markets	Length of Route to Market	Existing Commercial Traffic	Existing Small Craft Traffic	Sensitive Marine Areas Affected	Shipping Safety	Preferred Alternative
Northern marine access route (Dixon Entrance to Principe Channel to Douglas Channel to Kitimat Arm)	Yes	More protected route	Yes, Squally Channel to Wright Sound	Triple Island	More direct route out Dixon Strait and over the pole	Shorter	Yes, scheduled and variable along entire route	Yes, entire route	Yes, Squally Channel to Wright Sound	Coast Guard MCTS	Yes
Southern marine access route (Hecate Strait to Caamaño Sound to Douglas Channel to Kitimat Arm)	Yes	More exposed to weather conditions including higher winds/ larger waves in Hecate Strait	Yes, Caamaño Sound to Campania Sound to Squally Channel to Wright Sound	Triple Island or Pine Island. More than 3x as much travel from either location than the northern marine access route	Less direct route around southern end of Haida Gwaii	Longer	Yes, scheduled and variable along parts of route	Yes, entire route	Yes, Hecate Strait to Caamaño Sound to Campania Sound to Squally Channel to Wright Sound	Coast Guard MCTS	No

Evaluation Criteria	Technical Criteria			Economic Criteria		Existing Use or Zoning Criteria		Environmental and Heritage Resources Criteria		Industrial or other Safety Criteria	Selection
	Feasible	Suitable Route for LNG Loading Line	Sufficient Land Available	Land Acquired	Length/Cost	Suitable Land Zoning	Existing or Proposed Land Use Conflicts	Archaeological Resources Encountered	Sensitive Environmental Areas Affected	Safety Issues with Existing Land Uses	Preferred Alternative
Modification and enhancement of the existing RTA Wharf "B" and connecting LNG loading line	Yes	Yes, direct route south of facility	Yes, existing wharf	Yes	Shorter/Lower	Yes, industrial zoning	None expected	Yes	Yes	None expected	Yes
Construction of two new wharves and modifications to the existing Methanex jetty plus construction of LNG loading line around RTA facility site	Yes	Yes, but with major technical challenges including construction of a tunnel	Yes, but requires blasting to expand available land	Not acquired	Longer/Higher	Yes, but would remove Hospital Beach	Yes, LNG loading corridor conflicts with numerous other proposed ROWs	Yes	Yes	Potentially	No

Evaluation Criteria	Technical Criteria			Economic Criteria	Existing Use or Zoning Criteria	Environmental and Heritage Resources Criteria			Industrial or other Safety Criteria	Selection
	Feasible Option for LNG Canada	Power Availability	Power Reliability Concerns	Power Cost	Existing or Proposed Land Use Conflicts	Environmental Constraints	Combined GHG Footprint	Archaeological Resources Encountered	Safety Issues with Existing Land Uses	Preferred Alternative
All electric - electrical power sourced from the BC Hydro power grid for entire facility	Yes	No, requires expansion of power grid and installation of new generating capacity	Potential challenges if system is not built with normal redundancy of supply	Highest	None expected	Potentially (BC Hydro scope)	Lowest	Potentially (BC Hydro scope)	None expected	No
Hybrid – electrical power sourced from BC Hydro power grid for auxiliary power to augment power generated at LNG facility site	Yes	Yes	Potentially	Medium	None expected	Air emissions expected	Medium	None expected	None expected	Yes
All power generated at LNG facility site	Yes	N/A	No	Lowest	None expected	Higher air emissions expected	Highest	None expected	Power Generation Regulation	No

Evaluation Criteria	Technical Criteria		Economic Criteria		Existing Use or Zoning Criteria	Environmental and Heritage Resources Criteria	Industrial or other Safety Criteria	Selection
	Clean Dredge Material Disposal	Feasible	Suitable sites available	Cost	Follow-up Cost	Suitable Land Use Zoning	Environmental Constraints	Safety Concerns
Deep water disposal at or near Kitimat Arm	Yes	Yes	Lowest	Low, monitoring	N/A	Potential depending on site selection	None expected	Yes ^a
Shallow water disposal (log capping) at or near Kitimat Arm	Yes	Yes	Medium, depends on number of sites	Low, monitoring	N/A	Potential depending on site selection	None expected	No
On-land disposal at one or more sites within 10 km of dredge area	Yes	Unknown, technical challenges with volume	Highest	High, ongoing management of disposal site	Uncertain	Dewatering of dredge material	Potential ongoing management of disposal site	No

^a A comparison of five potential marine disposal locations is also provided and identification of preferred sites

Evaluation Criteria	Technical Criteria				Economic Criteria		Land Use or Zoning Criteria	Environmental or Heritage Resources Criteria	Industrial or other Safety Criteria	Selection
	Workforce Accommodation Centre Location	Feasible	Land Available	Water Supply	Sewage Treatment	Cost	Length of Worker Commute	Suitable Land Use Zoning	Sensitive Environmental Areas Affected	Interaction of crew bus traffic with Town of Kitimat
Adjacent to LNG site	Yes	Yes	Kitimat River	Onsite treatment, marine disposal	Lower	Not applicable	Yes	None expected	During crew changes to/from regional airport	Yes
Sandhill Materials Site	Yes, but available area would limit capacity	Yes, but limited to approximately 30 ha	Kitimat River	Onsite treatment, marine disposal	Higher	Slightly longer	Yes	None expected	During crew changes to/from regional airport	No

ES2.4 Land and Marine Use

The Project is located within the District of Kitimat on privately owned land, acquired through commercial agreement with RTA (2014). The land is predominantly designated Zone M1 (manufacturing), with permitted uses detailed under Part 9, Division 6 (industrial zoning) of the Kitimat Municipal Code. A small portion of land along the east side of the LNG processing and storage site is in an area identified in the Municipal Code as G6-A (special area, environmentally sensitive).

There are no land-based parks or protected areas near the LNG facility; however, there are five Class A Provincial Parks accessible by land located in the general area between Kitimat and Terrace.

The marine access route between the pilot boarding location near Triple Island and the port of Kitimat is approximately 295 km in length, and transits through parts of Hecate Strait, Principe Channel, Wright Sound, Douglas Channel, and Kitimat Arm. Haisla Nation, Gitga'at First Nation, and Gitxaala Nation communities are located along the marine access route.

The marine access route is used by Aboriginal Groups for a variety of traditional and current marine-based activities. Marine traffic occurring along the marine access route includes commercial and recreational fishing vessels, pleasure craft, cargo vessels, ferries, cruise ships, tug and tow, and eco-tourism vessels.

ES2.5 Benefits of the Project

The Project will provide a key link in allowing natural gas production from the WCSB to reach growing global markets for LNG. By converting natural gas to LNG, the Project offers an opportunity for increased economic growth and greater prosperity locally in Kitimat and Terrace, throughout the province and across the country. The Project will benefit both BC and Canada through economic development and diversification, job creation, and increased government revenue. The Project will also support the province of BC's strategic interests in developing an LNG industry.

LNG Canada is proposing to spend between \$25 billion and \$40 billion on construction and between \$7 billion and \$17 billion per year during 25 years of operation, with decommissioning expected to cost between \$2.1 billion and \$3.3 billion (figures in nominal Canadian dollars [\$]). The Project will directly and indirectly create between 0.7 million and 1.4 million person years (PYs) of employment in Canada during construction, operation, and decommissioning and generate between \$17 billion and \$39 billion in tax revenues for the Government of Canada.

About 20% of total construction costs, 53% of annual operating costs and 81% of decommissioning costs will be spent in BC, creating between 344,000 and 762,000 PYs of employment in BC, providing between \$18 billion and \$41 billion in revenues for the provincial government.

ES2.5.1 Project Costs

Expenditures on goods and services within BC during construction are estimated to be in the range of \$4.9 billion to \$7.9 billion, including direct labour, construction services, transportation services, spare parts, concrete, and fuel. Annual spending on goods and services (excluding natural gas) is estimated to range between \$485 million and \$1.1 billion. Of this, an estimated \$400 million to \$945 million will be spent in BC each year (83% of the total). LNG Canada expects to purchase all of its utilities, repair, and maintenance services from within BC, but some spending on corporate overhead costs and other services will occur elsewhere in Canada and abroad.

Annual labour costs are estimated to be in the range of \$140 million to \$340 million, or 2% of annual operating costs. During the Project's operation phase, BC residents are expected to account for 70% of operating labour, with 20% consisting of residents from other parts of Canada and 10% consisting of imported labour from outside Canada.

An estimated \$2.1 billion to \$3.5 billion of expenditures during construction (45% of BC expenditures) will occur in northwest BC. The value of labour, goods, and services procured from sources in northwest BC during operation is expected to range between \$335 million and \$790 million per year, or approximately 67% of operating costs (excluding natural gas).

ES2.5.2 Employment

Project construction is expected to create between 110,300 PYs and 166,100 PYs of employment for Canadian residents. Approximately 39 to 42% of total employment will come from direct employment, 33% to 35% from indirect employment, and 25% to 26% from induced employment. Approximately 38% of total employment in Canada is estimated to occur in BC.

Annual employment associated with the Project during operation is estimated at 21,700 PYs to 50,500 PYs, of which 55% will be residents of BC. Over a 25-year operating life, the Project is expected to create from 0.5 million FTEs to 1.3 million FTEs of employment.

Total employment during decommissioning is estimated at 10,200 PYs to 15,700 PYs, of which 70% will involve residents of BC. Of the total employment during decommissioning, 47% will be associated with direct employment, 32% will be indirect employment associated with the purchases of goods and services needed for decommissioning, and 21% will be induced employment.

ES2.5.3 Contribution to the BC Economy

During construction, it is estimated that Project purchases of labour, goods and services needed for construction will increase GDP in BC by between \$4.1 billion and \$6.7 billion over the construction period. Direct Project effects, such as direct employment of the construction workforce, account for 53% of total provincial GDP impacts.

During operation, the Project is expected to contribute between \$3.6 billion and \$8.4 billion per year to provincial GDP.

Expenditures undertaken as part of decommissioning will generate between \$1.3 billion and \$1.9 billion in GDP for the BC economy.

ES2.5.4 Contribution to the Canadian Economy

It is estimated that purchases of labour, goods, and services needed for construction will increase the GDP in Canada by between \$12.2 billion and \$19.6 billion. Direct Project effects account for 43% of the total contribution to national GDP.

During operation, the Project is expected to contribute between \$6.2 billion and \$14.5 billion per year to the Canadian GDP. Indirect Project effects, such as inter-industry purchases, account for 82% of total impacts.

Expenditures on decommissioning will generate between \$2.1 billion and \$3.0 billion in GDP for the Canadian economy.

Over the Project life, cumulative GDP effects for Canada will be between \$170 billion and \$385 billion.

ES2.6 Applicable Authorizations

LNG Canada will not request concurrent permitting under the BCEAA pursuant to the Concurrent Approval Regulation (BC Reg. 371/2002) due to the coordination of provincial permits through the Oil and Gas Commission (OGC). The OGC is an independent, single-window regulatory agency responsible for overseeing oil and gas operations in BC, including exploration, development, pipeline transportation, and reclamation. Regulatory responsibility is delegated to the OGC through the *Oil and Gas Activities Act* (OGAA) and includes specified enactments under the *Forest Act*, *Heritage Conservation Act*, *Land Act*, *Environmental Management Act*, and *Water Act*. In addition to coordinating provincial permits and authorizations, OGC will be the agency responsible for issuing an LNG facility permit for the Project under the OGAA.

Provincial permits, approvals, and authorizations anticipated to be required following issuance of the EAC are:

- permit for construction of the LNG facility under the *Oil and Gas Activities Act*
- water supply system construction permit under section 7 of the *Drinking Water Protection Act*
- water withdrawal (short term) under section 8 of the *Water Act*
- Heritage Investigation Permit under section 14 of the *Heritage Conservation Act*
- fish collection permit under the *Wildlife Act*
- approval (or notification) for a change in and about a stream under section 9 of the *Water Act*
- permit for operation of an LNG facility under the *Oil and Gas Activities Act*
- waste discharge permit for discharge of effluent and air emissions under the *Environmental Management Act*
- water licence to extract water from Kitimat River under the *Water Act*, and
- water supply system operation permit under section 8 of the *Drinking Water Protection Act*.

Key permits, approvals, and authorizations anticipated to be required from the federal government, following the issuance of the EAC include:

- authorization to carry on a proposed work, undertaking or activity causing serious harm to fish under section 35(2)(b) of the *Fisheries Act*
- permit for disposal at sea under section 127(1) of the *Canadian Environmental Protection Act*
- approval under section 5(1) of the *Navigation Protection Act* for works in and about navigable water, and
- export licence under section 117 of the *National Energy Board Act*, which was granted on February 4, 2013.

ES3 ASSESSMENT PROCESS

The Application has been prepared to fulfill the requirements with respect to a reviewable project under BCEAA and those of a designated project under CEAA 2012. In particular, this Application complies with the Application Information Requirements (AIR), as approved and issued on February 24, 2014, by the BC EAO and will be used to satisfy BCEAA and a substituted EA process under CEAA 2012.

ES3.1 Overview of the Provincial Framework

The Project is being reviewed under Part 4 (Energy Projects) and Part 8 (Transportation Projects) of the Reviewable Projects Regulation under BCEAA because the Project includes a:

- new energy storage facility with the capacity to store an energy resource in a quantity above the threshold of 3 PJ of energy
- facility to process natural gas at a rate greater than 5.634 million m³/day, and
- marine port facility that will require dredging, filling or other disturbance of more than 2 ha of foreshore or submerged land.

The EAO issued an Order under section 10 of BCEAA for the Project on April 3, 2013 indicating the Project requires an environmental assessment. The EAO issued an Order under section 11 of BCEAA on June 6, 2013, which describes the scope of the Project and the scope of the assessment under BCEAA. An Order under section 13 of BCEAA to amend the section 11 Order was issued by the EAO on August 7, 2013.

The EAO submitted a request to substitute the CEAA 2012 process with the BCEAA process under section 3 of the federal-provincial *Memorandum of Understanding (MOU) on Substitution of Environmental Assessments* (2013). Based on the environmental process set out in the Memorandum, the federal Minister of Environment issued a statement on May 21, 2013 granting substitution of the environmental assessment to BC, provided the BC environmental assessment process meets the requirements laid out in the Substitution Decision.

During the pre-Application stage, the EAO posted LNG Canada's public consultation plan to the EAO website site in August 2013. This plan lays out the approach, methods, and timelines for sharing information about the Project with the public, potentially affected communities, and stakeholders, including open houses, a Community Information Centre in Kitimat, information distribution, and participation on the EAO Working Group. On November 8, 2013 the EAO posted the draft AIR and a 30-day public comment period was held from November 13 to December 13, 2013, including open houses on November 27 (Kitimat) and 28 (Terrace). LNG Canada responded to all comments and the EAO posted the final AIR on February 24, 2014, specifying the information that must be provided in the Application. In addition, and pursuant to the section 11 Order, in August 2013 LNG Canada submitted its Aboriginal Consultation Plan to the EAO, describing the approach, methods, and activities planned to share Project-related information and seek input from Aboriginal Groups identified in Schedules B, C, and D of the section 11 Order. While the consultation plan was developed to meet regulatory requirements, it is also based on LNG Canada's commitment to providing meaningful opportunities for Aboriginal Groups to participate in and provide input to the Project. At the end of the pre-Application phase, the Application

is submitted to the EAO to be evaluated for completeness. If serious deficiencies in the Application are identified, revision and resubmission of the Application will take place.

Following a successful completion of the pre-Application stage, the Project will enter into the Application Review stage. During this phase, the EAO has 180 days to review the content of the Application. Another public comment period (minimum 45 days) and open houses will be initiated by the EAO. During this time period, the EAO will develop an Assessment Report, which will contain a recommendation whether to issue an EAC. The Assessment Report is informed by comprehensive input from the Working Groups, Aboriginal Groups and the public through a formal comment period, open houses, and working group meetings as well as by Aboriginal consultation sought during the Application review phase. Once the Assessment Report, with recommendations from the Executive Director of the EAO, is submitted to the responsible Ministers under section 17(3) of the BCEAA, they have 45 days to make a decision on the EAC.

ES3.2 Overview of the Federal Framework

The Project requires an environmental assessment under CEAA 2012 as per the *Regulations Designating Physical Activities* (SOR/2012-147) and amended in the *Regulations Amending the Regulations Designating Physical Activities* (2013).

On May 21, 2013 the federal Minister of the Environment announced the commencement of the EA under CEAA 2012 and granted substitution of the environmental assessment to the Province of BC. The Assessment Report prepared by the EAO will be submitted to the Minister of the Environment for a final decision under CEAA 2012; the Minister of the Environment will have 365 days from the time the Notice of Commencement was posted (i.e., 365 days from May 21, 2013) to issue a Decision Statement on whether the Project may proceed.

ES3.3 Environmental Assessment Participants

The section 11 Order established two EAO Working Groups for the Project (Facility Working Group and Shipping Working Group). Representatives from twelve government agencies, four municipal and regional agencies, and seven Aboriginal Groups were invited by the EAO to become members of the Working Groups for the Project

The EAO facilitated a number of consultation meetings with the Working Groups during the pre-Application stage. Members had the opportunity to review and comment on issues related to the Project and the assessment process, including the draft VC Scoping Document and development of the AIR. Comments received from the Working Groups were used to inform the structure and content of the AIR and Application.

During Application review, the Working Groups will have the opportunity to review and comment on the Application during a consultation period following the acceptance of the Application by the EAO. LNG Canada will provide a response to all Working Group comments on the Application in a format approved by the EAO. The Working Groups will also review and provide comment on the draft Assessment Report for the Application, prepared by the EAO for the provincial and federal Ministers.

ES4 ASSESSMENT METHODS

ES4.1 Valued Components

The Application focuses on components of the environment that could be most affected by the Project and identified as a concern by government, stakeholders, the public and Aboriginal Groups. The valued components (VCs) identified for the Project, potential effects of the Project on these VCs and standard measurable parameters used to assess the extent of effects are presented in Table ES-4.

Table ES-4: Valued Components, Potential Effects and Measurable Parameters

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Environment Pillar		
Air Quality	Change in ambient air quality in the Kitimat airshed or along the marine access route	<ul style="list-style-type: none"> ▪ Estimate levels of criteria air contaminants (CACs; SO₂, NO₂, CO, PM_{2.5}, H₂S) and VOCs
Greenhouse Gas Management (based on CEA Agency guidance[2003])	Emission of GHG from the LNG facility and shipping	<ul style="list-style-type: none"> ▪ Anticipated GHG emissions (CO₂, CH₄, N₂O, expressed as CO₂e) from Project activities
Acoustic Environment (excluding vibration)	Change (increase) in overall noise levels	<ul style="list-style-type: none"> ▪ Overall equivalent continuous A-weighted (dBA) daytime and nighttime sound level (L_d and L_n) ▪ A-weighted (dBA) daytime and nighttime equivalent sound level (L_{dn}) ▪ Percent highly annoyed (%HA)
	Increase in low frequency noise during LNG facility construction and operation	<ul style="list-style-type: none"> ▪ The difference between A-weighted and C-weighted (dBA and dBC) daytime sound level (L_d) ▪ The difference between A-weighted and C-weighted (dBA and dBC) nighttime sound level (L_n) ▪ Linear (dB) daytime and nighttime sound level (L_d and L_n)

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Vegetation Resources	Change in abundance of plant species of interest	<ul style="list-style-type: none"> ▪ Abundance (count, frequency, density or cover) of: <ul style="list-style-type: none"> • federally or provincially listed plant species at risk • traditional use plant species • invasive plant species
	Change in abundance or condition of ecological communities of interest	<ul style="list-style-type: none"> ▪ Area (hectares) of: <ul style="list-style-type: none"> • provincially listed ecological communities • old forest • floodplain associations • wetland ecosystems (by class) ▪ Wetland functions (biogeochemical, hydrological and habitat functions), qualitatively assessed and related to wetland area
	Change in native vegetation health and diversity	<ul style="list-style-type: none"> ▪ Area of sensitive vegetation communities where: <ul style="list-style-type: none"> • critical levels for SO₂ and NO₂ are predicted to be exceeded • critical loads for nitrogen and sulphur deposition are predicted to be exceeded • Critical loads for acid and sulphur deposition are predicted to be exceeded
Wildlife Resources	Loss or change in habitat for species of interest (e.g., key species, species at risk, traditional uses)	<ul style="list-style-type: none"> ▪ Area of high, moderate, and low value habitat for terrestrial wildlife key species
	Risk of injury or mortality	<ul style="list-style-type: none"> ▪ Potential increased mortality to wildlife resources from Project activities (qualitative analysis)
	Sensory disturbance or behavioural alterations	<ul style="list-style-type: none"> ▪ Potential change in movement patterns related to placement of Project infrastructure (qualitative analysis)
Freshwater and Estuarine Fish and Fish Habitat	Change in fish habitat (i.e., permanent alteration to or destruction of freshwater or estuarine fish habitat including changes in habitat quality and quantity)	<ul style="list-style-type: none"> ▪ Area of fish habitat potentially affected (m²) ▪ Quality (i.e., productivity) of fish habitat potentially affected (habitat units; HU)
	Change in risk of physical injury or mortality to fish	<ul style="list-style-type: none"> ▪ Likelihood of harm to fish that are part of CRA fisheries, or those considered at risk (includes likelihood of harm to fish as a result of reduced water flow in Kitimat River)
	Change in fish health	<ul style="list-style-type: none"> ▪ Water quality parameters for fish and fish habitat (e.g., RIC 2001) ▪ Water chemistry compared to CCME and MOE guidelines for protection of aquatic life

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Marine Resources	Change in fish habitat	<ul style="list-style-type: none"> ▪ Total area of fish habitat permanently altered or destroyed (m²) ▪ Productive capacity of fish habitat permanently altered or destroyed (qualitative)
	Harm to fish or marine mammals	<ul style="list-style-type: none"> ▪ Likelihood of harm to fish species that support or are part of CRA fisheries ▪ Likelihood of harm to marine mammals ▪ Likelihood of harm to species at risk
	Change in fish health as a result of toxicity	<ul style="list-style-type: none"> ▪ Chemical composition of sediment and water (unit depends on the contaminant)
	Change in behaviour of fish or marine mammals due to underwater noise or pressure waves	<ul style="list-style-type: none"> ▪ Likelihood of exposure to underwater noise relative to recommended acoustic thresholds
Surface Water Quality (freshwater)	Change in acidification potential of streams and lakes	<ul style="list-style-type: none"> ▪ Water chemistry: routine water quality parameters (e.g., total suspended solids, temperature, total phosphorous, dissolved oxygen), major anions (e.g., chloride, sulphate), dissolved organic carbon (DOC), pH, alkalinity, major cations (e.g., calcium, magnesium) ▪ Acid neutralizing capacity (ANC) ▪ Critical load exceedances (SO₄ and NO_x) in water ▪ Physical stream characteristics (e.g., catchment area, annual flow regimes)
	Change in trophic status resulting in eutrophication of streams and lakes	<ul style="list-style-type: none"> ▪ Major anions (e.g., sulphate, chloride) and nutrients (e.g., total nitrogen, nitrate, ammonia, nitrite, total phosphorus)
Economic Pillar		
Economic Conditions	Change in labour supply and demand	<ul style="list-style-type: none"> ▪ Labour availability (persons) ▪ Labour force skill levels ▪ Supply of local and regional training programs related to skills required for the Project
	Change in economic activity of other sectors	<ul style="list-style-type: none"> ▪ Cost of living (e.g., housing cost) ▪ Change in availability of goods and services ▪ Measurements of economic activity (i.e., revenue production)

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Social Pillar		
Infrastructure and Services	Effects on community infrastructure and services	<ul style="list-style-type: none"> ▪ Population/demographic composition ▪ Demand and supply of community, social and government infrastructure and services (i.e., education facilities, community centres, first responder services, domestic water supply, wastewater, solid waste.) ▪ Access and availability of green spaces, and land-based parks and places of recreation ▪ Parameters based on affected infrastructure and services (i.e. students/teacher, police officers/1,000 people) ▪ Local government cost measurements
	Effects on traffic and pressure on transportation infrastructure	<ul style="list-style-type: none"> ▪ Daily road traffic volume (vehicles/day) ▪ Traffic collisions (collisions/year) ▪ Air and rail traffic volumes
	Change in housing availability	<ul style="list-style-type: none"> ▪ Housing supply and demand, including government assisted housing ▪ Indicators of housing affordability
Visual Quality	Reduction in visual quality related to the LNG facility	<ul style="list-style-type: none"> ▪ Visibility ▪ Existing Visual Condition (EVC)
	Reduction in visual quality related to LNG carriers in marine access route	<ul style="list-style-type: none"> ▪ Visibility ▪ Frequency, duration, and prominence of LNG carriers within field of view
Marine Transportation & Use	Interference with marine navigation	<ul style="list-style-type: none"> ▪ Proportion of the navigable channel affected by construction and operation of marine terminal, including safety zones
	Change in demand on marinas and moorage facilities	<ul style="list-style-type: none"> ▪ Attribute data on marina and moorage facilities (e.g., moorage slips)
	Interference with marine fisheries and shoreline harvesting	<ul style="list-style-type: none"> ▪ Number and types of marine vessels as a result of the Project (LNG carriers per month) ▪ Location of fisheries including the marine access route ▪ Attribute data (i.e., characteristics of a fishery such as type of fish caught, location of landings) on marine uses along shipping channel (i.e., fishing, aquaculture, other seafood and shoreline harvesting)
	Interference with marine recreation and tourism	<ul style="list-style-type: none"> ▪ Recreational and tourism activities, destinations, and routes overlapping with Project infrastructure and marine access route ▪ Indicators of visitor frequency (i.e., visitor days)

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Community Health and Wellbeing	Change in community health and wellbeing	<ul style="list-style-type: none"> ▪ demand and supply of health care infrastructure and services (includes counselling services) ▪ changes in health outcome indicators (e.g., mental health issues, substance abuse, sexually transmitted infection rates (STIs), life expectancy) ▪ indicators of community cohesion and resilience (e.g., rapid population change, crime rates) ▪ indicators of factors affecting families (e.g., violence against women, divorce rates, children and youth at risk)
	Change in diet and nutrition	<ul style="list-style-type: none"> ▪ proportion of diets from country foods ▪ composition of country foods in diet
Heritage Pillar		
Archaeological and Heritage Resources	Damage to or removal of culturally modified trees (CMTs)	<ul style="list-style-type: none"> ▪ Number, type, age and heritage value of CMTs being altered or removed
	Alteration or removal of terrestrial archaeological or heritage sites	<ul style="list-style-type: none"> ▪ Number and heritage value of terrestrial archaeological or heritage resources, or portions thereof, being altered or removed
	Alteration or removal of intertidal archaeological or heritage sites	<ul style="list-style-type: none"> ▪ Number and heritage value of intertidal archaeological and heritage sites, or portions thereof, being altered or removed
Health Pillar		
Human Health	Change in human health risk from degraded air quality	<ul style="list-style-type: none"> ▪ Concentration ratios (CRs) for non-carcinogenic chemicals of concern ▪ Incremental lifetime cancer risk (ILCR) for carcinogenic chemicals of concern
	Change in human health risk from degraded drinking water quality	<ul style="list-style-type: none"> ▪ CRs for non-carcinogenic chemicals of concern ▪ ILCR for carcinogenic chemicals of concern
	Change in human health risk from ingestion of contaminated country foods	<ul style="list-style-type: none"> ▪ Hazard quotient (HQ) for non-carcinogenic chemicals of concern ▪ ILCR for carcinogenic chemicals of concern

ES4.2 Assessment Boundaries

Spatial boundaries for the assessment of each selected VC encompass the geographic extent of environmental, economic, social, heritage and health effects of concern that could arise from the Project. The Project footprint is the physical area cleared for the Project. The local study area (LSA) for a VC encompasses the area in which Project effects can be measured and could be of concern. A regional study area (RSA) is the broader area used for determining the significance of Project residual effects and where Project residual effects overlap with effects of past, present, and reasonably foreseeable future activities for which cumulative effects are assessed.

Temporal boundaries generally coincide with the Project's construction, operation, and decommissioning phases and may also include time periods of particular sensitivity for each VC (e.g., breeding, migration).

Each VC section also addresses administrative and technical boundaries, including regulatory requirements and relevant regional planning initiatives and limitations in information, data analyses, and data interpretation.

ES4.3 Description of Baseline Conditions

Baseline conditions are described for each selected VC in sufficient detail to allow potential interactions to be identified, understood, and assessed and compared to estimated changes. Baseline conditions focus on information required to address measurable parameters defined for the VC.

ES4.4 Assessment of Project-Specific Effects

The Application follows a standard approach to assessing the Project's effects on each VC, consistent with EAO guidance (EAO 2013). Mitigation measures that will reduce or eliminate an adverse environmental, economic, social, heritage, or health effect are described in each VC section. Residual effects from the Project on each VC are characterized using specific criteria (context, magnitude, geographic extent, duration, frequency, and reversibility). Relevant thresholds, regulatory standards, and professional judgment are applied to determine the significance of Project residual effects. This includes a discussion of the prediction confidence based on the level of scientific certainty and professional judgment.

ES4.5 Assessment of Cumulative Effects

Each VC section includes an assessment of potential cumulative effects on environmental, economic, health, social, and heritage conditions arising when residual effects resulting from the Project interact with similar effects of past, present, and reasonably foreseeable future projects and activities. The RSA boundaries for each VC are used to assess the potential for cumulative effects.

ES4.6 Follow-Up Programs and Compliance Monitoring

Follow-up and compliance monitoring programs to verify the accuracy of the assessment conclusions are briefly described for each VC. A summary of all follow-up programs and compliance monitoring is provided in Section 21.

ES5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

ES5.1 Environmental Background

Section 5.1 summarizes the existing biophysical environment, including surrounding areas, to provide a general understanding of the area surrounding the Project.

ES5.2 Air Quality

Air quality is a VC because of its intrinsic importance to the health and well-being of people, wildlife, vegetation, and other biota that make up ecosystems. The assessment of air quality is limited to consideration of substances for which there are applicable regulatory criteria (e.g., criteria air contaminants or CACs). Assessment of effects on human receptors is assessed in Human Health; acidic deposition is assessed in Vegetation Resources, and Surface Water Quality, and effects of fogging or icing are considered in Visual Quality, and Accidents or Malfunctions.

The air quality assessment is based on the requirements of the Ministry of the Environment (MOE) *Guidelines for Air Quality Dispersion Modelling in British Columbia* or the "Guidelines". BC regulatory agencies use a variety of ambient air quality objectives (AAQOs) developed at the national and provincial level to inform decisions on the management of CACs. The potential adverse effect addressed in the air quality assessment is the change in ambient air quality in the Kitimat airshed due to LNG facility emissions or along the marine access route due to LNG carrier emissions, and associated vessels such as tugs.

The LSA for the facility is a 40 km by 40 km square centred on the Project footprint; and, the LSA for the marine access route is 2 km on either side of the route. The RSA is a 78 km by 78 km square centred on the Project footprint; and, the RSA for the marine access route extends 5 km on either side of the route.

The current ambient air quality is good, with few instances of observed concentrations exceeding the most stringent air quality objectives measured at thirteen monitoring stations. Plume dispersion modelling, following the Guidelines, is used to estimate the effects of Project emissions on air quality in the LSA and RSA.

During construction, the main sources of air emissions will come from site preparation, onshore construction, dredging, and marine construction. During operations air emissions will be produced by the LNG processing facility, marine terminal, marine shipping in the head of Kitimat Arm, docking, and idling of LNG carriers. Air emissions from the dismantling of the LNG facility will result in less air emissions compared with emissions in the construction phase

The estimated total annual Project-alone case emissions are as follows:

- SO₂ = 752 tonnes
- NO_x = 3,723 tonnes
- CO = 3,047 tonnes
- PM_{2.5} = 224 tonnes
- H₂S = 0.37 tonnes
- VOC = 138 tonnes

Concentrations associated with these amounts are well below the most stringent applicable AAQO. When the Project emissions are added to the base case emissions, SO₂ levels exceed AAQO objectives; however, SO₂ emissions are 99.8% attributable to existing sources. The annual Project-alone case shipping emissions are as follows:

- SO₂ = 17.6 tonnes
- NO_x = 465 tonnes
- CO = 65.0 tonnes
- PM_{2.5} = 9.12 tonnes
- H₂S = 0 tonnes
- VOC = 27 tonnes

Concentrations associated with these amounts are well below AAQO and localized near the LNG carriers. These concentrations will not measurably elevate existing SO₂ levels.

Throughout construction and operation, LNG Canada plans to limit the air quality effects due to CAC emissions from Project activities by incorporating the following key mitigation strategies:

- Potential combustion sources of air emissions, particularly NO_x emissions and fugitive dust emissions will be managed through engineering design and operational procedures (Mitigation 5.2-1 to 5.2-7).
- Construction vessels, supporting tugs, and LNG carriers will use low-sulfur fuel in compliance with applicable marine emission standards (IMO 2008) (Mitigation 5.2-8).

Project emissions have a potential to interact with many other sources in the RSA that have a potential to result in changes in ambient air quality in the Kitimat airshed and along the marine access route. Of these, the Project's natural gas treatment, LNG production, and marine vessels (at the jetty and along the marine access route) are assessed quantitatively.

After mitigation, which includes adherence to the Air Quality Management Plan, reduction of continuous NO_x emissions associated with gas turbine exhaust, and the use of low-sulphur fuel, the Project's residual effects and cumulative effects are not significant. The Project is not, either singly or as a substantial contributor in combination with other sources, responsible for causing exceedances of AAQO beyond the Project site fenceline.

ES5.3 Greenhouse Gas Management

Greenhouse gas (GHG) management is included in this assessment because the Project will contribute GHG emissions, which, on a cumulative basis, have the potential to affect climate change. The approach to GHG management assessment follows the guidelines of the Canadian Environmental Assessment Agency (CEA Agency) method for incorporating GHG considerations in environmental assessments (CEA Agency 2003) and global best practices for estimating the quantities of GHGs that may be released. Carbon dioxide is the major component of GHG from an LNG facility due to combustion processes. The other components of GHGs include methane and nitrous oxide due to fugitive leaks and internal combustion engines, respectively. These three components of GHG are reported as CO₂e. The spatial boundaries are global, recognizing the global nature of GHG emissions, and the framework established by applicable provincial and federal GHG policy and legislation. The primary criterion used to assess Project-related changes in GHG emissions is magnitude. Therefore, significance of Project-alone emissions is determined at a global geographic extent, based on a comparison of Project GHG contributions to total global emissions.

Canada's National Inventory Report (NIR) indicates that in 2011, Canada emitted about 699 million tonnes CO₂e, excluding land use, land-use change and forestry (LULUCF) estimates. Based on the latest numbers for BC from the NIR (EC 2014), the province generated 60.1 million tonnes CO₂e in 2012, which is 8.6% of the Canadian total.

Sources of GHG emissions during construction include removal of vegetation and release of diesel engine exhaust. During operation, GHG emissions will be released mainly through natural gas combustion to produce LNG, with smaller contributions from other Project activities.

Assuming full build-out, during construction, 255,742 tonnes CO₂e will be released into the atmosphere. If construction emissions are assumed to be evenly distributed over the minimum number of construction years (five years), the emissions will be approximately 51,148 tonnes CO₂e/y. Annual construction

emissions will increase provincial, national, and global inventories by 0.085%, 0.007%, and less than 0.0001%, respectively

During operation, the Project (at full build-out) will release approximately 4 million tonnes CO₂e per year from operation of the four trains (97.2% for eight gas turbines and four incinerators), flaring emissions (2%), and marine shipping activities and fugitive sources (less than 1%). The majority of GHG emissions are attributable to LNG production. It is estimated that the Project will increase the 2012 national (699 million tonnes CO₂e per year) and BC GHG emission total (60.1 million tonnes CO₂e per year) by 0.57% and 6.6%, respectively, and the total global GHG emissions by 0.009%. Considering these magnitudes and following CEA Agency guidance (2003) on ranking GHG emission intensities, the Project is ranked as a high GHG emitter.

Project GHG emissions will be reduced by implementing a comprehensive GHG management plan, which includes international BMPs, policy updates, emission source categories, effectiveness of mitigation, and activity specifications (i.e., frequency of monitoring and reviewing), as well as data management.

The GHG management plan will reflect LNG Canada's support for the development of technologies and management practices that reduce GHG emissions and will identify reporting and measurement systems. With adherence to the GHG Management Plan residual effects of the Project-alone case on GHG management are assessed as not significant.

ES5.4 Acoustic Environment

The acoustic environment is a VC because activities during construction, operation, and decommissioning of the Project will generate noise. Noise is unwanted sound and has the potential to affect the health and wellbeing of humans. Its effects are regulated by provincial and federal guidelines.

The municipal code that regulates noise in Kitimat refers only to noise generated as an outcome of typical human activities. Thus, this assessment is based on provincial and federal noise guidelines. The OGC (provincial) noise guideline recommends that sound levels from industrial facilities not exceed the permissible sound level of 50 dBA L_{eq} during daytime and 40 dBA L_{eq} during nighttime at a distance of 1.5 km from the facility, or at the nearest receptor, whichever is closer. The OGC also addresses low frequency noise (LFN) concerns. Health Canada's (federal) approach to noise assessment is based on determining the % highly annoyed.

The LSA for the facility is the area within 3.5 km of the LNG facility and, for marine shipping, is within 2 km of the marine access route. The LNG facility includes the Project footprint and safety zones. The RSA extends 5 km from the LNG facility and 2 km to either side of the marine access route.

The existing ambient acoustic environment near the Project area is characterized by a combination of natural sounds and those generated by human activities. Human activities include rail traffic, aircraft flyovers, local business and industrial activities, and vehicular traffic on local roads.

During the construction phase, noise emission from activities such as site preparation, onshore construction, dredging, and marine construction may result in a change in overall noise levels. Operational noise will be emitted by the LNG processing facility, marine terminal, marine shipping, and docking, and idling of LNG carriers. Decommissioning will generate noise during dismantling of the LNG facility that is lower than that experience during construction.

Noise effects from the construction and operation phases of the Project are predicted to comply with the OGC and Health Canada noise guidelines. Construction and operation will result in low-magnitude residual effects. These residual effects will occur continuously during the facility operation phases, at multiple regular intervals during the marine activities in the operation phases, and at multiple irregular intervals during construction and decommissioning of the Project. Residual effects from an increase in overall noise levels and an increase in LFN, during all phases of the Project, are assessed as not significant. Cumulative effects are also assessed to be not significant.

ES5.5 Vegetation Resources

Vegetation is a VC because of its ecological, aesthetic, recreational, and economic value, and its importance to Aboriginal Groups. The vegetation resources considered in this assessment consist of:

- listed plant species (as defined by the BC Conservation Data Centre [CDC], the federal *Species at Risk Act* [SARA] and the Committee on the Status of Endangered Wildlife in Canada [COSEWIC])
- traditional use plants (identified through consultation with Aboriginal Groups)
- non-native invasive plant species (as listed in the *Weed Control Act* and associated regulation, or the Northwest Invasive Plant Council [NWIPC])
- provincially listed ecological communities at risk, as defined by the BC CDC
- wetlands and floodplain associations
- old forests, and
- vegetation communities sensitive to emissions.

The LSA for vegetation covers 786 ha and is selected because vegetation in this area is susceptible to potential direct and indirect (edge) effects. The RSA covers 127,893 ha.

For considering effects from air emissions on vegetation resources, the spatial boundary for the LSA is 63,419 ha in size and is based on the CALPUFF air quality modelling results. The RSA is 125 km by 40 km around the LNG facility to assess acid deposition patterns.

Potential effects of Project activities on vegetation resources will be greatest during the construction phase when site preparation activities, such as clearing and grading, occur. The majority of this area will remain cleared and/or in a degraded state permanently.

The LSA contains 26 ecological communities and 16 anthropogenic, sparsely vegetated, and non-vegetated cover types. The area is composed of 14% upland forest, 33% floodplain, 17% wetlands and 35% anthropogenic, sparsely vegetated, and non-vegetated units. The most common ecosystem in the LSA is the Sitka spruce - salmonberry high fluvial bench floodplain, which covers 179.8 ha (23% of the LSA). Approximately 76% of the RSA is forested upland, 2% is avalanche, 4% is floodplain, 13% is wetland and 5% is anthropogenic (rock outcrops or urban developments). Approximately 34% of the RSA (43,250 ha) is old forest. The RSA is dominated by four ecosystems that comprise 51% of the total area:

- CWHvm1/06 and CWHvm2/06 western hemlock-amabilis fir / deer fern at 17%
- CWHvm1/01 and CWHvm2/02 western hemlock-amabilis fir / blueberry at 17%
- CWHvm1/08 and CWHvm2/08 amabilis fir-Sitka spruce / devil's club at 10%
- CWHvm1/03 and CWHvm2/03 western hemlock – western redcedar / salal at 7%.

There were no SARA or COSEWIC listed species found within the LSA; three provincially listed species were detected within or near the LSA, including two blue-listed and one red-listed. Plant species found within the LSA and RSA used by Aboriginal communities for traditional purposes include 7 tree, 20 shrub, 18 forb, 2 fern, and 2 moss species.

Two listed lichen species are known to occur in the RSA (blue-listed and special concern on SARA). Three non-native invasive plant species were detected near the Project footprint; Canada thistle (*Cirsium arvense*) is noxious under the *BC Weed Control Act* and the other two are listed as “very” and “extremely-invasive” on the Northwest Invasive Plant Council’s list of invasive plant species. Six blue-listed and six red-listed ecological communities at risk comprise 53.6 ha (7%) and 130.4 ha (17%) of the LSA, respectively.

Based on the air quality modelling and a soil study to assess the potential effect of nitrogen, sulphate, and acid deposition on soils, there is a low likelihood that a decline in the vegetation health and diversity will occur from acid deposition in the emissions RSA because the effect on native vegetation is restricted to 3.6 ha, which is less than 0.1% of the emissions RSA.

Mitigation for the occurrences of blue-listed rock sandwort and red-listed long-leaved aster located within the Project footprint includes pre-construction salvage and translocation. Given the abundance of plant species and ecological communities of management concern elsewhere in the RSA, only low magnitude residual effects will occur on plant species and ecological communities of management concern. LNG Canada will develop a Wetland Habitat Compensation Plan that, when implemented in combination with the Fish Habitat Offsetting Plan, will result in no net loss of wetland function. Residual effects on vegetation resources are therefore assessed to be not significant.

Neither the Project residual effects nor the Project contribution to cumulative effects will affect the regional sustainability of vegetation resources. Consequently, the contribution of the Project to cumulative effects on vegetation resources is assessed to be not significant.

ES5.6 Wildlife Resources

Wildlife resources is a VC because of potential interactions with Project activities and because of their ecological, aesthetic, recreational, economic and cultural importance. Wildlife resources are also important to Aboriginal Groups, regulators, and the public.

The facility LSA is 0.24 km² (2,375.6 ha) and encompasses the footprint of the LNG facility plus a 1 km buffer to the east and west, a 500 m buffer to the north and south of the LNG facility, the shipping LSA is 589 km² (58 900 ha) and includes 1 km on both sides of the marine access route between the marine terminal and Triple Island Pilot Boarding Station. The facility RSA is approximately 31,000 km², extending from the lower Kitimat River estuary to high alpine habitat. The shipping RSA is approximately 3.7 million km², including the waters and shorelines on both sides of the marine access route from the marine terminal to the Triple Island Pilot Boarding Station, with a buffer extending 10 km along the west side at the north end of the access route where the route is not confined by geography.

Potential effects on terrestrial wildlife and marine bird resources include loss or changes in habitat availability, risk of injury or mortality, and sensory disturbance or behavioural alterations. Availability of terrestrial habitat for key species will be reduced by 265 ha; this includes 40 ha of upland forest, 80 ha of wetland habitats and 145 ha of floodplain habitat.

Plans that will be established, such as the Wetland Compensation Plan, Fish Habitat Offsetting Plan, Traffic Management Plan, Marine Activities Plan, and the Decommissioning Environmental Management Program, will contribute to the reduction of Project residual effects on wildlife. In general, residual effects from the Project within the facility LSA will be low to moderate in magnitude, except during the construction phase where the residual effects are high for some species. The likelihood of habitat loss is high; sensory disturbance is moderate; and, mortality risk is low. The residual effects from the Project are assessed to be not significant.

Although the Project will increase vessel transportation by up to 350 LNG carriers per year, the effects will be mainly localized and terrestrial wildlife and marine birds are expected to habituate to noise and disturbance over time. Past, current and reasonably foreseeable projects are anticipated to lead to disturbance of 3,333 ha (less than 0.01%) of the RSA and increase cumulative shipping vessel traffic to 5.6 transits per day, of which the Project marine shipping will add 1.9 transits per day. A low degree effect from sensory disturbance or behavioural alterations will occur for marine birds, given the expectation that individuals will adjust movement patterns in response to increased vessel traffic within the RSA.

The Project has the potential to affect thirteen Schedule 1 SARA listed species. However, with the application of mitigation measures, the residual effects of the Project are predicted to be not significant. Recovery plans are available for two of the thirteen listed species. The proposed mitigation measures are consistent with the information provided in these strategies.

Overall, changes in habitat availability, mortality, and alteration of movement due to the Project will be local and will affect a small proportion of regional wildlife populations (estimated to be a few individuals); these changes will not influence the long-term sustainability of key species or regional wildlife populations. Consequently, the contribution of the Project to cumulative effects on wildlife resources is assessed to be not significant.

ES5.7 Freshwater and Estuarine Fish and Fish Habitat

Freshwater and estuarine fish and fish habitat is a VC because fish are an important component of the local recreational, commercial, and Aboriginal fisheries (including food, social and ceremonial purposes) and potential Project effects have been identified as a concern by Haisla Nation, the public and the scientific community. The LSA encompasses the Kitimat River estuary, Kitimat River, side channels up to the Methanex water intake, and tidally influenced channels of Beaver, Anderson, and Moore creeks west of Kitimat River.

The RSA includes all associated freshwater streams and estuarine areas within the Kitimat River Valley south of Highway 37 and Kitimat, and the head of Kitimat Arm to Emsley Cove on the west shore and Clio Bay on the east shore.

Freshwater habitat in the LSA is characterized by limited spawning, rearing and overwintering capacity in Kitimat River and Moore, Anderson and Beaver creeks due to high seasonal flow velocities and stream barriers; off-channel areas include overcuts, vegetative cover and large woody debris that provide suitable rearing and overwintering habitat, particularly suitable for coho salmon.

Construction of the Project will result in the potential alteration or destruction (PAD) of approximately 124,900 m² of freshwater and 23,500 m² of estuarine aquatic habitat. Water withdrawal from Kitimat River during the operation phase could potentially alter habitat downstream of the intake location and some fish could be entrained by the intake.

Scientific evidence and local knowledge suggest that there is an abundance of freshwater and estuary ecosystems in the LSA for Pacific salmon, and that this habitat predominantly supports the rearing and overwintering of juvenile coho salmon. The combined assessments of Project-level and cumulative residual effects concludes that effects on CRA fisheries will not pose a risk at the population-level.

Effective mitigation and offsetting measures that meet the guiding principle of no net loss of productivity are the key actions by LNG Canada to manage or eliminate residual effects. Appropriate mitigation, offsetting, and ongoing environmental management will be required under the auspices of an Authorization by DFO under paragraph 35(2)(b) of the *Fisheries Act*. LNG Canada compliance with the authorization will ensure that the Projects adverse effects on freshwater and estuarine fish and fish habitat are not significant.

ES5.8 Marine Resources

Marine resources is a VC because it has ecological importance; and the importance placed on marine resources by Aboriginal and non-Aboriginal peoples and regulatory authorities. The marine waters surrounding the Kitimat River estuary and the Kitimat Arm of Douglas Channel provide diverse habitats supporting many species that contribute to the ecological, cultural, and economic wellbeing of the region. Marine fish (and fish habitat) and marine mammals are the key components of this VC. Marine plants, sediment and water quality are considered as part of fish habitat.

The LSA is defined by a 500 m buffer around the marine terminal and the confined channels along the marine access route and marine waters extending 6 km to either side of the marine access route between Browning Entrance and the Triple Island Pilot Boarding Station. The RSA encompasses marine waters from the head of Kitimat Arm south to the northern tip of Coste Island and the extent of marine shipping activities out to the Triple Island Pilot Boarding Station with a buffer of 10 km on either side of the marine access route.

Marine habitat in the LSA is characterized by turbid low productivity surface layers, estuarine circulation, and typically hypoxic deep waters and has been subject to a variety of human disturbances associated with past and present industrial operations. The RSA is a nursery area and migration corridor for Pacific salmon and herring and a feeding ground for marine mammals, and is characterized by abundant benthic invertebrate stocks. Marine mammals, particularly humpback whales, are found year-round and seasonally within the shipping RSA.

Commercial, recreational, and Aboriginal fisheries may have affected fish populations. Sediment and water quality have been affected by historical industrial activities, such as an aluminum smelter, a pulp and paper mill (discharges from the mill entered the facility LSA from Kitimat River), a methanol plant, the municipal wastewater treatment plant (discharges effluent into the lower Kitimat River), and log storage and handling facilities.

Compliance with applicable regulatory standards and industry guidelines will ensure there are no changes to marine resources (i.e., water quality and sediment) due to sewage, wastewater, stormwater, and freshwater from the cooling towers into marine waters, hydrostatic testing, propeller wash and wave wake, and ballast and bilge water. Dredging, excavation, infilling, ground improvements, and pile installation for construction of the marine terminal will comply with water quality guidelines for the protection of marine life.

The total area of permanent alteration or destruction of marine fish habitat resulting from Project activities and works is approximately 165,230 m², of which most is salt marsh (51%) and subtidal mudflat (34%); the remaining fish habitat (15%) includes intertidal mudflat, constructed intertidal, and eelgrass bed. Dredging and marine construction could cause a change in fish health as a result of exposure to polycyclic aromatic hydrocarbon (PAH). Underwater noise or pressure waves due to pile driving and shipping activities may affect fish and marine mammal behaviour.

Key mitigation strategies will include the Fish Habitat Offsetting Plan will be developed and implemented to offset unavoidable permanent alteration or destruction of fish habitat from Project activities and works. The Plan will be developed in consultation with DFO, Haisla Nation, and key stakeholders (Mitigation 5.7-8). Although there is a high likelihood that contaminants will be re-suspended during dredging of the upper sediment layer, there is a low likelihood that these levels will result in a change in fish health due to low bioavailability (i.e., limited absorption by fish). Mitigation measures, such as marine mammal exclusion zones (Mitigation 5.8-2 and 5.8-10), will reduce the potential for marine mammals to be exposed to underwater noise above the injury threshold during pile installation. LNG carriers will travel at speeds up to 14 knots. Speeds will vary depending on navigational safety, weather conditions, location, and marine mammal presence, and will be determined based on the judgment of the ship's master who receives advice from the BC Coast Pilots on board. Subject to navigational safety needs, in areas of high whale density between the northern end of Campania Island and the southern end of Hawkesbury Island, LNG carriers will travel at speeds of 8 or 10 knots from July through October (recognizing predicted periods of high use by marine mammals) (Mitigation 5.8-12).

Changes to fish habitat will be localized and implementation of the Fish Habitat Offsetting Plan (Mitigation 5.7-12) is considered effective in addressing loss of fish habitat. Changes in sediment or water quality will be short-term during maintenance dredging and berthing and will not affect fish health or

marine resources. Mitigation measures will substantially reduce the potential for mortality and injury. Residual effects will not affect population viability of any species. With implementation of noise abatement measures during pile driving and reduced LNG carrier speeds, effects on fish and marine mammal behaviour will be minimal. The overall Project effect on marine resources is assessed as not significant.

Cumulative effects from dredging and marine construction activities may increase direct mortality or physical injury and change behaviour of fish and marine mammals caused by overlap in schedules with other projects. This has a low to moderate likelihood and will not to have an effect on population viability. This cumulative effect is, therefore, not significant.

Cumulative effects on water quality may occur if there is any spatial and temporal overlap of dredging and disposal of marine sediment with other proposed projects. These effects on water quality are short-term and local and are assessed as not significant.

ES5.9 Surface Water Quality

Water quality is a VC because water is required for aquatic life and for human consumption. There is a potential for Project air emissions to interact with water quality. Other facilities in the Kitimat region currently contribute to airshed emissions and, thus, the Project contributions to these emissions are assessed.

Potential acidification effects in freshwater systems are modelled based upon water chemistry data and SO_4 and NO_x deposition values obtained from the air modelling results. The assessment also considers the eutrophication potential of freshwater systems due to increases in nitrogen deposition.

The LSA, encompassing modelled concentrations that are above the combined sulphate and nitrogen screening threshold ($15 \text{ meq/m}^2/\text{y}$), is approximately 79,830 ha and extends approximately 35 km north and 13 km southwest of the LNG facility. The RSA is approximately 377,950 ha.

Lake and stream water within the LSA and RSA are typical of coastal freshwater systems, with relatively low conductivity, pH, alkalinity, and nutrient levels. Baseline conditions in much of the LSA have been affected by release of SO_x and NO_x in air emissions from the RTA facility since the early 1950s.

Deposition resulting from emissions of SO_x and NO_x will mainly occur during operation from LNG production. Deposition of these emissions has potential to cause acidification and eutrophication of freshwater systems, lowering pH and increasing nutrient loads. Excessive nutrient levels can cause dense aquatic plant growth, which in-turn can deplete dissolved oxygen in the water column. When plants decompose, they can subsequently decrease diversity in the affected aquatic system.

Project residual effects on surface water quality are assessed as not significant, with potential acidification and eutrophication effects limited to lakes already deemed sensitive to these parameters because of pre-existing deposition in the airshed.

Cumulative effects for modelled acid deposition result in a small but measurable increase in emissions of SO₂ and NO_x that will contribute to the acid deposition over the LSA and RSA. Nine lakes show critical load exceedances with emissions from other projects contributing more than 80% of the total acid deposition. Cumulative effects on water quality that could lead to eutrophication are assessed to be not significant.

A follow-up program will be developed in consultation with MOE and will most likely include sampling of lakes identified as acid sensitive (nine lakes).

ES6 ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

Economic conditions is a VC based on potential interactions between the Project and the local, regional, and provincial economies during construction, operation, and decommissioning. The assessment considers supply and demand for skilled and unskilled labour, wages and cost of living; availability of goods and services; and measures of economic activity in key economic sectors.

The local economy is largely supported by business services, retail trade, health care and social services and manufacturing. This demonstrates a relatively diverse economy. The average income (\$70,377 in Kitimat) is higher than the rest of BC, with a large percentage in service industries. The cost of living in the region is comparable to other northern communities (e.g., Prince George). Although housing costs are lower than the rest of BC, they have been increasing by approximately 33% (owned dwelling in Kitimat) due to a shortage of available housing. Potential effects on the economic environment during all Project phases include change in labour availability, change in wages, change in labour force skill levels, change in cost of living, change in availability of goods and services and regional economic activity.

The LSA includes communities that will potentially experience adverse economic effects related to Project requirements for labour, goods, and services. The RSA encompasses the Regional District of Kitimat-Stikine and Skeena Queen Charlotte Regional District Areas A and C.

Project regional employment will increase due to both direct and indirect (supporting businesses) jobs created within the area for the duration of the Project. Because many jobs on the Project require greater skills than those presently available in the workforce, it is expected that earnings, income, and education levels will improve. Through LNG Canada's initiatives to improve local employment through training and collaboration with Aboriginal Groups and local stakeholders, the number of local people hired during

Project operation will be increased, further offsetting the adverse effect of reduced construction employment.

The Project will create up to 7,500 new temporary jobs at the peak of construction and range between 350 to 450 new jobs during train 1 and train 2 operation, and then increase to between 450 to 800 new jobs when trains 3 and 4 become operational. These new jobs will attract workers and their families to Kitimat and Terrace, which will help diversify and expand the regional economy. Higher income for Project workers will translate into an increase in local income, which will result in induced jobs. The workforce accommodations centre(s) will mitigate adverse effects on other sectors throughout construction, while local hiring initiatives will continue to mitigate effects through the life of the Project.

LNG Canada will implement mitigation measures to avoid and reduce potential effects on local and regional economic conditions. With the application of these mitigation measures, there will be no significant adverse effects on economic conditions. Predicted effects will be of moderate to high magnitude and the Project will continue to contribute to residual and cumulative adverse economic effects throughout operation. Because the Project demand for labour, goods, and services will require resources beyond the LSA, there will be limited effects from employment and expenditures in the LSA compared with totals for each Project phase. However, based on the current economic conditions of the LSA, in which there are known labour availability issues and cost of living issues related to recent economic expansion, the effects from local employment and expenditures are likely to cause adverse economic effects on labour supply and demand in the LSA and on the economic activity of other sectors. Overall, effects are expected to be moderate and long term in duration and temporary and reversible upon decommissioning of the Project. With the application of Project-led mitigation measures, and government initiatives addressing such issues as labour availability, training, and housing affordability, and considering that beneficial economic contribution of the Project to the local and regional economy will offset some adverse effects. Project effects on the economic conditions are assessed as not significant.

Potential adverse cumulative economic effects are being anticipated by governments based on the planned growth of the LNG sector in northern BC, and planning initiatives are underway to address such issues as labour availability, training, and affordable housing. Enhanced economic activity in the RSA will offset some of the adverse effects of rapid economic growth by raising business revenue and average household incomes. With the application of Project-led mitigation measures and government initiatives cumulative economic effects are assessed as not significant.

ES7 ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

ES7.1 Social Background

Section 7.1 summarizes the existing social environment in the vicinity of the Project and surrounding areas, to provide a general understanding of the region surrounding the Project.

ES7.2 Infrastructure and Services

Infrastructure and services is a VC because the capacity and quality of infrastructure and services affects the quality of life within a community. Potential effects on infrastructure and services during all Project phases include accommodations, transportation, utilities, communications, education, land-based emergency services, social and recreational services and sites, and community infrastructure.

The LSA includes communities near enough to the Project to experience effects on infrastructure and services and includes transportation and utility infrastructure between the City of Terrace and District of Kitimat, as well as Northwest Regional Airport. The RSA is the Regional District of Kitimat-Stikine and Skeena Queen Charlotte Regional District Areas A and C and Highway 16 up to and including the Northwest Regional Airport Terrace-Kitimat.

Existing infrastructure and services in the RSA meet or exceed current levels of demand. Recent changes to Highway 16 between Prince Rupert and Terrace have increased highway capacity; road infrastructure and air service meet current levels of demand. Rental housing has limited availability and increased Project demand could result in insufficient availability; however, the general change in population in the LSA is expected to remain below 2006 levels. Delivery of waste services, sewer, education, and recreational services meet or exceed current demand in the LSA; pay-per-use services offset potential capacity issues related to increased demand. The workforce accommodation centre(s) (to be used to house Project construction workers) located in Kitimat will have its own water and waste treatment facilities and will not place increased demand on municipal infrastructure; thus, increased demand on local housing and related services will be greatly reduced.

During operation, it is estimated that workers and their families will in-migrate to either Kitimat or Terrace. Increased demand from in-migrating workers is expected to require roughly 1,143 housing units during the Project life and affect affordability due to increased demand. LNG Canada will provide permanent housing units in Kitimat sufficient to accommodate Project staff and their families who will permanently relocate to Kitimat during construction and operation. Because LNG Canada will work to reduce demands on local housing by generating new supply to accommodate its direct construction and operation workforce, the Project will not directly affect the supply and demand balance of housing in the LSA.

During Project construction and operation there will be an increase in vehicle traffic along Highway 37 and locally, and in air and rail traffic; the increases will be low to medium magnitude, short to medium term in duration, and continuous. Some effects on the available capacity or level of service will occur. Mitigation measures, such as implementation of a Traffic Management Plan, will further reduce the magnitude of residual effects and as a result, adverse effects are assessed as not significant.

Local communities in northwest BC will experience an increase in their permanent populations as the Project transitions into operation because it is expected that the workforce needed to operate the Project will only be partially fulfilled from local hiring. This in-migration is predicted to be beneficial by reversing the population decline that has occurred in northwest BC in recent years, diversifying the economy, and generating additional municipal tax revenue. Local communities will need to adapt to this change in population and, with the application of mitigation measures, adverse effects will be acceptable and are assessed as not significant.

Between 2015 and 2025, the RSA will benefit economically from industrial and infrastructure development, but a rapid increase in development will adversely affect infrastructure and services, transportation infrastructure, and housing availability and affordability. Mitigation measures will reduce most direct effects of the Project on community infrastructure, but there will be additional effects resulting from indirect and induced population change associated with the Project and other projects. Although local and regional governments will likely be able to raise sufficient funds to finance the increased service requirements, it is possible that during the period of rapid population change service demand will outstrip supply in certain areas, leading to a reduction in quality. This effect is expected to stabilize around 2021; thus, the adverse residual effect is assessed as not significant.

Transportation infrastructure in the RSA will similarly be affected by increased direct demands placed on it by the Project and other developments. Although transportation infrastructure overall has sufficient design capacity to handle the projected increase in demand, the Haisla Bridge will be a pinch point in the full build-out scenario involving multiple projects located west of Kitimat River.

A rapid increase in permanent population will lead to decreased housing availability and affordability in the RSA. Communities in the LSA are already experiencing these issues, and this trend is expected to continue and increase in magnitude if additional large projects are constructed simultaneously. This effect is assessed as adverse, short term and significant, particularly on vulnerable populations in the LSA and RSA.

In summary, while proposed resource and infrastructure projects, including the LNG Canada Export Terminal Project, will contribute to beneficial economic and social development in the RSA over the long term, overall cumulative effects over the short term will be adverse and significant for housing availability and affordability in the RSA.

ES7.3 Visual Quality

Visual quality is a VC because of potential effects on local viewsapes due to construction and operation of the LNG facility and Project marine shipping along the marine access route. The LNG facility and marine terminal are in Kitimat on a previously disturbed industrial site; the marine access route extends approximately 290 km along marine channels from Kitimat to the Triple Island Pilotage Station. Haisla Nation's largest community, Kitamaat Village, will have a direct view of the LNG facility and the LNG carriers while at berth. A number of Aboriginal communities are located along the marine access route and will have a view of the LNG carriers during transit. Approximately 50% of all lands within 8 km of the Project footprint will have a view of the LNG facility.

The LSA includes all lands and waters within 8 km of the LNG facility with a potential view of the facility and specific viewpoints along the marine access route identified through consultation with Aboriginal Groups. The RSA includes all lands and waters within 20 km of the LNG facility or marine access route where there is a potential view of the LNG facility or LNG carriers.

The area is characterized by varied vegetation patterns and expansive water views. Changes in visual quality due to construction and operation of the LNG facility and introduction of lighting may reduce enjoyment of the area for Aboriginal people, recreation users, mariners, tourists, and fishermen. The increased visual presence of shipping traffic (i.e., LNG carriers) may affect cultural and spiritual values and sense of place for Aboriginal communities, as well as tourism and recreational values.

Field studies indicated that the Project site is moderately visually sensitive because much of the land visible from the assessed viewpoints is relatively intact and generally has limited human interventions. Based on a computer simulation to evaluate how visual quality will change from key viewpoints, the LNG facility, including the marine terminal, will be visible to residents in Kitimat, Kitamaat Village, recreational and commercial fishers and mariners, and visitors to some viewpoints. LNG carriers will be visible for between 8 minutes to 67 minutes, with an average of 8 hours to 65 hours per month, depending on the viewpoint location along the marine access route.

A minimum 30 m vegetation buffer will be retained between the Project footprint and Kitimat River, where practicable (Mitigation 7.3-1), which will mitigate effects of the Project on visual quality. Tree and vegetation clearing for the Project components will be reduced to the extent possible outside of the Project footprint (Mitigation 7.3-2).

The Project footprint will be located on lands designated as industrial in the Kalum Land Use Management Plan. At full build-out, the Project will have a minimal effect on visual quality in the LSA. Visually sensitive units with established visual quality objectives are expected to be achieved. Given the considerable past industrial activities (i.e., limited change in visibility) and the short duration (one hour per day) and low prominence of LNG carriers (not close enough to dominate a person's central point of view), the Project residual effects and overall cumulative effects on visual quality are assessed to be not significant.

ES7.3 Marine Transportation and Use

Marine transportation and use is a VC because Project activities have the potential to affect or conflict with navigational safety, shipping and human use of the marine environment for commercial and recreational purposes. Potential effects on marine transportation and use during all Project phases include interference with marine navigation, change in demand on marinas and moorage facilities, interference with marine and shoreline fisheries, and interference with recreation and tourism.

The LSA includes waters surrounding the marine terminal and extending 6 km on both sides of the marine access route between Browning Entrance and the Triple Island Pilotage Station. The RSA includes the confined channels (Kitimat Arm, Douglas Channel, Principe Channel) and the waters extending 10 km on either side of the marine access route from the marine terminal to the Triple Island Pilotage Station.

In the LSA, there are two industrial facilities (Sandhill Materials and RTA facility) and five marine facilities, including marinas with public wharves, yacht clubs, and coastal ecotourism. A number of cruise ships will traverse the marine access route, if seas are rough. Commercial, recreational, and Aboriginal fisheries, mainly for salmon, herring and geoduck clams, are important to the local economy and traditions. Ecotourism and recreational boating are also common marine uses. Three hundred and twenty-nine 'safe haven' moorage sites exist within the Kitimat area.

Vessels in the area used for commercial shipping of cargo from the port of Kitimat (roughly 200 per year) include tankers, barges, tugboats, bulk carriers, and ships designed to transport specific raw materials and finished products. BC Ferries runs year-round scheduled services from Prince Rupert to both Port Hardy and Skidegate. Navigational traffic is aided by the Canadian Coast Guard (CCG) through Marine Communications and Traffic Services (MCTS).

The extent of LNG carrier interference with groundfish and salmon fisheries is limited due to fishing gear used and areas fished. The height and frequency of wake waves generated by LNG carriers, and associated escort tugs, are expected to be well within the range of naturally occurring wind and swell

generated waves. A Marine Activities Plan will detail local marine communications and emergency preparedness.

A 200 m safety zone will be established around each berth of the marine terminal during all phases of the Project; it will not affect the area used for commercial, recreational and Aboriginal fishers in the region since little harvesting occurs in the port of Kitimat due to contaminated waters in the Kitimat River estuary and low returns of eulachon. Although LNG carriers will travel between Triple Island and the marine terminal every day (when the facility is operating at full capacity), it will be a minor interference with current mariner traffic in the region, given mandatory pilotage and reduced speeds of between 8 knots to 14 knots within the marine access route, depending on navigation safety. In addition, LNG carriers will reduce speeds to 8 knots to 10 knots in areas of high mammal density (July through October).

While Project shipping activities will increase annual marine traffic by an average of two transits per day, most fisheries do not overlap with the marine access route or the gear or practices used precludes interactions with marine shipping traffic. Implementation of the Marine Activities Plan, along with other mitigation measures, will reduce conflicts with boat-based fishing and shoreline harvesting opportunities. Eco-tourism businesses have always operated alongside fluctuating levels of commercial shipping traffic, indicating that clients are accepting of passing ships. Moreover, many areas used for recreational activities and by tour operators are not located on the marine access route and will not be affected by the Project. Overall, implementation of the mitigation measures will reduce residual effects to negligible levels. Residual effects are, therefore, assessed to be not significant.

Assessment of cumulative effects included past, present, and reasonably foreseeable projects in the region. The assessment of cumulative effects determined that, with implementation of mitigation measures, all cumulative effects on marine transportation and use are assessed to be not significant.

ES7.4 Community Health and Wellbeing

Community health and wellbeing is a VC because interactions with the Project may change key areas of health, diet, and nutrition during all Project phases. Community health and wellbeing is influenced by the environment and by the socio-economic status of individuals and households within a community.

The LSA includes the following communities: Kitimat District Municipality, the Terrace Census Agglomeration (the City of Terrace, Kitimat-Stikine E, Thornhill, and Kulsapai Indian Reserve 6), Kitamaat Village, Kitselas First Nation, Kitsumkalum First Nation, Gitga'at First Nation, Gitxaala Nation, Lax Kw'alaams First Nation, and Metlakatla First Nation. The RSA includes the communities within the Kitimat Local Health Area, the Terrace Local Health Area, and the Prince Rupert Local Health Area.

Community health and wellbeing is measured through socio-demographic characteristics, such as access to medical care, the proportion of residents of a given age group, life expectancy in a community, education levels, and personal income. Physical and mental wellbeing is associated with a person's quality of life and happiness and is reflected in the community through the incidence of crime, drug and alcohol abuse and social cohesion (poverty and homelessness).

Health infrastructure and services exceed current demand and include three hospitals, 12 medical clinics, and ambulance services in the RSA. Life expectancy in Kitimat and Terrace is lower than the BC average; alcohol and drug abuse is higher; percentage of population receiving income assistance is higher; percentages of children and youth at risk are higher; and education levels are lower. Income levels are often positively correlated with educational attainment. On average, education levels in Kitimat and Terrace are lower than that of the province. Rates of depression are higher in the Northwest health services delivery area than in the rest of BC. Per capita rates of youth, child, and adult serious violent crime are some of the highest in BC.

Project design that includes self-sufficient workforce accommodation centre(s) will reduce potential effects on community health and wellbeing and housing affordability during construction and operation. While an influx of up to 7,500 workers during peak construction will lead to increased demand for medical services, on-site medical services and an emergency preparedness plan are expected to limit pressure on existing medical facilities and services. It is anticipated that workers and their families will in-migrate to either Kitimat or Terrace during the operation phase; potential exists for these individuals to affect local social determinants of health.

Local Aboriginal and non-Aboriginal residents hunt, fish, and harvest country foods. Restricted access to the Project site and surrounding marine areas, as well as potential effects on the availability of country foods due to Project activities and increased income, could result in changes to the composition of local diets consisting of country foods.

Potential positive effects of the Project are increased household income, reduced unemployment (direct and in-direct), expansion of social services, improved mental and physical health of employees, increased training and education and reduced percentages of household income spent on housing resulting from an increase in household income.

Project residual effects on community health and wellbeing are expected to be not significant. However, cumulative effects on community health and wellbeing are anticipated to be significant. Baseline conditions in Kitimat and Terrace indicate that increased demand for health infrastructure and services is already occurring. Further increases in demand, and adverse changes in social determinants of health, are expected to be exacerbated with the addition of Project residual effects and those of other reasonably

foreseeable projects. Potential Project residual effects on community health and wellbeing are anticipated to be greatest during Project construction but will be managed through the use of mitigation measures. The cumulative effects on community health and wellbeing are anticipated to be greatest in magnitude with respect to overlapping facility-based projects because of population and economic change, as it relates to housing affordability.

Project residual and overall cumulative residual effects on diet and nutrition are assessed to be not significant because decreased consumption of country foods is not expected to occur.

ES8 ASSESSMENT OF POTENTIAL HERITAGE EFFECTS

Archaeological and heritage resources is a VC, based on its cultural importance to Aboriginal communities and the historical importance of the area. Archaeological and heritage resources are of importance to Aboriginal people because they demonstrate the long-term use of their traditional territories and provide a physical link to their cultural history. These resources are also important to scientific communities and the public.

The LSA is the area of ground disturbance for the Project footprint, with an approximately 100 m buffer to the west and north and an approximately 250 m buffer to the east. There is no RSA because effects will not extend beyond the area of ground disturbance.

Two terrestrial archaeological sites were identified; no intertidal archaeological or heritage sites were found, likely due to substantial disturbance from previous development. Although no culturally modified trees have been found in the LSA to date, they are common in the area. No other archaeological or heritage sites were identified on land; however, if they are present, they are vulnerable to disturbance or damage during site clearing on land and dredging in the intertidal area.

Effects on archaeological and heritage resources can be mitigated through standard practices and commitments made with local Aboriginal communities through consultation.

Archaeological site GaTe-4, located at Shovel Test Location (STL)-5, can be avoided during Project construction, while GaTe-5, located at STL-9, cannot. GaTe-5 is the only known archaeological and heritage resource that will be affected by the Project and standard data or artifact recovery practices will be applied on a site-specific basis to mitigate these effects. Therefore, there will be no residual effects and no cumulative effects on unrecorded resources.

Given the use of standard data recovery and archaeological monitoring, none of the information regarding traditional Aboriginal, terrestrial, and intertidal use will be lost. Project residual effects and cumulative effects on GaTe-5 or other archaeological and heritage resources, therefore, are not significant.

ES9 ASSESSMENT OF POTENTIAL HEALTH EFFECTS

Human health is a VC because there is potential for the Project to change the chemical conditions of the environment (air, water, soil, sediment, and country foods). Chemicals in the environment could be transferred to human receptors, either through direct exposure or trophic transfer (i.e., diet).

The human health risk assessment evaluates the relationship between exposure to chemical stressors and potential effects on health. Project-related stressors include chemical emissions into the terrestrial, aquatic, and atmospheric environments. The assessment of human health uses the modelling results from the assessment of other VCs including air quality and marine resources.

The spatial boundaries are based on the boundaries used for the air quality assessment. The LSA is a 40 km x 40 km area centered on the Project footprint and the RSA is a 60 km x 60 km area centered on the Project footprint. The RSA to assess marine contaminant exposure to human health is the same as that for marine resources. The RSA to assess human exposures to CACs in terrestrial and freshwater aquatic country foods is the combined RSA for vegetation resources, wildlife resources, and freshwater and estuarine fish and fish habitat.

Atmospheric emissions from the LNG facility and associated transportation activities release chemicals to the atmosphere that contribute to air quality in the Kitimat region. Direct respiratory effects associated with changes in ambient concentrations of CACs which comprise SO₂, NO₂, PM_{2.5}, and CO are likely to be the most commonly experienced health effects.

The Project will not result in a change in human health as a result of changes in SO₂-related air quality or changes in combined SO₂ and NO₂ air quality. Project residual effects are assessed to be negligible magnitude, long-term duration, limited to the LSA and reversible. Residual effects are assessed to be not significant.

The assessment of residual effects from shipping assesses the potential change in ambient air quality from stack emissions generated by Project-related vessels (e.g., LNG carriers, escort tugs, support vessels) during construction, operation, and decommissioning. Based on the results of air quality modelling, contribution of shipping to air quality in the Kitimat region shows no potential interaction between shipping and human health.

Cumulative changes in CAC concentrations in the Kitimat region do not present potential human health concerns for PM_{2.5}, CO, and NO₂. Although the cumulative effects from existing projects, including the increases from the RTA facility, will be a concern with respect to SO₂, the incremental Project increase in SO₂ concentrations is limited (less than 0.01%). Changes in human health associated with SO₂ exposures in the cumulative case, beyond exposures in the base case, will be negligible and the effects

will be reversible. Therefore, the cumulative effects on human health, resulting from changes in air quality, are assessed as not significant.

ES10 ACCIDENTS OR MALFUNCTIONS

The credible worst-case accident and malfunction scenarios are not likely to occur due to design measures and operational procedures. Environmental or social effects associated with these events are, therefore, not likely to occur. In the unlikely event that such an accident or malfunction occurs, emergency response and contingency plans will be in place to limit adverse effects.

Accidents or malfunctions considered are:

- spills of hazardous materials (not including LNG)
- loss of containment of LNG in the LNG processing area and storage tanks, or loading lines
- emergency LNG facility shutdown
- explosion and/or fire, and
- vessel grounding or collision.

LNG facilities are highly regulated and continuously monitored to ensure they operate to the highest and safest standards possible. The Project will be constructed in accordance with the Liquefied Natural Gas Facility Regulation, under the BC *Oil and Gas Activities Act*, which prescribes that LNG facilities be designed, located, installed, and operated in accordance with the Canadian Standards Association (CSA) Standard Z276-11: Liquefied Natural Gas (LNG) – Production, Storage, and Handling (2011). LNG Canada will also implement a suite of internal processes and standards intended to prevent and mitigate accidents and malfunctions, such as (but not limited to):

- Hazards and Effects Management Process (HEMP)
- Asset Integrity Process Safety Manual (AI-PSM), and
- The LNG Canada philosophy is that the facility is designed and built so that risks are as low as reasonably possible (ALARP), works within the operational limits and includes maintaining the hardware barriers. Leaders play an important role in avoiding process safety incidents and must daily demonstrate visible and felt leadership in the field.

An emergency response plan framework (ERPF) and medical emergency response (MER) strategy have been developed for the Project, which will provide an outline for phase-specific (i.e., construction, operation) emergency response plans (ERPs).

Spills of either diesel or bunker oil from LNG carriers and support vessels could occur over the life of the Project and could adversely affect the quality of marine, estuarine and fish habitat, or cause direct or indirect localized mortality of flora and fauna.

An LNG spill would cause localized freezing, followed by a vapour cloud extending from the spill (GHG emission), but no soil contamination. LNG is non-toxic, evaporates rapidly under ambient environmental temperatures, and causes no long-term environmental or human health effects.

A shutdown and flaring scenario would result in a large flame burning from the flare stack for one hour or less and would release SO₂, CO_{2e} and NO_x contaminants. However, on occasion it will last for longer (sometimes much longer). Emissions would be below ambient air quality objectives; and, the greenhouse gas component would be negligible in the context of overall provincial and national GHG emissions. Some audible and visual disturbance may occur for a short period of time.

An explosion or fire due to release of natural gas would be confined to the Project footprint and associated safety zone, or beyond the immediate vicinity of an LNG carrier.

Residual effects resulting from an accident or malfunction are assessed as not significant, with specific conservative exception of risk of explosion or fire, and vessel grounding and collision and the potential effects that may occur on SARA-listed species. The likelihood of such an event is low; however, the consequence could be high, depending on the time of year and severity of event, resulting in an immediate term significant event.

ES11 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Local environmental conditions, such as severe or extreme weather, can cause adverse effects on the Project. These are typically mitigated through the use of standard design (e.g., engineering standards) and management (e.g., construction scheduling) practices. The Project could be subject to the following environmental factors:

- climate change
 - temperature and precipitation, and
 - sea level rise.
- extreme weather events
 - temperature
 - precipitation and flooding, and
 - wind and waves.

- seismic activity and tsunamis, and
- forest fires.

All parts of the facility will be designed and constructed to account for possible effects of the environment including compliance with international standards, codes, technical advisory standards specifications, design and engineering practice, publications and standard drawings as well as agreed resiliency improvement measures beyond these standards and codes.

Implementation of the strategies and mitigation measures will allow Project infrastructure to withstand potential adverse effects due to environmental conditions. It is unlikely that the Project will be affected by the environment.

ES12 SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS

A summary of the proposed environmental management program (EMP)—and associated plans that will be developed for works undertaken by LNG Canada or its contractors during each phase of the Project—is provided in Section 12.

A detailed Construction Environmental Management Program (CEMP) will be developed upon receipt of an EAC. The Operations Environment Management Program (OEMP) will be developed prior to the start of the operation phase, and the Decommissioning Environmental Management Program (DEMP) will be developed approximately two years prior to the end of operation in order to address the decommissioning phase of the Project.

Each EMP will include a series of management plans to protect the environment, personnel, and the public by preventing or reducing potential adverse effects from Project activities. The plans will be based on current best management practices (BMPs), industry standards, and regulatory requirements, including commitments in this Application and subsequent conditions of the Project approvals. An environmental management team, consisting of specialists, will be established to oversee the implementation of the EMP and carry out monitoring and reporting requirements.

The list of management plans to be included in the CEMP and OEMP are provided in Table ES-5.

Table ES-5: List of Management Plans included in the CEMP and OEMP

Management Plan	CEMP	OEMP
Air Quality Management Plan	✓	✓
Archaeological and Heritage Resources Management Plan	✓	
Emergency Response Plan	✓	✓
Erosion and Sediment Control Plan	✓	
Fish Habitat Offsetting Plan	✓	✓
Greenhouse Gas Management Plan		✓
Health and Safety Management Plan	✓	✓
Invasive Plant Management Plan	✓	✓
Marine Activities Plan	✓	✓
Noise Management Plan	✓	✓
Social Management Plan	✓	✓
Surface Water Management Plan	✓	✓
Traffic Management Plan	✓	✓
Waste Management Plan	✓	✓
Wastewater Management Plan	✓	✓
Wetland Compensation Plan	✓	
Wildlife Management Plan	✓	✓

ES13 ABORIGINAL GROUPS INFORMATION REQUIREMENTS BACKGROUND

Section 13 provides available background information for those Aboriginal Groups identified in the section 11 Order, including traditional territories, ethnography, language, land use setting and planning, governance, economy and reserves. The background information section is followed by an overview of the Aboriginal Consultation Plan and a summary of consultation and engagement undertaken with Aboriginal Groups throughout the Pre-Application stage, including the identification of key issues and concerns raised by Aboriginal Groups and LNG Canada's response and actions taken to address those concerns.

ES14 ABORIGINAL INTERESTS

As set out in the section 11 Order, the following eight Aboriginal Groups have Aboriginal Interests that could potentially be adversely affected by the Project:

- Schedule B groups (facility and associated activities)
 - Haisla First Nation (Haisla Nation).
- Schedule C groups (shipping activities), and
 - Haisla Nation
 - Gitga'at First Nation
 - Gitxaala First Nation (Gitxaala Nation)
 - Kitselas First Nation
 - Kitsumkalum First Nation
 - Lax Kw'alaams First Nation, and
 - Metlakatla First Nation.
- Schedule D groups (notification only)
 - Métis Nation British Columbia.

Five potential adverse effects on Aboriginal Interests were identified through consultation with Aboriginal Groups and other working group members, a review of secondary literature and other environmental assessment applications, and professional judgment. These potential adverse effects and associated sub-components are as follows:

- disturbance of traditional harvesting (e.g. hunting, trapping, fishing, vegetation gathering):
 - potential adverse effects on preferred harvesting methods
 - potential adverse effects on use or access to identified valued TU locations
 - potential adverse effects on preferred harvested species, and
 - potential adverse effects on the experience of traditional harvesting.
- disturbance of the use of sacred and culturally important sites and landscape features:
 - potential adverse effects on the experience of using sites and landscape features for rituals or spiritually important purposes
 - potential adverse effects on sacred and culturally or spiritually important sites and access to those sites, and
 - potential adverse effects on landforms and natural features associated with ritual or spiritual use and access to those sites.

- changes that affect aspects of traditional Aboriginal governance:
 - potential adverse changes in harvesting levels of traditional foods (especially high-value foods used for governance-related events and ceremonies), and
 - potential qualitative changes in harvested traditional foods (especially high-value foods used for governance-related events and ceremonies).
- changes in aspects of Aboriginal cultural identity:
 - potential adverse effects on participation in teaching trips, cultural camps and traditional harvesting activities
 - potential adverse effects on the use of Aboriginal languages
 - potential adverse effects on culturally important species, and
 - potential adverse effects on harvested species used for feasting activities.
- effects on Aboriginal spiritual places:
 - potential disturbance of Aboriginal spiritual places by non-Aboriginal human activity

LNG facility construction, operation, and decommissioning could potentially adversely affect consumptive harvesting, Aboriginal Interests (e.g., hunting, trapping, fishing, intertidal harvesting, vegetation gathering), Aboriginal traditional governance systems, and aspects of Aboriginal cultural identity that are linked to traditional harvesting activities through:

- changes in the abundance, availability, diversity, health and safety for human consumption of harvested traditional plant species, wildlife and marine birds, marine and freshwater fish, and intertidal resources
- interference with preferred traditional harvesting methods
- limiting or eliminating the use of, or access to, identified valued TU locations, and
- adversely affecting the experience of Aboriginal Groups' members who use land and marine areas affected by Project activities when exercising their consumptive Aboriginal Interests.

Shipping activities during construction, operation, and decommissioning could also affect the use of sacred or culturally important sites and landscape features by Aboriginal Groups by physically altering those sites or features, by interfering with access to those areas, and by adversely affecting the experience of Aboriginal people who use those sites or areas.

Shipping activities during all Project phases could potentially affect:

- aspects of the cultural identity of potentially affected Aboriginal Groups by physically interfering with traditional cultural practices (e.g., access to areas used for teaching trips and cultural camp activities), and
- areas identified by Aboriginal Groups as having particular spiritual importance through changes in the number of non-Aboriginal humans interacting with those areas, as well as changes in the acoustic environment and visual quality at those sites.

Measures to mitigate potential effects on Aboriginal Interests have primarily been adapted from relevant VCs assessed in Part B.

LNG Canada concludes that, overall, the LNG facility and shipping activities will result in a low level of interference with the identified Aboriginal Interests (with the exception of interference with consumptive Aboriginal Interests which is rated as low to moderate magnitude as a result of the LNG facility and high magnitude within the Project footprint).

ES15 STATUTORY REQUIREMENTS UNDER CEAA 2012 SECTION 5 (1) (C)

Any change that may be caused to the environment through Project effects on the following are considered:

- health and socio-economic conditions
- physical and cultural heritage
- the current use of lands and resources for traditional purposes, and
- any structure, site, or thing that is of historical, archaeological, paleontological, or architectural importance.

Table ES-6 identifies Project potential effects on the environment (as defined in CEAA 2012) that could, in turn, affect the CEAA 2012 section 5(1)(c) factors (as they relate to Aboriginal people).

Table ES-6: Potential Project Effects on Section 5(1)(c) Factors (CEAA 2012)

Valued Component	Potential Effects	Aboriginal Health	Aboriginal Socio-Economic Conditions	Aboriginal Physical and Cultural Heritage (Including Structures, Sites or Things)	Current Use of Land And Resources for Traditional Purposes
Health VC					
Human Health	Change in human health risk from degraded air quality	✓	✓		✓
	Change in human health resulting from degraded drinking water quality	✓	✓		✓
	Change in human health risk from ingestion of contaminated country foods	✓	✓		✓
Environment VCs					
Air Quality	Change in ambient air quality in the Kitimat airshed or along the marine access route	✓	✓	✓	✓
Greenhouse Gas Management	Emission of GHG from LNG facility and marine shipping				
Acoustic Environment	Change (increase) in overall noise levels	✓		✓	✓
	Increase in low frequency noise during LNG facility construction and operation	✓		✓	✓
Vegetation Resources	Change in abundance of plant species of interest (e.g., traditional use plant species)	✓	✓	✓	✓
	Change in abundance or condition of ecological communities of interest	✓	✓	✓	✓
	Change in native vegetation health and diversity because of air emissions	✓	✓	✓	✓
Wildlife Resources (Terrestrial Wildlife, Marine Birds)	Loss or change in habitat for species of interest (e.g., species at risk, traditional use species)	✓	✓	✓	✓
	Risk of injury or mortality	✓	✓	✓	✓
	Sensory disturbance or behavioural alterations	✓	✓	✓	✓
Freshwater and Estuarine Fish and Fish Habitat	Changes in fish habitat (i.e., permanent alteration to or destruction of freshwater or estuarine fish habitat, including changes in habitat quality and quantity)	✓	✓	✓	✓
	Change in risk of physical injury or mortality to fish (i.e., harm to fish by way of physical injury or mortality to freshwater or estuarine species)	✓	✓	✓	✓
	Change in fish health	✓	✓	✓	✓

Valued Component	Potential Effects	Aboriginal Health	Aboriginal Socio-Economic Conditions	Aboriginal Physical and Cultural Heritage (Including Structures, Sites or Things)	Current Use of Land And Resources for Traditional Purposes
Marine Resources (Fish and Fish Habitat, Marine Mammals)	Change in fish habitat	✓	✓	✓	✓
	Harm (physical injury or mortality) to fish and marine mammals	✓	✓	✓	✓
	Change in fish health as a result of toxicity	✓	✓	✓	✓
	Change in behaviour of fish and marine mammals due to pressure waves or underwater noise	✓	✓	✓	✓
Surface Water Quality	Acidification of streams and lakes within the Aboriginal Interests LSAs (related to sulphur dioxide (SO ₂) and nitrogen oxide (NO _x) emissions)	✓	✓	✓	✓
	Eutrophication potential of lakes and streams (related to N emissions)	✓	✓	✓	✓
Socio-economic VCs					
Visual Quality	Reduction in visual quality (LNG facility)		✓	✓	✓
	Reduction in visual quality (marine access route)		✓	✓	✓
Marine Transportation and Use	Interference with marine fisheries and shoreline harvesting		✓		✓
	Interference with marine recreation and tourism		✓		✓
Community Health and Wellbeing	Change in diet and nutrition	✓	✓	✓	✓
Physical Heritage VC					
Archaeological and Heritage Resources	Damage to or removal of culturally modified trees (CMTs)			✓	
	Alteration or removal of terrestrial archaeological or heritage sites			✓	
	Alteration or removal of intertidal archaeological or heritage sites			✓	

The potential residual effects that the Project may have on the “environment” as that term is defined in CEAA, 2012, range from negligible to moderate in magnitude depending on the section 5(1)(c) factor.

LNG Canada considers the potential effects on section 5(1)(c) factors to be adequately addressed. LNG Canada will continue to consult with potentially affected Aboriginal Groups on the potential adverse effects of the Project on section 5(1)(c) factors and measures to mitigate potential adverse effects throughout the Application Review phase; this section will be updated to reflect views heard through that process.

ES16 OTHER MATTERS OF CONCERN TO ABORIGINAL GROUPS

Five themes of concern that were identified by Aboriginal Groups were determined to be outside the scope of assessment in Part B and Section 14 and are, therefore, considered here for further analysis. The themes reflect other matters of concern heard through the working group process and through consultation undertaken by LNG Canada, and were consolidated into the following themes:

- availability of emergency services in Aboriginal communities
- effects of Project-related shipping activities on Aboriginal archaeological and heritage resources
- effects of Project-related displacement on Aboriginal harvesters, and
- effects of Project-induced changes in safety and environmental risk on Aboriginal people’s perception
- availability of workers, volunteers and traditional practitioners in Aboriginal communities

Measures offered to mitigate these other matters of concern were developed by building on existing mitigation measures defined in Part B and Section 14 of the Application, and through ongoing consultation with Aboriginal Groups.

Project-related shipping and vessel traffic will not have a measurable effect on marine navigation (including navigation by Canadian Coast Guard vessels). Project shipping and vessel traffic will not result in changes in Canadian Coast Guard response time to emergencies within Aboriginal communities.

It is not anticipated that Project-related shipping will introduce noticeably different wave effects on archaeological and heritage sites. Wake from LNG carriers is expected to be lower than normal weather induced waves.

The number of Aboriginal harvesters who may relocate their harvesting activities as a result of population increases in the Kitimat area, Project-related residual effects on Aboriginal traditional harvesting, and

increased competition for harvested species and harvesting locations between Aboriginal and Project workers is uncertain. Added competition between Aboriginal Groups for harvested species and productive harvesting locations could result from Project-related migration of those affected Aboriginal harvesters into new or less-used areas, but the actual amount of increased competition between Aboriginal Groups that would result is uncertain.

LNG Canada recognizes that Project-related effects and risks may be perceived differently by Aboriginal Groups. Aboriginal perception of environmental risk may be heavily influenced by traditional knowledge (TK) and traditional use (TU) information, personal experience, and local knowledge. The presence of the LNG facility and associated shipping activities could be perceived by Aboriginal people as adversely affecting, or increasing risk to, the environment as a whole, these changes in perception could result in increased avoidance of certain locations, and a reduction in participation in traditional use activities and related cultural changes.

Through ongoing consultation and dialogue, LNG Canada hopes to alleviate some concerns held by potentially affected Aboriginal Groups related to their perceptions of Project-related environmental and safety risk.

The Project may result in noticeable changes in labour supply and demand within the Aboriginal communities located within the economics LSA. Effects on the available labour pool and the number of volunteers in Aboriginal communities may adversely affect local businesses, volunteer organizations, and traditional practitioners but the magnitude of that effect is uncertain. LNG Canada will continue to work with potentially affected Aboriginal Groups to determine whether there are ways to reduce these potential adverse effects.

ES17 SUMMARY OF ABORIGINAL GROUPS INFORMATION REQUIREMENTS

Section 17 provides a table organized by Aboriginal Group that summarizes the potential adverse effects of the Project on Aboriginal Interests and the mitigation measures identified by LNG Canada to address these effects. Identification of Aboriginal Interests based on consultation activities, described in Section 13.2, and available information on TU and TK is also incorporated.

Aboriginal Interests were identified based on input from Aboriginal Groups through the Project's consultation activities (including review of the dAIR, the Aboriginal Consultation Plan, Aboriginal Consultation Reports and draft Part C of the Application) and on TU/TK information provided by Aboriginal Groups.

ES18 SUMMARY OF PUBLIC CONSULTATION

LNG Canada adopted an early approach to engaging with stakeholders, local and regional government and community members, and began meeting with them in 2011. Early engagement efforts have helped construct a positive working relationship with the community that LNG Canada intends to carry forward.

LNG Canada developed a Public Consultation Plan that broadly outlines LNG Canada's approach, methods and timelines for information sharing, engagement and other consultation activities during the pre-Application and Application review process, as required in the section 11 Order, as well as consultation activities after the decision on the Project. Consultation in addition to the scope discussed in the Public Consultation Plan has been undertaken in response to input received during the pre-Application process.

LNG Canada is required to submit two Public Consultation Reports to the EAO, as stipulated in paragraph 18.1 of the section 11 Order. The first report was submitted on March 19, 2014 following the first public consultation period on the draft AIR; the second report will be submitted at the time of submission of the Application.

Four formal stages of public consultation take place as part of the Application process. Stage 1 consultation occurred between 2011 and March 2013 and formed the basis of input for the Project Description. Stage 2 consultation was held during the pre-Application stage from spring 2013, and spring and summer of 2014. Engagement was broadened during this stage to obtain additional input on the Project and to update the community on Project progress. Formal EAO Working Group meetings and open houses hosted by the EAO on the VC Scoping Document and the AIR in accordance with the requirements of the section 11 Order have also taken place. During the Application Review, Stage 3, LNG Canada will continue to share information with the public and provide the opportunity for the public to provide input on the Application. Stage 4 consultation will constitute ongoing engagement post-decision.

ES19 SUMMARY OF PROJECT RESIDUAL EFFECTS

A summary of residual effects for each VC that cannot be avoided or mitigated through the re-design or relocation of Project infrastructure, or through other LNG Canada mitigation measures, is summarized in Section 19.

ES20 SUMMARY OF MITIGATION MEASURES

Mitigation measures are identified to reduce the adverse effects of the Project on each VC and thus reduce potential for significant adverse effects. A consolidated table of mitigation measures and commitments is outlined in Section 20.

ES21 SUMMARY OF FOLLOW-UP PROGRAMS AND COMPLIANCE MONITORING

A follow-up program will verify the accuracy of assessment conclusions and determine the effectiveness of the measures implemented to mitigate the adverse effects of the Project. Follow-up programs generally include effects monitoring, but can also include environmental compliance monitoring, which involves monitoring of activities to confirm compliance with the regulatory requirements and environmental commitments.

Follow-up and compliance monitoring programs are summarized in Table ES–7 and Table ES–8.

Table ES–7: Follow-Up Program

Follow-up Program	Valued Component	Project Phase	Application Section or Supporting Document
Surface Water Quality: <ul style="list-style-type: none"> This follow-up program will monitor acidification/eutrophic conditions in acid sensitive lakes (nine lakes) in the LSA to quantify potential Project effects on water quality and aquatic habitat. 	Surface Water Quality	Operation	5.9

Table ES–8: Compliance Monitoring Programs

Environmental Management Plan	Legislation / Guidance	Project Phase	Application Section
Air Quality Management Plan: <ul style="list-style-type: none"> Project emissions will be monitored and reported consistent with the requirements of the permit under the <i>Environmental Management Act</i>, Waste Discharge Regulation, once issued. Specific emissions may include nitrogen dioxide and ozone in the RSA. National Pollution Release Inventory Program reporting requirements will also be met. 	BC <i>Environmental Management Act</i> Canadian <i>Environmental Protection Act</i> (National Pollutant Release Inventory)	Operation	5.2

Environmental Management Plan	Legislation / Guidance	Project Phase	Application Section
Greenhouse Gas Management Plan: <ul style="list-style-type: none"> ▪ Project GHG emissions, verified annually by March 31 by an accredited third party, will be reported to MOE as required and to Environment Canada by June 1 each year. 	BC <i>GHG Reduction Targets Act</i> BC <i>GHG Reduction (Cap and Trade) Act</i> BC <i>Carbon Tax Act</i> Canadian <i>Environmental Protection Act</i>	Operation	5.3
Erosion and Sediment Control Plan: <ul style="list-style-type: none"> ▪ A qualified professional will monitor TSS and turbidity at watercourse during construction and adjust mitigation measures, as necessary. 	<i>Fisheries Act</i>	Construction	5.7
Fish Habitat Offsetting Plan: <ul style="list-style-type: none"> ▪ A qualified professional will monitor compliance with requirements outlined in the section 35(2) <i>Fisheries Act</i> authorization. 	<i>Fisheries Act</i>	Construction Operation	5.7; 5.8
Marine Activities Plan: <ul style="list-style-type: none"> ▪ A qualified professional will monitor compliance with the MAP. This will include monitoring compliance with requirements outlined in the section 35(2) <i>Fisheries Act</i> authorization and the Disposal at Sea Permit. 	<i>Fisheries Act</i>	Construction Operation	5.8
Noise Management Plan: <ul style="list-style-type: none"> ▪ Monitoring of sound levels, if required and appropriate, will follow the Noise Complaint Investigation Form (Part 1 and 2) from the OGC Noise Control Best Practices Guideline. 	OGC Noise Control Best Practices Guideline	Operation	5.4

ES22 CONCLUSION

With the implementation of mitigation, monitoring and follow-up programs, any residual effects resulting from the Project will be not significant. Cumulative effects will also be not significant, with the exception of possibly significant cumulative effects on community health and wellbeing and infrastructure and services as relevant to availability of health services and availability of affordable housing, respectively, and the potential effects that may occur on SARA-listed species in the unlikely event of an explosion, fire, vessel grounding or collision.

The Project is strategically important for the community of Kitimat and, to a broader extent, the people of BC and Canada, given the need for opportunities to generate employment and income for communities to prosper and the need to find new export markets for an abundance of surplus natural gas. The Project presents one of the best opportunities in a generation to turn BC's abundant natural gas resources into economic growth, jobs and improved services. LNG Canada will continue to work with interested

stakeholders and Aboriginal Groups to develop the Project in a manner that is environmentally sustainable and socially and economically beneficial to deliver a low-impact, clean energy solution to meet growing energy demand.